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"An investigation into the relationship between children's cognitive style and their perception of the environment".

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ABSTRACT OF THESIS

This study considers relationships between the cognitive style identified by Witkin et al (1964) (ie analytic/field independence, as opposed to global/field dependence) and children's perceptions of their environment. Arising from a review of the literature, a variety of hypotheses were examined through an empirical investigation with 481 children aged between 10 and 13 and drawn from a rural and an urban environment.

The results of the study raise questions about the conceptual inadequacy and empirical validity of the style identified by Witkin and further whether the tests used to identify the style can explain performance on map and environmental exercises. The inter correlations between the three measures of cognitive style used in the study were comparatively low (Embedded Figures Test (EFT) with Rod and Frame Test (RFT) 0.4290 $p < 0.01$, Embedded Figures Test with Articulation of Body Concept Scale (ABC) 0.4392 $p < 0.01$, RFT with ABC 0.3448 $p < 0.01$) and the most regularly used measure of this particular cognitive style in previous research (EFT) correlated more highly with intelligence (0.5982 $p < 0.01$) particularly perceptual reasoning (0.5616 $p < 0.01$) and spatial ability (0.7333 $p < 0.01$) than with RFT and ABC. In the investigation of 25 specific research hypotheses, a more positive relationship was demonstrated with the result of the Embedded Figures Test than with those of the RFT and ABC and it is suggested that this can be explained in terms of general intellectual ability. Similarly performance on the measures of environmental perception and mapping skill employed in the study appeared to be considerably influenced by general intelligence and more especially perceptual reasoning. The strong spatial/intellectual bias of the relationships identified in the research were confirmed in a principal components and multiple regression analysis of the results.

In a follow up study of a representative group of extreme analytic/field independent individuals and extreme global/field dependent individuals it was possible to identify children who demonstrated capacities as described by Witkin, which were not dependent upon ability. In general however, intelligence was the major differentiating factor between the two groups.

Specific findings related to each of the research hypotheses are discussed in detail in the text. The main findings of the study however appear to question the existence of the cognitive style identified by Witkin and the expectation of an association between cognitive style and environmental perception was not confirmed.

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I N D E X

THE FOLLOW UP STUDY

CHAPTER ONE - Introduction

Geographers have regularly demonstrated considerable interest in keeping pace with current trends in educational thinking and have derived benefit especially from psychological contributions to our understanding of children's development. This is demonstrated particularly in attempts to explain the problems experienced by children with map skills and interpretation (Satterly 1965) and with the development of map understanding. (Catling 1978, 1979, Sandford 1972).

More recently, the relationships between the disciplines of geography and psychology have been reinforced by the emergence of 'Behavioural Geography' (Gold 1980) Environmental Psychology (Craik 1972, Ittelson,Rivlin and Proshansky 1974) and in the plethora of new books on the 'Psychology of Place' (Canter 1976) and investigations into individual's perceptions of their environments. (Lynch 1965, 1979, Pocock and Hudson 1978, Moore and Golledge 1976).

This study attempts to investigate the contribution of psychology to geographical understanding in an additional direction. Psychology of Education has focussed attention upon the investigation of individual differences for some considerable time and recently this has been represented by consideration of 'Cognitive Styles' or individual preferences for study and learning. (Pask and Scott 1972), Messick 1976, Kogan 1971, Goldstein and Blackman 1978). One particular cognitive style which has been extensively researched by Witkin and his colleagues in the United States is that which distinguishes between an 'analytic' as opposed to a more 'global' and less specific approach to the solution of problems. The foundations of Witkin's research lie in the study of perception and has strong spatial associations. Similarly, when one considers how children might come to perceive, know and understand their environment, spatial skills must influence the process considerably. If the cognitive style identified by Witkin exists, it may help in explaining differences amongst and between children in the way they come to perceive, know and understand their environment.

The following two chapters present a review of research into cognitive styles and environmental perception. Then an outline of the empirical research devised for this study is presented which attempts to investigate the relationship between cognitive style and children's perception of their environment. Chapter Five discusses the results of the empirical research in the light of previous investigations and this is followed by a summary of the conclusions reached. A series of Appendices contain examples of the tests and exercises used in the study, as well as a representative selection of the children's responses.

CHAPTER TWO - A review of the Literature associated with the study of cognitive styles

Introduction

This section opens with an analysis of the background and definition of 'cognitive style' which is then considered in terms of relationships with other variables of individual differences. A review of cognitive styles research is then undertaken with reference to their specific nature and any educational applications which have been derived for them. The focus of attention is then directed at a detailed analysis of one particular cognitive style, that formulated by Witkin and others of an analytic/global conceptualisation. The relationships between Witkin's findings are then discussed in terms of individual's understanding of their environment; and the section concludes with a review of issues pertinent to Research into Environmental Perception which arise throughout the discussion.

(i) Cognitive Styles - Background and Definition

Probably no two people approach a given learning situation in exactly the same way, whether it be studying a research article, learning to type or understanding a problem in mathematics. Each of us, as individuals are unique. We each have preferred problem solving strategies and ways of organising all that we see, remember and think about. Recent years have seen a revival of interest amongst psychologists and others in individual differences in problem solving.

This interest is no new phenomenon Tyler (1965) notes that differences between individuals was recognised as of importance in understanding development at the turn of this century. The lack of immediate practical application, coupled with the rise of Gestalt Psychology and its search for universal laws of perception led to a decline in interest in individual differences.

A return to individual differences as the focus of studies in psychology has been commented upon by various authors. Mahoney (1977) for example noted that one common characteristic is the attention paid in recent research to the cognitive learning perspective and that individuals respond to their own cognitive construction of the environment rather than to objective reality. In other words we each have our own unique individual interpretation of the world and it is to this that we respond and refer in our everyday environmental encounters. In his overview of the status of Psychology, McKeachie (1976) indicated a return amongst psychologists to an interest in the 'psyche', mental processes and cognition. Similarly, in a recent lecture by Nisbet (1979) reviewing the status of Educational Psychology, he saw the future of psychological study as centred essentially within the cognitive-learning framework and its association with individual differences and applications which might be derived for educational practice.

One manifestation of this increased interest in cognition and its association with individual differences is the attention which has been paid to the idea of 'Cognitive Styles'. This interest is demonstrated in Brody's (1972) review of the common characteristics of research in to the cognitive approaches to personality over the last twenty years. He isolated four main features:

(1) There is an emphasis on individual differences in styles of thinking as a starting point.

(2) The emphasis is on style to the neglect of content.

(3) The assumption is that styles of thinking are related to other personality characteristics of an individual.

(4) The treatment of preferred ways of thinking, acting or feeling as individual traits. (The characteristics are independent of situational influences, and the emphasis is on the consistency of style).

Cognitive styles have been defined in a variety of ways.

Kogan (1971) for example describes them as,

"Individual variations in modes of perceiving, remembering and thinking or as distinctive ways of apprehending, storing, transforming and utilising knowledge"

Goodenough (1976) refers to cognitive styles as,

"Dimensions of individual difference involving the form of cognitive functioning, with expression in a wide array of content areas including perceptual, intellectual, social-interpersonal and personality defence processes".

Messick (1976) regards cognitive styles as,

"consistent individual differences in the ways of organising and processing information and experience."

One group of investigators, the Witkin group, defines cognitive style in the following way,

"... manifestations in the cognitive sphere of still broader dimensions of personal functioning which cut across diverse psychological areas ... and represent different ways of cutting the personality 'pie' from those traditionally used" (Witkin 1977 et al)

Others have defined cognitive styles as,

"... the characteristic ways in which individuals conceptually organise the environment." (Goldstein and Blackman 1978 p 2)

"... the way an individual filters and processes stimuli so that the environment takes on psychological meaning." (Harvey 1961)

"... a term that refers to stable individual preferences in mode of perceptual organisation and conceptual categorisation of the external environment." (Kogan et al 1963 p 74)

Each of these definitions specifies fundamental aspects of the way in which individuals experience, interact with, and learn from their environment. Common to all of them is an emphasis of stability of style and a concern for the structure of thought processes as opposed to the content of thought. Cognitive styles seem to be concerned with <u>how</u> cognition is organised rather than with <u>what</u> knowledge an individual has acquired. They might be conceptualised therefore as,

"... stable attitudes, preferences or habitual strategies determining a person's typical modes of perceiving, thinking and problem solving." (Messick 1976)

There is an important distinction which needs to be made between cognitive styles and cognitive strategies. Cognitive styles as represented in the various interpretations described previously, refer to high level heuristics, which organise and control an individual's behaviour in the majority of situations that he finds himself in. Strategies on the other hand are seen as decision making regularities in information processing which result as a function of the conditions of a particular situation. This distinction is clearly made by Messick (1976) and Goodenough (1976) and is demonstrated in the work of Pask and Scott (1972) where they distinguish between 'learning styles', which are relatively stable personal preferences or characteristic ways of learning; and 'learning strategies' which are seen as the immediate response to the requirements of a particular task. Pask (1976) recognises that an individual's response to a task will depend on both his cognitive (or learning) preference and on the perceived characteristics of the task. Messick (1976 p 6) sums up the differences between cognitive styles and cognitive strategies when he says,

> "Cognitive strategies are selected, organised and controlled in part as a function of larger-scale, more general cognitive styles and ability patterns, but they are also determined in part as a function of task requirements, problem content and situational constraints; hence in comparison to styles, strategies are likely to be more amenable to change through training under varied conditions of learning. It may thus be possible for individuals to learn to use optimal problem solving and learning strategies consonant with their cognitive styles and even to learn to shift to less congenial strategies that are more effective for a particular task than are their preferred ones."

(ii) <u>Cognitive Styles and relationships with other variables of individual difference</u>

In that cognitive styles are seen to encompass diverse aspects of an individual's behaviour, it is not surprising that advocates of the existence of such styles recognise strong relationships between an individual's cognitive style and his personality. As such, cognitive styles are thought to be intimately associated with affective, temperamental and motivational features of the whole personality. In this view, a core personality represents itself in the various domains of psychological functioning, both intellectual and affective. (Witkin et al 1971)

In a review of the concept of cognitive style, it would seem important to examine the distinction between cognitive style and general intellectual abilities. The concept of ability implies the measurement of capacities in terms of maximum performance, with an emphasis on level of achievement. The concept of cognitive style implies the measurement of characteristic modes of operation in terms of typical performance and the emphasis is on process. Similarly, abilities are concerned with the level of skill, the more or less of a performance, whereas cognitive style considers the manner or form of cognition, the preferred way of doing something. Cognitive styles are certainly not habits in the technical sense of learning theory, for they are not directly responsive to the principles of acquisition and extinction. They are seen to develop slowly and experientially and are not easily modified by specific training or tuition. (Kogan 1971). It is also the case that abilities are unipolar, whereas cognitive styles are bipolar. Abilities therefore, vary from zero, or very little, to a great deal, with an increased score implying more and more of the same facility. High spatial ability for example predisposes a person to achieve in certain areas but its absence only implies that in those areas associated with spatial ability might an individual experience difficulty. Cognitive styles are described in the form of a continuum which ranges from one extreme to another extreme, with each end of the continuum having different implications for cognitive functioning. Cognitive styles are therefore a more advantageous way of categorising people in that each of the extremes have differentiated values, whereas abilities are seen as being possessed or not. Each end of a cognitive style continuum is seen as possessing both positive and negative features and because of this, Witkin (1976) believes that cognitive style becomes a less threatening concept to people than are abilities or intelligence. Information about an individual's cognitive style is therefore more easily communicated to him. There are disadvantages to conceptualising styles in this way however, since the various extremes are often described as if they were stereotypes, when in reality individuals are distributed continuously between the extremes with considerable variations. A further problem is isolated by

Vernon (1972) and Satterly (1976) who point out that one end of a cognitive style continuum can quickly assume superiority over its opposite and is then viewed by recipients in the same way as measures of intelligence.

A measurement of ability also differs from a cognitive style in terms of the range of competence with which it is associated. An ability usually delineates a fairly discrete area of human behaviour and is specific to a particular domain of content or function. Cognitive styles, in contrast, cut across domains and as described earlier are conceptualised as high level heuristics that organise lower level strategies, operations and propensities, including abilities.

There is also an important historical distinction which can be made between ability and cognitive style, in that they differ in the methods by which they are ordinarily measured. Abilities are rooted in mental test theory and dating from the beginning of this century have a close association with Education. Psychologists associated with the identification and measurement of abilities have tended to develop pencil and paper measuring instruments for use in school settings, either with individuals or groups. One consequence of this is that ability measures tend to emphasise accuracy of response and level of achievement. Cognitive styles, in contrast, have their roots in the study of perception and personality mainly derived from laboratory and clinical studies and employing individually administered measuring devices (for example, Rorschach or word association procedures). One natural consequence which has already become apparent in the discussion, is that cognitive style measures, at least at the level of interpretation, emphasise process of responding. These differences in measurement are not intrinsic to the variables measured however and a considerable range of pencil and paper tests of cognitive style have been developed which are suitable both for individual and group administration. (Messick and Fritzky 1963, Messick and Kogan 1966, Witkin, Oltman, Baskin and Karp 1971).

(iii) A review of Cognitive Styles Research, their nature and Educational Applications

In an attempt to review cognitive style research up until 1975, Messick distinguishes current studies in terms of nine categories. The first four derive from the work on cognitive controls by Gardner and Klein (Gardner, Holzman, Klein, Linton and Spence, 1959) and are those of scanning, levelling-sharpening, constricted as opposed to flexible control and tolerance for incongruous or unrealistic experience. A fifth approach was originated by Witkin and his colleagues (Witkin, Lewis, Hertzman, Machover, Meissner and Wapner 1954) who use the categories of field dependence - field independence. Workers in the area of cognitive controls also investigated this variable, terming it 'field articulation'. Messick's sixth category of 'cognitive complexity' included the work of Kelly (1955) Bieri, Atkins, Briar, Leaman, Miller and Tripodi (1966) and Harvey, Hunt and Schroder (1961). The final three categories in this list were reflection - impulsivity (Kagan, Rosman, Day, Albert and Phillips 1964) Pettigrew's (1958) styles of categorisation and Kagan, Moss and Sigel's (1963) styles of conceptualisation, Recently Messick (1976) has modified these nine categories and added new ones to produce a list of 19 American approaches to the study of cognitive style which reflects both increasing research interest in cognitive styles as well as Messick's continuing attempt to organise and integrate a wide variety of research efforts. To the list produced by Messick, could be added Pask and Scott's (1972) styles of Holists and Serialists and Satterly's (1970) Analytic-Synthetic categorisation.

Kogan (1973, 1976) distinguishes between three types of cognitive style. The first type refer to an ability to perform, with performance judged against a standard. He cites Witkin's category of field dependence - independence as an example. In type II Cognitive Styles, greater value is placed on one of the stylistic categories by the investigator. For example, Kelly (1955) and Bieri et al (1966) view the cognitively complex person as having an advantage over the cognitively simple person in processing information about his environment. This particular category appears to contradict the point made earlier about the continuum nature and value free status of cognitive style categories. The third type of cognitive style described by Kogan does not relate to ability. Further, the investigator does not attribute superiority in performance to an individual at any particular pole or in any particular situation. Kogan (1976) cited Pettigrew's (1958) investigation into 'category width' as an example of this type of style, as are Bruner's (1956) focussing and scanning strategies of concept attainment. Perera's (1974) review of cognitive style adopts a similar interpretation to that of Kogan. Working under the guidance of Satterly at Bristol, Perera distinguished between cognitive style as ability and cognitive style as preferences. The former are identified where subjects are set to determine a single correct response (for example in Witkin et al's (1971) Embedded figures test) and the latter where situations are presented which are potentially capable of a number of equally valid solutions (as in Satterly and Brimer's (1971) style of thinking test).

As can be seen, numerous approaches have been made to the study of cognitive style, often from diverse theoretical standpoints and employing various research techniques. This variation of approach has resulted in obvious problems of definition. Such conceptual distinctions as arise are, more often than not, a matter of the differences in theoretical orientation than in the phenomena isolated. Yet the conceptual differences are important, for the psychological processes underlying individual variation in cognitive functioning will be relevant to the way individual differences are articulated and the suggestions for application and further experiment. It would seem therefore essential to consider various styles within the framework of their heritage before appropriate comparisons might be derived. The problems associated with comparison across cognitive style research is demonstrated in a recent study by Goldstein and Blackman (1978) in which they question some of the basic assumptions of cognitive styles. Despite the elements of common interest in the study of cognitive style, the variations in approach and the use of varying measuring instruments, has produced a body of literature from which it is difficult to extract general principles. Kagan and Henker pointed out the need for systematisation at the levels of theory and research in 1966. The Goldstein and Blackman study (1978) attempted to investigate the inter-relationships which exist between five established and well researched cognitive styles and found that each of them do relate to identifiable behaviour of one sort or another. They concluded by emphasising the need for more specific, yet generally applicable measuring instruments, as well as research directed towards the examination of the interactions between the various cognitive styles and the relationship between cognitive styles and environmental experience.

The discussion so far has considered cognitive styles in general terms and there are apparent inconsistencies between the claims made for cognitive styles and the criticisms which have been suggested about these claims. Despite these comments, it is the case that some argue strongly about the potential educational applications which might be derived from cognitive styles research. (Witkin et al 1977, Kogan 1971, Doebler and Eicke 1979). For the teacher, the diversity of individual differences is an everyday fact of life. There are obvious differences which distinguish pupils, such as age, sex, race, ethnic background and social class. Pupils also differ in abilities (general and specific), their motivation to achieve, their interests, attitudes, values and personality characteristics. Teachers are accustomed to describing children in terms of all of these factors. Unlike ability, personality and value constructs, all of which have been intimately linked to Education for many years, the concept of cognitive styles has penetrated the scene to only a minor extent. Yet, much that has been discussed so far has an immediate attraction in the educational context. A measurable feature of individual difference, which is stable and consistent over time and which is thought to cut across levels of intelligence would be a valuable addition to the teachers' armoury. A further important feature of cognitive styles, the relationship to process rather than content, would also seem to be closely associated with current emphases in modern educational thinking. Information derived from cognitive styles research would therefore appear to offer important potential applications to education, some of which might call for radical re-thinking and restructuring of educational experiences. For example, does the way in which a child or student is taught suit his cognitive style, his preferred way of learning? If not, is this an important factor in his failure to grasp or understand certain situations or experiences? Is there anything that can be done to match teachers and learners cognitive styles and more importantly, ought we to do this? There are obviously a whole range of important educational questions here and Witkin (1965) claims that whilst educational decisions have traditionally been taken in relation to a child's age, intelligence and interests,

> "... knowledge of a child's cognitive style is potentially capable of suggesting effective ways by which he may best be taught."

As one might expect however, in the light of earlier comments of the poor inter-correlations between cognitive styles research and the resulting lack of generalisability, suggestions such as those made by Witkin are treated skeptically by some. Satterly's (1976) response to Witkin's assertion is that,

> "Although research into stable and consistent individual differences in cognition has been extensive over the last twenty years there are few, if any, convincing data to demonstrate the relevance of cognitive styles to school learning and achievement." (page 36)

(iv) The field dependence/field independence conceptualisation

The above comments and previous questions about potential educational applications will be considered in relation to one particular cognitive style. Amongst the styles identified to date, the most widely known, and most extensively researched, is the Field dependence/Field independence dimension identified by Witkin and his colleagues in the United States. For something over twenty five years now, the Witkin group have been the source of and stimulus for a considerable body of research into this dimension. A bibliography dated up until 1976 lists something over 2,500 pieces of research associated with this cognitive style.

Witkin's earliest work was concerned with how people locate the upright in space (Witkin 1949, 1950, 1952; Witkin and Asch 1948). Most individuals might be expected to be clear about which way is up, on the basis of information received from the visual environment as well as reference to bodily sensation and to adjustment to gravity in maintaining upright posture and balance. In Witkin's initial experiments in this field, the complex visual world was eliminated and replaced by a simpler and more manipulable visual world, in which it was possible to separate visual and bodily standards.

(1) <u>Measuring Instruments</u>

The Body Adjustment Test (BAT) was the first test designed to do this. The test consists of a tilting chair within a tilting room. The seated subject is required to adjust the chair to the vertical and the subject's score is represented by the deviation of the chair's adjusted position from the true upright. The room is tilted by the experimenter whilst the subject is blindfolded and the subject is also moved such that the chair's position, the dimensions of the tilted room and the outside environment are all in contradiction. The aim of the experiment is to differentiate between the subjects' reliance on visual impression or bodily sensation. Some subjects choose to align themselves almost completely with the walls of the room in front of them and are entirely influenced by the tilted walls. All other bodily sensation seems to be overridden by the contradictory visual information. Such subjects were described by Witkin as 'field dependent'. Other subjects manage to achieve a good approximation of the true upright and are able to ignore the dominant visual impression. These subjects were termed 'field independent' by Witkin. It is important to remember that these categories represent the extremes of performance on the BAT and that other subjects place themselves somewhere between these two extremes, emphasising this distinction in behaviour as a continuum, one of the characteristic features of cognitive style descriptions of behaviour. The BAT consists of six trials. In half of these the room and chair are tilted in the same direction and in the other half they are tilted in opposite directions. An alternative procedure which required subjects to adjust the room rather than their bodies to the true upright has also been developed. Scores derived from this test, the room adjustment test, showed little relation to other tests of the field dependent/independence conceptualisation and was subsequently dropped from Witkin's studies.

A second test to investigate the style of field dependence/independence is conducted in a completely darkened room. The apparatus consists of a square frame and rod which pivot at the same centre, both of which have been coated with luminous paint. This is all the subject can see, Rod and Frame can be tilted clockwise or anticlockwise, together or separately. In a typical trial, the subject on having his blindfold removed, finds the rod and frame in tilted positions. He is asked to adjust the rod to the upright whilst the frame remains in its tilted position. As with the BAT some subjects align the rod with the tilted frame whilst others approximate it to the true vertical. Handel (1972) cites a number of studies which use variations of the original Rod and Frame Test (RFT) all of which correlate well with performance on the original instrument. One of the most widely used modifications of this test is Oltman's portable apparatus. In a standardisation study with 163 college students, Oltman (1968) reported a correlation of 0.89 between performance on the standard RFT and his portable apparatus.

A further test of this particular style has subsequently been developed. The Embedded Figures test is a pencil and paper test which, since it does not require elaborate equipment, features in most research associated with Field dependence/independence. The test itself is an adaptation of that originally developed by Gottschaldt (1926) and requires the subject to identify a simple figure which is embedded within a more complex geometric pattern. The mean time taken to locate all 24 figures in the test is the subject's score. A version of this test is available for administration to groups (GEFT). This version Witkin et al (1971) suggests requires additional validity studies which is consistent with the findings of Renna and Zenhausen (1976). In this study a sample of 337 undergraduates were found to be more field dependent than expected on the basis of the norms suggested in the handbook for administration (Witkin et al 1971).

The original version of the EFT is thought suitable for children aged ten years and above. A children's version was developed by Goodenough and Eagle (1963) the CHEF. They administered this test, the RFT, BAT and EFT to a group of thirty ten year old boys and achieved statistically significant correlations of 0.70, 0.46 and 0.63 respectively. This test has subsequently been modified by Kemp and Konstadt (1971) and is now known as the Children's Embedded figures test (CEFT). This test is regarded as suitable for children aged from five years old and instead of the geometric designs used in the standard Embedded figures test employs meaningful complex figures (eg a man, a car, a dog - each of which resembles a large jig-saw).

(2) Test reliability

Witkin et al (1962) reported the results of their own research and that of others on the reliability of the RFT, BAT and EFT. In all studies reported, the reliabilities were high, clustering between 0.80 and 0.90 when tested with a one week interval. Test-retest reliabilities over a longer period are lower, yet still satisfactory (Goldstein and Blackman 1978).

Some question has been raised about the reliability of the RFT (Sigman, Goodenough, Flannagan 1979). Small (1973) summarises the research related to these complaints and suggests that performance can be improved with practice. Goodenough and Witkin (1977) also noted that EFT and RFT performance shows greater field independence with practice and training, which suggests that research should be undertaken with naive subjects to avoid any bias in subjects scores. It also raises an important question of the stability of this cognitive style. This point will be discussed later when development of field independence is considered.

(3) Test Intercorrelations

It has already been indicated that scores on various versions of the RFT are highly correlated, (Handel 1972), and it would seem essential to discuss the evidence related to intercorrelations between the various tests. In a study with 150 male undergraduates, Karp (1963) administered the BAT, EFT and RFT with a variety of other measures. A factor analysis of the inter-correlations revealed a common loading for the three tests of field independence. Karp concluded that they were measuring the same ability, to separate figure from context, the ability to overcome embeddness.

In a further long itudual study of developmental differences in field dependence, Witkin, Goodenough and Karp (1967) found statistically significant correlations between the EFT, RFT and BAT at various ages (8, 10, 11, 12, 13, 15, 17 and 20 years). Goldstein and Blackman (1978) reviewed 16 reports representative of the research on the relationships between versions of the RFT and EFT and concluded that almost all correlations were significant and were generally in the range 0.30 - 0.65.

An immediate question arising from the discussion so far, centres on the psychological basis for coherence amongst the measures of field dependence. Witkin et al (1962) rules out such explanation as perceptual accuracy or bodily sensitivity. Performance on the BAT with eyes closed is not significantly related to performance with eyes open and such a finding cannot be explained by bodily sensitivity alone. (Kogan 1971). The currently accepted interpretation is that each of these criterial measures entails the overcoming of an 'embedding context'. The body, the rod and the geometric design represent the elements in the BAT, RFT and EFT respectively which must be separated from the embedding field. Further evidence for the 'embeddedness' interpretation is offered by Karp (1963) in the study previously referred to, he found that Witkin's criterial measures generated a factor different from that yielded by a series of tasks with distracting as opposed to embedding contexts.

(4) Relationships with Age and Sex

In 1954 Witkin and his colleagues presented data on the relationship between field dependence and age. In this research a particularly interesting finding which emerged was that field independence was seen to increase sharply during the middle years from 10-13. As a result one might have expected research to consider why this might be so and more especially that a considerable volume of research in to this style to have been investigated with this age group, where the greatest changes were taking place. In fact, the great majority of research has been undertaken with adults and more especially college students.

From 13 - 17 years of age there was only a slight further increase in field independence and there was no significant difference in field dependence between 17 year olds and an adult group with a mean age of 24 years.

Correlational data on two longitudual groups, one tested at 8 and 13 and the other at ages 10, 14, 17 and 24 indicate high levels of stability of cognitive style. (Witkin, Goodenough and Karp 1967). This data emphasised the stability of relative position on the continuum. Both cross sectional and longitud studies have shown a progressive increase in field independence up to the age of 17 in males and 15 in females, with no additional increase between 17 and 24.

> "The stability of field independence therefore appears to be inter-individual rather than intra-individual. Individuals maintain their position relative to others but at the same time progressively increase in field independence through mid to late adolescence." (Kogan 1971)

Canavan (1969) reported on a developmental study of field independence involving 1,510 children aged 6 to 12. Field independence was measured with a modified RFT in which the rod was replaced by a silhouette of a man. An analysis of variance indicated age, sex and ethnic group differences. White subjects were found to be more field independent than Mexican-American children, who in turn were in general more field independent than black children. The same results occured even when the effect of IQ measured by a full scale WISC was eliminated by analysis of covariance.

There has also been interest within the research into this style in the levels of field independence demonstrated by older people. Studies reveal a decrease in field independence with age, and indicate that advanced age and infirmity are associated with field dependence. (Schwartz and Karp 1967). Although in another study (Karp 1967) of a group of elderly males who were still employed and compared with a similar group of unemployed elderly males, performance of the employed males were significantly more field independent than those who were unemployed.

In their earlier studies (Witkin, Lewis, Hertzman, Machover, Meissner and Wapner 1954) small but persistent sex differences in field dependence/independence were identified. Beginning in adolescence, women tend on average to be more field dependent than males. Since this early report, it has often been maintained that females are more field dependent. This is in fact a misrepresentation, as emphasised by Witkin et al (1977)

> "... it should be stressed, however, that the difference in the means between the sexes is quite small compared to the range of scores within each sex; in other words, the distribution for the two sexes shows considerable overlap" (Witkin et al 1977 p 7)

Goldstein and Blackman (1978) cite a number of studies in which there were no statistically significant differences between scores of males and females, for both children and college students. In fact one study with children (Coates 1974) and one with undergraduates (Constantinople 1974) found females to be more field independent.

(5) <u>Relationships with Intelligence</u>

A number of studies have identified a positive relationship between field independence and intelligence (Woerner and Levine 1950). Witkin et al (1962) reported positive and high correlations on the BAT, RFT and EFT and total IQ scores derived from the Stamford Binet for children aged 10 and 12. (0.57 for boys and 0.76 for girls). In a follow up study comparing scores on the criterial measures of field independence and the WISC (Witkin et al 1962) indicated a positive correlation in which performance scores on the WISC were higher than verbal scores. In a factor analytic study with a small number of children Goodenough and Karp (1961) discovered an 'analytic field factor' which indicated substantial loadings (0.66) between measures of field independence and the Picture Completion, Object Assembly and Block Design components of WISC. They interpreted these findings as providing evidence that these tests share with the measures of field dependence/independence the requirement of overcoming an 'embedding context'.

In addition to the 'analytic field factor' this study identified two other factors, a verbal/comprehension factor which was represented by the vocabulary, information and comprehension subtests; and an Attention/Concentration factor represented by the Digit Span, arithmetic and digit symbol subtests of WISC. These three elements are similar to those identified in previous factor analytic studies of WISC by Cohen (1957, 1959). In a later study with 150 male undergraduates Karp (1963) found similar confirmatory results. In the EFT test manual, Witkin et al (1971) sums up the implications of these findings for the field dependence/independence dimension.

> "If separate factor IQ is computed for each of the three Weschler factors, EFT scores correlate at a high and significant level with the analytic factor IQ's but only at a low and usually non-significant level with both the verbal/comprehension and attention/comprehension factors". (p 6)

The important word in this statement would seem to be 'usually' the implication being that verbal intelligence is not or very rarely related to the perceptual measures of field dependence, since only those WISC performance subtests that have been loaded together with the perceptual subtests have been interpreted as involving extraction of an item from an embedding context. In a review of 20 studies, Goldstein and Blackman (1978) p 186 - found conistent indications that the measures of field independence/dependence are related to various measures of both verbal and performance intelligence. The correlations between field dependence/independence and intelligence were mostly in the range 0.40 - 0.60 and correlations between field dependence/independence and academic achievement and aptitude tests somewhat lower.

Whilst Witkin et al (1971, 1977) accept that moderate correlations have been found between full IQ scores and EFT scores, they believe that the factor analytic studies offers conclusive evidence that these correlations are in the main part due to success on the analytic elements of such tests. It is still felt by some researchers however, (Satterly 1976) that the distinction between intelligence and field dependence/independence has not been completely established.

Further research appears to be required to satisfy this dilemma. It would be interesting, for example, to apply the technique developed by Wallach and Kogan (1965) to investigate modes of thinking in young children (ie to consider the differences between High field independent/High IQ, High field independent/Low IQ. Field dependent/High IQ, Field dependent/Low IQ individuals). Witkin concluded however, that one cannot therefore assert that persons who are field independent on the Embedded figures test are necessarily superior in general intelligence, as reflected in the Weschler, since such individuals might show wide variations in the other two factors revealed in the factor analytic study.

(6) Analytic/Global functioning

The individual differences first identified in Perceptual tasks Witkin et al (1971) argue clearly extend therefore in to intellectual functioning and are an important feature of an individual's problem - solving propensities. Witkin et al (1954) commented,

"Intellectual problems that call for a high degree of creativity but do not involve perception directly, often also require that 'parts' be separated from the context in which they are embedded and brought in to new relationships. It is likely - and this is of course subject to experimental test - that if a person has this basic ability to 'break-up' a configuration it will be manifested not only in straight forward perceptual situations but in problem solving situations as well." (p 477)

In fact one might argue that if the assertions made here are correct, the existence of such stylistic tendencies are likely to influence an individual in all of his environmental encounters. However, following the interpretation by the Witkin group, of the factor analytic studies, Witkin designated the field dependent/independent dimension as a 'cognitive style'. Yet, he also argued that the description of field dependence and independence was primarily associated with a specifically perceptual ability and as such was felt to be too limited a label for the broader realm of cognitive functioning that had been revealed. What was basic to this cognitive style was a measurement of the extent to which an individual is able to overcome an embedding context. This ability, when developed, makes possible an 'analytical' way of viewing experiences and demonstrates contrasting ways of approaching a stimulus field, whether immediately present, or presented symbolically. (As in a map for example). On the basis of the correspondence across perceptual and intellectual fields the construct was redefined as an 'Analytic' as opposed to a 'Global' dimension of cognitive functioning. Field dependence/independence is currently treated by Witkin and his colleages as the perceptual aspect of a more pervasive analytic/global cognitive style. Witkin et al (1954) argued therefore that,

> "The dimension of individual difference with which we are dealing thus represents, at its extremes, contrasting ways of approaching a field, whether the field is immediately present or represented symbolically. It may therefore best be described as an analytic vs. global field approach. What we have been calling 'field dependence' is in effect the perceptual component of this more general cognitive style". (pp 70 - 71)

(7) Relationships with Personality

As a result of this reconceptualisation, Witkin went on to consider the association of this style to other personality and behavioural characteristics. In an investigation using Rorschach inkblots (Witkin et al 1962) field dependent individuals were found to leave such material as it is, rather than attempting to impose any structure on it. As a result, percepts tend to be rather vague and indefinite. In contrast, field independent individuals are likely to impose a structure on the inkblots which lack it, with the result that their percepts are organised and definite. Such individuals are able to perceive items as discrete from their backgrounds, or re-organise a field when the field is already organised, or impose some structure on a field and so perceive it as organised, when the field itself has relatively little inherent structure. Perera (1974) comments, however, that the validity and reliability of the Rorschach is often questioned and have been reported as near zero. (Evon, 1965; Guilford 1959; Harris 1960). Witkin interprets the research employing the Rorschach as indicative of the ability to structure experience, which in turn was seen to be part of an increasing tendency towards 'articulation'.

At the global end of the continuum when the field is structured, there is a tendency for its organisation as given to dictate the manner in which both the field as a whole and its parts are experienced. When the field lacks structure, experience tends to be global and diffuse. At the articulated extreme, there is a tendency for experience to be delineated and structured even when the material lacks inherent organisation. Parts of the stimulus field are experienced as discrete and the field, as a whole, as organised. As with the original dimension of perceptual field dependence, Witkin et al (1971) confirm that there was no intention that the world should be viewed as peopled by two distinct kinds of human beings, scores for any large group of subjects show a continuous distribution.

More recently, Witkin and his colleagues have argued that the global/articulated style is part of a still broader psychological dimension and it has been found for example that individual differences in cognitive style are also related to individual differences in body concept (Witkin et al 1962, 1965) in the nature of the self and the controls and defences typically used.

Whereas study of performance on the embedded figures test focusses on externalised experiences, study of the body concept has its primary source within the individual. Witkin suggests that there is now considerable evidence that children and adults who show an articulated cognitive style are also likely to have an articulated body concept (that is they experience their body as a whole and as having definite limits or boundaries and the parts within as discrete, yet unrelated and joined in a definite structure). To assess this, figure drawings have been used. Originally referred to as the 'sophistication of body concept scale' (Witkin et al 1962 and reprinted in 1974) it has subsequently been redefined as the Articulation of Body Concept Scale in the 1974 reprint and can be used with both children and adults. Studies using the scale have shown that figure drawings made by field dependent subjects tend to be global in character. Their drawings include very little detail and tend towards unrealistic representation and proportioning of body parts. Sexual characteristics are indicated minimally or not at all. In many cases there is no attempt at role representation and it is difficult to distinguish what sex has been represented. In field independent subjects' drawings, proportion is more realistic and the representation of body parts detailed and accurate and sexual distinctions are clearly and often amusingly portrayed. Measurements on a scale of articulation of body concept applied to figure drawings for both children and adults have repeatedly been shown to relate significantly to measures of field dependence. (Corah 1965, Karp, Silberman and Winters 1969, Winestine 1969, Witkin et al 1962). One immediate question however relates to the association of the distinction described here to general intelligence. Is what is demonstrated merely evidence of intellectual maturity? This point has been tested by relating the scale scores to a full scale WISC IQ and to the intellectual and verbal indices within the Weschler. Though a significant relationship was established between IQ score and level of articulation of body concept (0.55), the fact that the intellectual index achieved a higher association than the verbal index (0.54, as opposed to 0.33) has been interpreted by Witkin to indicate that the differences in nature of the drawing is primarily a reflection of the differences in mode of field approach rather than a reflection of general intelligence. It would be interesting to investigate whether it was more an indication of drawing skill, which seems to be an important element of representing features realistically, there are clear relationships between the Articulation of body concept test and the Draw-a-man-test.

Individuals with a more global or more articulated cognitive style have also been found to differ in their sense of separate identity. Thus more articulated individuals have a greater awareness of the needs feelings and attributes which they recognise as their own and which they identify as distinct from those of others. This sense of separate identify implies experience of the self as segregated from the non-self, it also implies experience of the self as structured. Internal frames of reference have been adopted and developed and are available as guides for self definition. The less developed sense of separate identity associated with individuals with a more global cognitive style demonstrate a reliance on external sources for definition of their attitudes, judgements, sentiments and their view of themselves. Studies to support these claims for a separate sense of identity have shown that field dependent individuals are more attentive to faces of people around them, they literally look more at faces and are better at remembering faces. (Crutchfield, Woodworth and Albrecht 1958, Konstadt and Forman 1965, Messick and Damarin 1964) Witkin et al argue (1971 p 9) that the extent to which a face is the major source of cues as to anothers feelings and thinking, it is not unreasonable to define their views of themselves by other's reactions to them in terms of facial cues.

Another type of study used to assess a sense of separate identity is exemplified by Bell (1955) who obtained from a group of students their views, in writing, on the use of antihistamines. At a later date they were presented with a made up, apparently authoritative analysis of the use of antihistamines which contradicted their previously expressed viewpoint. Relatively field dependent subjects were more likely to change their original viewpoint to the position attributed to the authority, whereas field independent individuals were more likely to take up their previously expressed view. Witkin et al (1971) suggest that this and similar studies demonstrate that the person for whom the context strongly determines perception of an element within it, will be strongly influenced by the immediate social context in his experience of attributes of the self.

It has further been demonstrated that persons who experience in an articulated fashion tend to use specialised defences such as isolation. More global individuals are strongly influenced by feelings, which is congruent with their perceptual abilities where they do not keep things separate (ie body separate from field, rod separate from frame or simple figure separate from organised ground). Persons with an articulated style, in using isolation, maintain the discreteness of feelings and ideas. This is demonstrated in a study by Minard and Mooney (1969) where field dependent subjects speed of perception of tachistoscopically presented words was markedly effected by whether or not the word carried an emotional connotation. Percepts and feelings were not kept separate. Field independent persons showed no difference in speed of perception of neutral and charged words, suggesting an ability to separate percept and feeling.

In commenting on such studies Perera 1974 states (p 54)

"It appears that though certain cognitive-style-personality relationships have been observed, the interpretation of the results obtained in this regard is not an easy matter. The difficulty of interpretation ... is due to employment of projective techniques in the assessing of certain personality measures as well as due to the uncertainty as to whether these findings were due to general intelligence or to the cognitive style as claimed by Witkin et al".

Witkin et al (1971) however, sum the evidence up as an indication of an individual's "psychological differentiation". An individual who demonstrates a greater degree of differentiation will have a perception of the world in which parts of the field are perceived as discrete and the field structured. His body concept will have a definite sense of boundary and a clear understanding of the inter-relation among its parts, he will see himself as distinct from others and has developed internalised standards to guide his view of the world and of himself. Witkin et al argues (1971) in this context,

"It is reasonable to believe that these various characteristics .... are not the end product of development in separate channels, but are diverse expressions of an underlying process of development towards greater psychological complexity". (p 10)

The relationships discussed here are derived originally from Werner's (1948) orthogenetic principle of differentiation. This principle states that development proceeds from a state of relative globality and lack of differentiation to increased articulation and hierarchical integration. Werner intended this as an abstract, untestable theoretical construct, yet it has been taken by Witkin to represent the ability to extract an item from an embedding context (Witkin et al 1962, p 13) and as has been discussed he attempts to demonstrate the permeation of this ability in diverse areas of psychological functioning.

(8) Determinants of the dimension

Many studies have sought to identify the determinants of the characteristics under discussion. One group of such research has investigated early socialisation experiences as a possible source, (Dyk and Witkin 1965, Witkin et al 1962) and have established a relationship between the extent of a child's field dependence and the degree to which his early socialisation effected the achievement of a separate autonomous functioning. In particular, the opportunity and encouragement of separation from the mother, the manner of dealing with the child's expression of impulse, have been found to be of importance. Also the parental characteristics and their influence in the separation process and the regulation of their children's impulsive behaviour. More field independent children appear to have interacted with their parents in ways that foster separate autonomous functioning. (Barclay and Casumans 1967, Berry 1966, Dawson 1967). Further, it has been hypothesised (Witkin et al 1962) that the classification of mothers as 'fostering' or 'inhibiting' differentiation would reflect their own level of differentiation, that less differentiated children are likely to have less differentiated mothers. But the results obtained by administering EFT and the Figure drawing test to mothers have not proved conclusive in the main (pp 318 - 319). Parent child relations as demonstrated in TAT stories appear to suggest that relatively less differentiated children tend to have relatively non-supportive parents in contrast to the more differentiated children. Zigler (1963) points out however, that much of the data which was collected by interview could be questioned, since the interviewers were aware of the characteristics associated with the cognitive style they were investigating and would thus find it difficult to remain objective in their interpretations.

In a further study which attempted to identify the socialisation experiences which contribute to the development of a more field dependent or more field independent style, cross-cultural studies have been undertaken. Recently (Witkin, Price-Williams, Bertini, Christiansen, Oltman, Ramirez and Van Meel 1974) have completed a study of children from two relatively self-contained villages in each of three countries, Italy, Holland and Mexico. These villages were chosen because of the marked difference between them in the child rearing practices earlier found relevant to the development of field dependence and independence. Similar studies have investigated varying cultural settings for example the Temne of Sierra Leone, the Eskimo of Baffin Bay, the Arunta of Australia and the Boat People and Hakka of Hong Kong (Berry 1966, Dawson 1967 a. b. 1971). The evidence of these pieces of research demonstrate that the development of the various extremes of the style identified by Witkin is indeed related to processes of socialisation - and primarily those referred to earlier. Yet socialisation experiences are not felt to be the only influence. Witkin and Oltman (1967) suggest that differences in the central nervous system and autonomic nervous system also effect the development of field independence. This evidence is based on studies with adults, and it is therefore difficult to distinguish cause from effect. Studies with infants suggest that some of the somatic differences found later in life may be present in the neonate and constitute the foundations for the development of more or less differentiated functioning. (Dyk 1969)

The possibility that genetic factors may be an important variable has also been considered. Three kinds of study are currently investigating this and are discussed by Witkin in Messick (1976 pps 46 - 47). In the first study a check is being made about predictions of the extent of resemblance of son and daughter to each parent. The predictions derive from the hypothesis that a recessive gene on the X chromosome plays a role in the development of individual differences in field dependence. The second study investigates the cognitive style of men with an extra Y chromosome (XYY's) or an extra X chromosome (XXY's) in addition to the usual XY sex chromosome complement. This study has been undertaken in Denmark because of their excellent social records. The third study has identified three son families, in which two of the sons share one of the mother's two X chromosomes and the third son has received her other X chromosome. To make these distinctions such X-linked characteristics as colour blindness and blood features have been used. If there is a genetic influence on the X chromosome which contributes to differences in field dependence/independence, the two brothers with the same X chromosome should be significantly more similar on this dimension than either is to the third brother. Messick (1976) concludes this discussion on determinants of field dependence/independence,

> "In overview, it seems fair to say from the evidence now on hand that socialisation factors are undoubtedly of overwhelming importance in the development of individual differences in field dependence versus field independence. At the same time, it may be that genetic factors are implicated as well, although probably

to a much smaller degree. If they are implicated, we should know about the role they play in interaction with social factors." (p 47)

(9) Conclusions

To conclude this discussion therefore, the conceptualisation that has been proposed by Witkin attempts to bring together within 'cognitive experience', experience of stimulus configuations, experience in the domain of symbolic representations, experience of one's own body, of the self, and experience which is the produce of defence mechanisms as they mediate between an individual's environmental encounters. This conceptualisation also proposes that there is a consistency in quality or type of experience - whether more global or more articulated - across all of these domains. Witkin et al (1971) believe that investigation of an individual's experience in any domain such as in perception through the Embedded figures test, is likely to reveal his general tendency to function at a more or less differentiated level. In the figure below, 'psychological differentiation' is the highest order construct and field dependence-independence the lowest order construct of Witkin's conceptualisation.

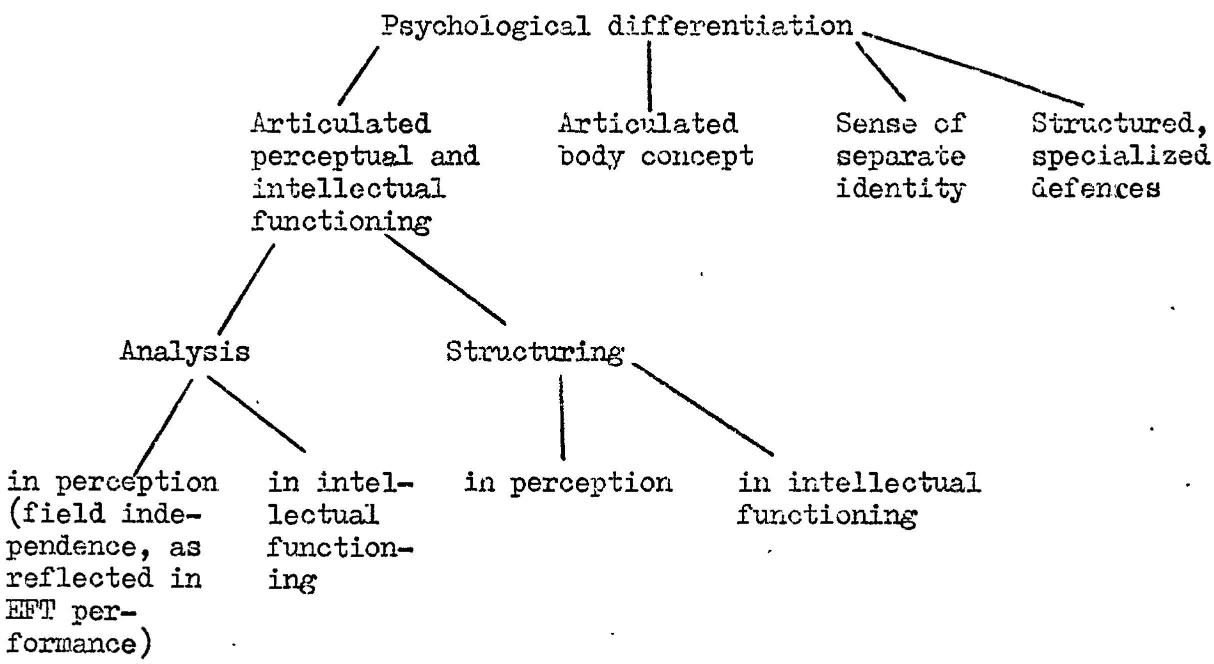

Figure 1

(Witkin et al 1971 p 14)

(v) Educational Applications derived by the Witkin Group

More recently the attention of the Witkin group has been turned towards educational applications which might be derived from their studies. In 1977 Witkin suggested that the concepts and methods derived from studies of cognitive style are being increasingly applied to the study of educational problems. In particular it is argued that the research undertaken by Witkin and his colleagues has implications for how children and students learn, how teachers teach, and how students and teachers interact. (Witkin et al 1977, Doebler and Eicke 1979).

In relation to learning, students with a field dependent, or more global cognitive style have been shown to be better at learning and remembering incidental social material (Ruble and Nakamura 1972, Crutchfield et al 1958,). It is also the case that an individual's cognitive style may influence his learning in terms of the effects of different kinds of reinforcement. Field dependent individuals have been seen to be more effected by external reinforcement through praise or criticism. (Ferrell 1970, Konstadt and Forman 1965). The evidence suggests that field independent persons tend to learn more than field dependent persons under conditions of intrinsic motivation, although these differences are seen to disappear when external rewards for learning are introduced. In a study by Steinfeld (1973) a group of 11 year old children played an experimental marble game in which three types of reinforcement were compared. In the first reinforcement condition an abstract technique was used, a flashing light, and field independent children learned more successfully. In the second condition token rewards were given. These were exchangeable for small toys and all children learned equally successfully, as was the case in the final condition, where social reinforcement in the form of praise by the experimenter was employed. In another study of the effects of social reinforcement, the evidence suggests that field dependent individuals are more effected by criticism. Whether the criticism has a positive or negative effect on learning depends on the manner in which it is administered. (Ferrell 1971, Konstadt and Forman 1965). A final point on the implications of cognitive style on learning relates to the skills of analysis employed by individuals. Because of their weaker analytic abilities field dependent individuals have been found to prefer greater structure in their learning and to experience difficulty with relatively unstructured learning experiences. (Renzi 1974, Nebelkopf and Dreyer 1973).

The relationship between field dependence and independence and concept attainment would seem to be of significance in relation to current educational emphasis on the fundamental features of a discipline as opposed to acquisition of factual information. (Blythe et al 1976). Goodenough (1976) and Witkin et al (1977) consider this in detail and cite a number of studies which suggest that field dependent persons tend to favour a 'spectator approach' to concept formation and attainment, whereas more field-independent individuals employ an hypothesis testing approach. When required to employ an hypothesis testing strategy, field dependent individuals may be more strongly guided by the salient features of a stimulus array. Field Independent individuals are less easily influenced and tend to sample the array more extensively and selectively. (There seem obvious similarities here with Bruner et al's (1956) focusing or scanning approaches to concept formation and with Pask and Scott's (1972) investigation into learning strategies). However, one main implication for learning, is the importance for field dependent individual's, of ensuring that the main features of a piece of learning are clearly and unambiguously displayed.

In a recent study which questions some of the above assertions Grieve and Davis (1971) compared field dependent and field independent students learning capacities when studying geography in two different learning modes. (ie A discovery learning approach and a more directive expository approach). They concluded that neither cognitive style, nor the method of instruction had an overall effect on the acquisition of knowledge. However, extremely field dependent males experienced difficulty in acquiring knowledge through an expository mode and were also limited in their ability to apply any of the knowledge that they had gained in a new situation. Field independent students, both male and female, on the other hand, were better able to apply their geographic knowledge and coped equally well with both instruction modes.

Witkin et al (1977) emphasise that the approaches favoured by one kind of person do not necessarily make for better achievement.

Whether learning is successful or not seems to depend on the specific characteristics of the learning task and the circumstances under which it is taking place. They go on to argue, however, that the available evidence suggests that,

"It is not unreasonable to expect that as teachers become more aware of the ways in which relatively field dependent and field independent students learn ..., they may become more effective in adapting instructional procedures to the needs of different kinds of students." (Witkin et al 1977 p 27)

Evidence in support of Witkin's second educational application of cognitive styles research comes from studies of teachers preferences and behaviour in simulated conditions and has demonstrated important differences in characteristics between field dependent and independent teachers. The characteristics which result from a more social or a more impersonal orientation has an effect on the level of interaction with others, as well as a preference for the more social or more abstract features of a curriculum. Similarly the degree of separateness of identity has been demonstrated as effecting the extent to which the teacher is likely to assume responsibility for directing the teaching situation or sharing this responsibility with his students. (Witkin 1977). Thus, field dependent teachers seem to prefer teaching situations which allow for interaction with their students, whereas more field independent teachers prefer more impersonal teaching situations, oriented towards the more cognitive aspects of teaching. Wu (1968) for example, found that field dependent student teachers ranked discussion as more important than lecture or guided discovery approaches, which tended to be preferred by field-independent student teachers. Both lecture and guided discovery leave much of the organisation of the learning to the teacher. Similarly Moore (1973) found that more field independent teachers tended to use questions as instructional tools more often than field dependent teachers, preferring to use questions to check on student learning. The more field dependent teachers tend to use questions to introduce an idea, and to follow up on students' answers.

Emmerich (Witkin 1977 p 29) found that field independent teachers employed the use of feedback more extensively in their teaching and regarded that telling a student if he was right or wrong, and why, as an effective way of enhancing student learning. As such, Emmerich took this as an indication of the field independent teacher's preference for organisation of the learning experiences themselves, rather than involving the students in their own learning. Probably also reflecting the preference of field independent individuals for analytic and abstract situations, students of field independent teachers perceived them as encouraging students to apply principles. In contrast, field dependent teachers were often seen as emphasising facts.

Despite such differences, there seems to be no evidence for differences in teaching competence, any differences that do exist appear to lie in the preferred approach to a teaching/learning situation. If teachers have preferred approaches, an important question would seem to be, how far are teachers able to adapt their teaching to meet the needs and preferences of a particular student and an obvious corollary to this, should they? Di Stefano (1970) found that teachers and students matched to each other for cognitive style tended to view each other positively, whereas when mismatched the tendency was towards a negative appraisal. In another study using a very small sample, James (1973 - Witkin et al 1977 p 33) obtained similar results and also found that teachers gave students matched to them in style higher grades. Teachers also stated that students matched to them in style understood the material better. It would appear therefore that there are positive advantages to matching students and teachers for cognitive style. Students matched for style are seen as having superior performance than those who are not matched, even when no real differences exist.

There are also disadvantages to matching however. For some kinds of learning it would seem important that a contrast in styles was established, since this could be more stimulating. Wapner (1976) advocates this viewpoint and believes that mismatching is more appropriate when the aim is to promote flexible and creative thinking,

> ".... obstacles, opposition and conflict are necessary to stimulate development and creativity." (Wapner 1976)

Wapner does accept, however, that matching may be more appropriate when the aim is the promote subject matter achievement.

A further point about the disadvantages of matching relates to subject matter content. It is certainly the case that some subjects in the curriculum require particular strategies to cope with them. The more analytic subjects for example (eg maths) may be more successfully undertaken by those with an independent cognitive style. Further, there are some advantages to mismatching relating to the features Witkin identifies for the field dependent/independent dimension. The feedback provided by field independent teachers could be advantageous to the field dependent student, by providing the structure which he appears to need in his learning. Similarly the preference of more open 'discussion' in learning adopted by field dependent teachers, would appear to suit more field independent students and their preference for imposing their own structure on their learning. It would seem that there are positive advantages and as Witkin comments (1977) a classroom which contains representatives from the full continuum of the style he has identified is more typical and leads to more diverse viewpoints which could enliven the classroom.

Witkin believes however that it is possible to obtain the positive effects of matching, whilst avoiding the negative. Witkin, Lewis and Weil (1968) found that therapists, regardless of their own cognitive style, took a systematic and more directive role with field dependent clients, and a more flexible approach with field independent clients. By using more directed questions with the one group and more open questions with the other, they seemed to be adjusting to the need for structuring experiences based on cues they had picked up about their clients cognitive style. On this basis one might ask that if this is achieved naturally and intuitively as seemshere, isn't this also likely to happen within the teaching-learning situation. Goodenough (1976) suggests that,

> "... by sensitising teachers to the implications of their own cognitive style and the styles of their students for the teaching learning process, we might increase the adaptability of teachers." (p 50)

A recent study by Doebler and Eicke (1979) attempted to investigate this. The cognitive styles of three classes of 11 and 12 year olds and of their teachers were assessed. Teachers in two of the schools were told of the results and were given some instruction on the educational implications of cognitive styles research with reference to the evidence from the Witkin group. The teachers were followed up over a period of six weeks, when they were invited to raise questions in relation to the children in their own class. Measures of the children's self concept and attitude to school were taken at the beginning and end of the experiment and the evidence seems to indicate that it is possible to create a more educationally conducive atmosphere in the classroom by making teachers more aware of the educational implications of a knowledge of field dependence and independence. There was also evidence to suggest that teachers could show adaptations in their own teaching style to accommodate differing cognitive styles in their children. They concluded that,

> "This study lends further credence to the value of cognitive style data as a means of conveying information about individual students to the teacher. Cognitive style relates to processes involved in how a student perceives, thinks, learns, solves problems and relates to others, as well as other personality dimensions. The bi-polar nature gives cognitive style a neutral character and eliminates the value judgements associated with IQ. This study indicates that cognitive style information can be used to bring about significant and beneficial changes in the student." (p 231)

It is obviously important to consider the results in the light of likely experimental effect.

(vi) 'M-Space and Cognitive Style

The description of the development of field-independence provided by Witkin and his supporters (Witkin et al 1954) raises an important question about the relationship of the field-dependence/independence continuum to maturation of cognitive processes in general. As Saarni (1973) suggests.

> "The sorts of strategies an individual uses in a problem solving situation can be understood in terms of the developmental capacities he brings with him into that situation. These strategies that he is capable of dictate his approach to the problem

> and to a considerable extent, what he is capable of finding out. They reflect the cognitive structure underlying his problem solving performance." (p 338)

Pascual-Leone (1969, 1970) has attempted to investigate the inter-relationships between an established theoretical description of the development of cognitive processes, that of Piaget and the work of Witkin. A major purpose of the study by Pascual Leone was to attempt to make Piaget's theory a 'functional' theory, for as Flavell and Wohlwill (1969) point out, Piaget's theory is predominantly 'structural' aiming at a formal description of an individual's knowledge or competence at different points in his development.

According to Piaget (1964, 70 and 78) the most influential factor in cognitive development is the child's auto-regulative or equilibrative activity. In problems of conservation, for example, where objects or substances are made to look different by some kind of transformation, the immediate impression is often perceptually confusing, especially for the non-conserver. The child's development leads him to recognise inconsistencies in his own thinking and in his response to such perceptually confusing situations. As he matures, he attempts to remedy these inadequacies, to eliminate the conflicting picture based on one particular type of cue. By conservation, reversibility and logic, such paradoxes are overcome as a normal part of development. A further important variable in the Piagetian framework is the part played by maturational processes, but,

> "The maturation of the central nervous system can do no more than determine the possibilities and impossibilities at a given stage of development. A particular social environment remains indispensable for the realisation of these possibilities. It follows that their realisation can be accelerated or retarded as a function of cultural and educational conditions." (Piaget 1970)

Piaget (1969) also believes that problem solving is influenced by the existence of 'field-effects', as for example in the perceptually confusing conservation exercises.

Pascual Leone has attempted to incorporate these features of Piaget's ideas into his discussions of the inter-relation between the development of thought and the development of field independence. Pascual-Leone (1969) hypothesises that a child or adult's 'M-Space' is an important feature of an individual's developing cognitive structure. M-space is regarded by Pascual-Leone as the maximum number of schemes (patterns of activity which are co-ordinated and act as integrated wholes), that can be co-ordinated simultaneously - that is, the number of variables present in a problem solving situation that can be attended to and co-ordinated in an attempt to solve the problem. According to Piagetian theory, in the course of an individual's everyday environmental interactions, he is assumed to be constantly modifying his basic repertoire of schemes. The total set of schemes activated at any moment is held to constitute the form of thought (Case 1974). Pascual-Leone believes that an essential feature of problem-solving is the ability of an individual to utilise the full 'M-power' that he has available, to call on all necessary available schemes to solve a problem. Some people are especially low 'M' processors, they prefer to look at or respond to a problem in the simplest manner possible, involving the least mental effort and relying on a limited number of schemes. The maximum mental effort - or M-power-activated in response to any situation is thought by Pascual-Leone to vary both within and across age groups. Within age group differences are assumed to result largely from biological factors and across age group differences from maturation. For normal individuals 'M power' is assumed to increase linearly with age.

Like Piaget, Pascual-Leone accepts the influence of 'field effects' on problem solving ability. Amongst adults and children the ability to solve problems is often dependent on the relative weight an individual gives to cues from the perceptual field, as opposed to cues obtained from other sources such as task instructions. Pascual-Leone suggests that individuals differ in their tendency to give weight to salient but often misleading cues and that individual differences in this tendency are stable across tasks and across time. As a result of this Pascual-Leone assumes that the full utilisation of 'M power' and the differential effects of perceptual cues are highly correlated with the field dependence/independence dimension. In his 1969 study for example, he found high correlations emerged between tests of conservation involving the use of 'field effects' and the Rod and Frame Apparatus. (0.52). He suggests therefore, that field-dependent subjects are likely to be low M-processors, who assign a higher weight to perceptual cues than to those provided by the task instructions and that field independent individuals tend to be high M-processors who assign a higher weight to the task instructions than to perceptual cues. (Pascual-Leone 1969, Case and Globerson 1974)

As has been described earlier, tests of field independence are thought to rely heavily on a 'disembedding' or analytic capacity. The fact that low, but still significant correlations are obtained with cognitive measures not containing such a requirement, has been explained by the suggestion that these tests are factorially impure. That is, they contain elements unrelated to disembedding. (Vernon 1972, Dubois and Cohen 1970). Pascual-Leone however suggests that the weak correlations with non-analytic items may result from the psychological nature of disembedding itself. (Pascual-Leone 1969, Case 1974). According to Pascual-Leone a subject confronted with a disembedding problem can respond to it in one of two ways. He can either answer in terms of the perceptual display itself, through learned reaction to similar displays previously experienced. Responses of this kind rely on the salience of the perceptual cues on which the response is based, as well as its structural simplicity. Alternatively the subject can respond in relation to the problem as it is stated, which requires consideration of cues which at first may seem hidden, as well as the structural complexity of that situation, i.e. such a subject recognises that there are more variables in the problem which might well be associated with the solution to that problem.

In the Rod and Frame Test for example a subject can respond primarily in terms of the salient perceptual cues provided by the tilted frame and create a simple understanding in which the rod is squarely aligned with the frame, or a response can consider the less salient cues provided by his body and create a more complex mental pattern in which the rod lies at an angle to the frame, but on the imaginary line which can be formed by mentally connecting true up and down.

"The Rod and Frame Test therefore differentiates between those who adopt an incorrect response which is simple and perceptually compelling ... and a correct response which is more complicated and less perceptually compelling." (Case and Globerson 1974)

The generation of a more complex response is assumed to place a greater burden on a subject's M-Space, since it requires that a greater number of items of information and/or transformational processes be activated simultaneously.

Studies by Saarni (1973), Case (1974, 1977) and Case and Globerson (1974) are amongst those who have attempted to empirically investigate the hypotheses proposed by Pascual-Leone. Saarni (1973) investigated the ability of young adolescents according to their level of field independence and their level of cognitive functioning. Her results did not appear to yield any significant differences in problem solving ability as a result of level of field independence. This she believes challenges Witkin's claim for his construct as a cognitive style which shows some kind of consistency across various sorts of intellectual functioning. Saarni comments,

"The construct Field-Independence appears to have doubtful implications for complex problem-solving performance. The analyses indicate that Field Independence within each Piagetian level does not affect complex multistep problem-solving performance as manifested in the productive thinking problems. This does not invalidate the role Field Independence might have in determining performance on problems which are more perceptually bound and/or relatively non-verbal. The results obtained here, however, cast doubt on the generality of the field independence construct as a cognitive style or as a consistent characteristic of the individual in his intellectual functioning." (p 343)

Three immediate questions arise in response to Saarni. Again, in contradiction to comments made earlier, she relies on one criterial measure for the assessment of Field independence. It is also the case that she concentrates solely on field independence in her discussion and the empirical investigation. So one might comment reciprocally on her criticism of Witkin's construct as a cognitive style, which should supposedly consider individuals in terms of a continuum, ie Field dependence and Field Independence, with various gradations between these extremes. Finally it is also the case that Field Independence is merely another variable in the research and not the focus of the investigation (ie 'In addition, it was hypothesised that individual differences in field independence ... might be a second variable relevant to explore in studying problem solving behaviour." p 338)

Case and Globerson (1974) attempted to assess Pascual-Leone's proposition that there would be a correlation between tests of Field Independence and implicit demand on the use of 'M-space'. They concluded that tests of field independence share a substantial degree of common variance with structurally similar IQ tests but also that in agreement with Pascual-Leone, a disembedding situation is one where a relatively large amount of central computing space must be used in the process of generating a complex perceptual response. It would be interesting to speculate whether the ability to interpret a map makes similar demands, in that it presents a complex embedded picture. Case and Globerson also concluded that one of the reasons that a subject fails in disembedding situations is that he uses insufficient of his central computing space.

In their discussion of their results Case and Globerson raise a number of important issues. The first concerns the nature of the developmental increase in field independence, as described by Witkin et al (1954) and discussed earlier. This could result they suggest, from the developmental increase in 'M-power'(Pascual-Leone 1969, Case 1972) or a change in the way information is processed or co-ordinated, or a developmental decrease in sensitivity to perceptually misleading information. Whilst the last point would seem to be particularly pertinent, it is important to remember that the age range during which Field-Independence shows the greatest increase (ie 10 - 13 years) is not one during which sensitivity to primary perceptual illusion shows much change. (Piaget 1969). Pascual-Leone suggests that sensitivity to perceptual features actually increases with development and that the decrease in field dependence is exclusively a result of developmental changes in 'M-space' and the improved co-ordination and processing of experience within that 'M-Space'.

A second important point relates to the nature of the Educational Environment most suitable for field-dependent subjects. Case (1974) suggests that there are different types of field dependent subject and that this needs to be considered in any educational programme. A field dependent subject so classified because he uses limited 'M-space' may respond differently to someone who is especially sensitive to misleading perceptual cues, eg someone whose spatial ability is limited. There is now considerable evidence to suggest that there are cerebral functions equated with particular cerebral areas, for example that the right brain is largely responsible for performing spatial functions. (Milner 1971, Downs and Stea 1977, Blakemore 1977). Given the spatial character of tests of field independence it could be hypothesised that the analytic function of disembedding is located in the right hemisphere.* This does not explain the correlation of Field Independence with tests of M-Space, since they contain no element of spatial transformation. The Backward Digit Span test, for example, does not even involve visually presented material. Case and Globerson (1974) suggest that the spatial elements of a disembedding problem draws on right hemisphere and the processes required to overcome the 'perceptual pull' of such problems is located in the left hemisphere, which is usually associated with linguistic and logical capacities. Although speculative, they believe this may explain why patients receiving a shock to the right hemisphere of their brain show improved RFT performance, although performance on other spatial tasks decreases and why patients receiving shocks to the left hemisphere show a decrease in RFT scores but not in other spatially oriented tests. (Cohen, Berent and Silverman 1973)

In a study in (1977) Case attempted to investigate whether a subject's cognitive style continues to affect performance on conservation tasks after some instruction had been given on that task. His analysis was based on an investigation with 54 non-conserving children aged between 5 and 8 years. He concluded that before a child can be expected to ignore his current perceptual judgement, he must acquire an understanding that some perceptual judgements are more reliable than others. This is similar to comments made by Braine and Shanks (1965). Within the context of Pascual-Leone's theory

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* Brophy (1982) suggests that success on the Rod and Frame test may be associated with 'Hemispheric Specialisation'.

before a child can co-ordinate the specific schemes relevant to a conservation problem, he must acquire an appropriate 'executive scheme' - a general plan for evaluating the relative quantity or difference between the objects presented. Both Case and Pascual-Leone believe that field dependence results from an unusually strong tendency to apply global, perceptually facilitated executive schemes and that limitations in reasoning may result from failure to fully comprehend and overcome perceptual influence at earlier stages of development.

(vii) Criticisms

There have been many studies associated with the work of Witkin and his colleagues. In a bibliography dated to 1976 something over 2,500 different papers are included. It is not surprising therefore to find that the research has not gone uncriticised. The number of such critics are by no means numerous however. Perera (1974) comments,

> "While most investigators appear to have adopted Witkin et al's procedures and interpretations without criticism, Gruen (1957), Zigler (1963), Lester (1968), Vernon (1972) and Satterly (1970, 71, 76) are amongst those few who have pointed out various errors of commission and omission that appear to question the validity of the superstructure built up by the Witkin group".

This section proposes to consider some of these criticisms.

Goldstein and Blackman (1978) criticises much of the research related to the dimension for its lack of consistency in the various measurement instruments employed. The earlier reliance on BAT, RFT and EFT now seems to have been superceded by either RFT or EFT alone, sometimes a combination of both of these measures, but mainly the use of the EFT in a variety of forms. Although it is clear that a short form, a group form and a children's form serve useful functions, it is not clear that the many variations of each of these serve a useful purpose. The relationships among these many variations and the standard measures are often unclear, which makes the task of comparison somewhat difficult. This is a point stressed by Satterly and Brimer (1971) who argue that any investigation designed to assess an individual's cognitive style ought to attempt to employ some standardised procedure, yet be sufficiently flexible. They suggest that there are three important factors which ought to be considered in any such investigation:

(i) The tests used should allow freedom to the subject to determine what is significant for him - so that the material can be organised in a variety of ways.

(ii) Highly formalised diagrammatic material should be avoided, since these demand too specific an orientation - and exerts a strong influence on the modes of solution.

(iii) That the results should be analysed by a technique which does not seek to impose a number of preconceived categories by which to classify the styles elicited by the task.

Despite these comments however, Satterly's subsequent research (Satterly 1976, Satterly and Telfer 1979) investigating the association between field dependence/independence and spatial ability and school learning, employs the use of only one test from the Witkin criterial measures, the Embedded Figures Test. This falls short of Vernon's (1972) recommendation that a version of the Rod and Frame Test and the Draw-a-person test, together with the Embedded figures test constitute a reasonable minimum battery for the measurement of field dependence. Satterly argues however that the RFT and DAP tests were shown by Vernon to have low, but admittedly positive correlations with the Embedded Figures test, which Satterly believes causes investigators to question the necessity of deriving a pooled index of field dependence from such disparate measures. In a recent study (1982) Brophy reported positive correlations between EFT and DAP in a sample of 147 14 year olds, but no correlation with RFT. In a factor analysis of his results, RFT scores emerged as an independent factor unrelated to other measures of field independence which clustered with tests of spatial ability. It seems likely however that the various versions of the EFT do measure substantially similar functions amongst adults (Jackson et al 1964) and ten year old children (Perera 1974). It is also the case that Witkin et al (1971) accept the EFT as an acceptable base measure of field independence. It is interesting to note that the Body Adjustment Test now features rarely in experimental investigations, probably because of the size and costs involved and also to a lesser degree the Rod and Frame test is less extensively used. As a result many assertions are made for the style identified by Witkin based primarily on one test, which appears to have a very strong association with spatial ability. (Gardner, Jackson and Messick 1960, Kogan 1971, Vernon 1972, Satterly 1976).

Another difficulty associated with comparability of results obtained in different studies arises from the various ways in which the extremes of field dependence/independence are delineated. Vaught (1968) commenting on an exchange between Immergluck (1968) and Pressey (1968) showed that when an average deviation on the RFT of 10 degrees or more is used as the criterion for defining field dependence, only about 17% of the undergraduate population is defined as field dependent. Many investigators who do not have access to large pools from which to draw samples simply divide their subjects on the basis of median or quartile scores and therefore likely to fail to include in the field dependent group subjects who are clearly field dependent.

Perera (1974) introduced two interesting criteria associated with delineation of style. To investigate this dimension he used a version of Thurstone's concealed figures test, the score of which is usually the number of correct responses. In Perera's investigation a 'correction for guessing' was included, by substracting each persons incorrect marks from his correct scores. After correcting, a constant was added to each subjects score to convert all scores to positive ones. He then differentiated Field Independent and Field dependent subjects as one standard deviation above and below the mean of the scores for his group sample. A further intermediate group was designated as those falling immediately above and below the mean.

Similarly, in a study by Case (1974) which employed the Weschler Blocks as the test of Field independence, subjects who scored one standard deviation above the mean for 'national averages' were classified as Field Independent and those scoring one standard deviation below the mean was classified as field dependent.

A similar technique was adopted by Doebler and Eicke (1979) who having administered the EFT to each of the children in a large sample (296 children). The mean and standard deviation of the scores were computed. Only students falling more than one half of a standard deviation from the mean were retained in the sample. Field dependence was defined as an EFT score of 1,812 or above (n = 108), field independence was defined as an EFT score of 1,454 or below (n = 78).

In the discussion on intelligence and field dependence some critics find it difficult to accept Witkin's assertion that the cognitive style of field dependence/independence cuts across general levels of intelligence. Correlations between field dependence and measures of intelligence have been shown to be positive and in the range between 0.40 and 0.60, and are not taken by Witkin as indicative of a single dimension underlying both intelligence and field dependence. Similar correlations of 0.30 - 0.60 are accepted by Witkin as demonstrating positive and significant relationships between the Rod and Frame Test and the Embedded Figures test. (Goldstein and Blackman 1978). In a detailed and comprehensive study of the correlations between RFT and EFT Arbuthnott (1972) concluded that while the measures of field dependence/independence do share some variances the amount is generally quite low.

Witkin acknowledges the existence of high correlations with intelligence, but as explained earlier, these are interpreted in the factor analytic terms identified by Karp (1963). Following an extensive review of the literature, and an enquiry designed to assess the distinctiveness of Field independence, Vernon (1972) concluded that the group versions of the pencil and paper tests of field dependence/independence do not measure a factor distinct from general intelligence. Not all studies agree with Vernon however, Busse (1965) was able to extract a factor of cognitive style distinct from general intelligence. Further criticisms associated with field dependence and intelligence relates to the low correlation with verbal ability. Contrary to Witkin's claims, Crandell and Sinkeldam (1964) and Wachtel (1972) report significant correlations between EFT scores and verbal ability in pre-adolescents and young adults respectively. Similarly, Bieri, Bradburn and Galinsky (1958) found significant correlations between mathematical ability and field independence amongst college students.

All of the above research suggests that the analytical/global cluster identified by Witkin <u>may</u> be linked empirically with verbal, numerical, and as was mentioned earlier, spatial ability. It would seem essential therefore to attempt to control for these abilities when comparing field dependence/independence to other variables.

If it is the case that field dependence/independence is not separable from general intelligence, Satterly (1976) argues that the criterial measures of this particular cognitive style are unlikely to further our understanding or knowledge of an individual, nor are they likely to suggest potential for achievement beyond that which is predicatable from standardised tests of intelligence. Entwistle (1979) adopts a similar point of view and is wary of over emphasis on the attributes of describing individuals in terms of styles of thinking. He is particularly critical of accepting individual differences as indicative of preference for this implies that both capabilities exist within an individual. He says,

> "Throughout childhood, styles as preferences are impossible to separate from the limitations imposed by differential development in reasoning ability."

and with reference to the cognitive style identified by Witkin, Entwistle (1981) has commented, more recently that,

> "The problem in Witkin's description is that field dependence is an inability to impose structure. If it is to be a style a rather more positive description of 'global' thinking should be expected." (Entwistle 1981 p 207)

Kogan (1971) however refutes assertions such as those of Satterly and Entwistle. He believes that Witkin's research has identified important individual differences which are reflected in each individual's behaviour patterns. In 1965 Cattell commented that the capacities isolated by Witkin had a strong association with one factor of personality embodied within his personality theory, that of an 'independence factor' (QIV within his 16PF measuring instrument). Ohnmacht (1968) correlated scores on two versions of the EFT with the QIV scores derived from Cattell's 16PF. He found non-significant relationships which led him to reject Cattel's claim of an association between QIV and field independence. This finding was later supported by Johnson et al (1969). Cattell's comments on these studies suggested that these relationships needed further investigation, and hypothesised that tests of field dependence, QIV and a further 'general temperamental factor' of the 16 PF-(UI 19) would all load together (Cattell 1969). Thomy's (1972) study threw doubt on this assertion, as does Brophy's (1982) more recent investigation.

A further point of criticism associated with research in to this area is discussed by Goldstein and Blackman (1978) and that is the relative lack of direct systematic research on specific issues. They commend Witkin and his colleagues for their continuing and detailed studies but are critical of the lack of coherence in the work of other researchers. The suggestion is made that field dependence/independence is often not the central concern in many studies but is employed as one further variable, primarily because of the ease of administration of the EFT, even in spite of comments made earlier about reliance on one criterial measure. Arbuthnot (1972) makes similar comments and criticises research for indeterminate use of tests which 'resemble' Witkin's original measures, which he argues is unwarrented and 'conceptually dangerous'. Future studies he believes should be based upon at least two measures, preferably the RFT and EFT. Arbuthnot concludes however that within the samples he studied there are clearly subgroups for whom the measures under consideration relate and identify describable individual characteristics, which suggests research into this area is valuable. Kogan supports these assertions when he comments,

> "Witkin's analytic/global dimension would appear to be ideally suited for research on the interaction between cognitive style and instruction. Both ends of Witkin's dimension have adaptive properties, though of a distinctly different kind and it is feasible that educational programmes could be devised to profit each of these polar types." (Kogan 1971 p 253)

Despite many of his earlier criticisms, recent research by Satterly (1979) seems to offer some support to the assertions made by Kogan. Satterly identified some factors which lead him to now accept that the cógnitive style measured by performance on the EFT is an educationally relevant measure of individual difference. Satterly and Telfer (1979) found that, in agreement with Witkin, field independent pupils favour school subjects where greater cognitive activity is necessary, rather than those subjects which merely required reproduction of what had been seen or heard. It was also found that in complex information processing tasks gains may be made when the children are made consciously aware of the inherent organisational structure of a piece of learning, especially for those field dependent pupils who lack the facility of analysis associated with the articulated end of the dimension.

In a further study of the co-variance of cognitive styles, intelligence and achievement Satterly (1979) identified factors of general ability, field independence and levelling-sharpening. One of the highest factorial loadings were found between the EFT and tests in Mathematics and Geography. The geographical tasks selected were of a spatial nature associated with children's understanding of maps and plans. (0.386 for Test 1 and 0.398 for Test 2) The results lend further support to the association of this style to spatial abilities and more especially to mapping abilities. Yet the analysis of this piece of research Satterly concluded "provides some support for the independence of cognitive style from general intelligence."

If it is possible to separate cognitive style indices from the usually accepted indices of ability and aptitude, Kogan believes this is of considerable educational significance. It demonstrates, for example, that standardised tests of intelligence do not begin to tap the many forms of cognitive variation present in the repertoire of all children. It was this conclusion that led Piaget to search for an alternative investigatory technique and to adopt the clinical method as a means of revealing more information about childrens' reasoning than is obtained from standardised test results. It is perhaps important therefore to consider information derived from tests of cognitive style in the same way that Vernon (1979) suggests Intelligence test scores should be interpreted, that is as one further part of the complex jig-saw of individual differences, which help us to understand that individual a little better.

A further implication is that educators cannot afford an exclusive pre-occupation with mastery of subject matter, but rather, must give due consideration to the child's mode of thinking. Bruner (1966) aptly describes the interplay of recognising individual differences and determining the strategies and goals of instruction when he says,

> "Individual differences ... exist in massive degree - in the extent to which children have problem-solving predispositions, in the degree of their interest, in the skills that they bring to any concrete task, in their preferred mode of learning and representing things, in their ability to move easily through any particular sequence and in the degree to which they are initially dependent upon extrinsic reinforcement from the teacher. The fact of individual differences argues for pluralism

and for an enlightened opportunism in the materials and methods of instruction ..... no single ideal sequence exists for any group of children. The conclusion to be drawn from that assertion is .... that if a curriculum is to be effective in the classroom, it must contain different ways of presenting sequences, different opportunities for some children to 'skip' parts while others work their way through, different ways of putting things. A curriculum, in short, must contain many tracks leading to the same general goal". (p 71)

(viii) Relationships with Environmental Understanding

Faced with the complexity of reality man attempts to identify significant features and relationships and searches for order. Bryant (1971) regards the way man understands his environment as the central problem of cognitive psychology. The development of this understanding, which is always incomplete and approximate, is the result of a long and complex process throughout childhood.

"It is a complex one because it involves not only the way children manage to learn the rules that govern their world but also the effects of this learning on subsequent behaviour. The way a child understands his environment probably effects his behaviour in it and his behaviour probably determines the experiences on which further development is based." (p 22) (Bryant 1971)

The association of ideas within the mind provides a conceptual framework for handling sense perceptions and enables us to go beyond an immediate experience. If Witkin's suggestions are in any way correct, the conceptualisation that he proposes would seem to be of fundamental importance in helping us to understand the way in which an individual comes to terms with his environment and learns and interprets his environmental experiences. In Witkin's terms, investigation of experience in any domain is likely to reveal a general tendency to function at a more or less 'differentiated' level. Witkin (1976) believes that with growing knowledge about salient cognitive styles, in time it will be possible to identify each individual's cognitive pattern. This cognitive pattern he refers to as "an individual's Cognitive Map" - which he suggests is a comprehensive classification of an individual's cognitive and broader psychological functioning.

The term 'Cognitive Map' has been used in an entirely different way by those interested in man's perception of his environment, here the term is used as a construct to provide an explanation of how people come to know the environment about them. As Kaplan (1976) explains,

> "The Cognitive Map is a construct that has been proposed to explain how individuals know their environment. It assumes that people store information about their environment in simplified form and in relation to other information they already have. It further assumes that the information is coded in a structure which people carry around in their head and that this structure corresponds, at least to a reasonable degree, to the environment it represents. It is as if an individual carried around a map or model of the environment in his head. The map is far from a cartographer's map, however. It is schematic, sketchy, incomplete, distorted and otherwise simplified and idiosyncratic. It is after all, a product of experience not precise measurement." (Kaplan, Preiser Vol 1 pps 275 - 6 1974)

In that one's cognitive map as represented in these terms is built up on the basis of experience, one might expect a preferential learning set, as identified by cognitive style research, to influence the way in which an individual's image of his environment is constructed and developed. It is interesting therefore, that Witkin chose to adopt the term 'Cognitive Map', for the potential interrelationships between cognitive styles and cognitive maps seem worthy of further investigation. The next section of this study reviews the growing interest amongst psychologists and geographers into the field of Environmental Perception and particularly the various interpretations and uses of 'cognitive map' before proceeding to a discussion of the relationships which might exist between an individual's cognitive style and his perception of his environment, but before doing so it would seem pertinent to indicate issues in the previous discussion which are thought to be pertinent to the proposed study.

(ix) Areas of potential study

Within the text, the following factors would seem to be of importance for the proposed study:

1. Cognitive styles appear to be closely associated with environmental experience· (p4/5)

2. Cognitive styles develop slowly and experientially - as does an individual's perception of his environment (p 7 and Bryant's comments p 48)

3. A suggestion has been made that research is needed which relates cognitive styles to environmental experience (p11)

4. The middle years is seen as a period of important changes in the style identified by Witkin - and the study proposes to focus attention on this age group (p 16)

5. The relationship between IQ and cognitive style is still not really very clear - and this is perhaps worthy of further research.(p 18/19)as are the relationships with personality. (p 20 on.)

6. It would be possible to test Witkin's assertions on p 20, that an individual's ability to break up a configuration will be manifested in problem solving activities - especially in terms of environmental encounters.

7. There appear obvious relationships with mapping abilities. A map requires the ability of an individual to 'disembed' from a symbolically presented stimulus array. (comments on page 20)
Map understanding could also be described as an 'analytic' skill - and is likely to be more successfully undertaken by field independent individuals. (pps 21 and 42)
Maps might also be described in terms of the articulated - global dimension, as demonstrated in the Articulation of Body Concept Scale (p 22).
As with the Articulation of Body Concept Scale there is an important and often ignored element of drawing ability in maps which merits further consideration in the analysis of individuals mental representations of their environments. (p23)

The associations suggested here have been demonstrated by Satterly's research (1976, 1979) (p 47)

8. The educational applications of cognitive styles research for learning and teaching about the environment, as well as for the structuring of environmental experience would seem to be an important area of potential research. (pps 29 -34)

9. Although many of the criticisms discussed are justifiable and raise doubt about the existence of the style identified by Witkin, it appears that the majority of the criticisms are levelled at research other than that undertaken by Witkin and his colleagues. (pps 41 -48)

CHAPTER THREE - A review of the literature associated with the study of Environmental Perception

Introduction

This section opens with an attempt to delineate the field of study which has come to be known as 'Environmental Perception'. An analysis of this kind necessarily leads to an examination of terminology which arises in the literature and in particular, terms such as 'perception', cognition' and 'images' are considered as are the factors which contribute to their formation. A selection of the resultant models of 'environmental knowing' are then compared and contrasted. The historical and philosophical roots of this area are also discussed and particular reference is made to the contribution of geography to perception studies. A review of the various kinds of research undertaken to date are considered in relation to the problems of measurement and the measurement techniques which have been employed in the research. One particular technique, 'cognitive mapping', which has been extensively used by researchers in this area, is critically evaluated. The final section examines how it is believed an individual's knowledge and understanding of his environment develops, and concludes with a review of the investigations which have been undertaken into children's perceptions of their environment.

(i) The Study of Environmental Perception

> "There is an environment in the minds of men. It encompasses the environment of sun and rain, bricks and mortar, people and things. For the human concerned, it is no less real than the external ambience despite its existence solely in the form of perceptions, cognitions, attitudes, beliefs and behaviour. It is the environment which men both respond to and seek to fashion." (Kates 1970 p 648)

Saarinen (1970) referred to a list of over thirty disciplines of knowledge concerned in some way with the relationship which exists between man and his environment. Of this range, he suggests that the two main contributors in this field are those of geography and psychology. The geographer attempts to understand man's use of or behaviour in the environment, whilst the psychologist focusses upon man's psychological processes in order to explain how the environment is known.

During the 1960's there was considerable inter-disciplinary interest in the interaction between man and his environment, which has culminated in a wide range of studies which collectively have been referred to in various ways. For example, the fields of Environmental Cognition (Golledge 1975), Environmental Perception (Goodey 1971, 1974), Environmental Psychology (Craik 1969, 1970) Ittelson, Proshansky, Ruhn and Winkel 1974), The Psychology of Place (Canter 1977) and more recently, Environmental Knowing (Moore and Golledge 1976).

The range of titles listed here demonstrate clearly the potential from both geography and psychology to studies which attempt,

> "... to understand the relations among human experience and behaviour and the large scale socio-physical environments in which we carry out our daily lives." (Moore and Golledge 1976 p xi)

Environmental Perception, Cognition or Knowing are collective terms therefore for any of the ways in which we apprehend our surroundings. The environment we experience and the way we make sense of that experience is a cognitive or mental process in which environmental reality is thought to be simplified in to environmental images which we all carry around with us in our heads. Pocock (1978, 1979) conceptualises such environmental images as,

> "... learned and stable mental conceptions .... mental models ... which can be thought of as summarising an individual's environmental knowledge, evaluations and preferences and as having implications for their behaviour." (Pocock and Hudson 1978 p 3)

Studies investigating into this area work from the premise that an individual's understanding of the world is built up through direct sensory experience which is ordered in significant ways through the processes of perception and cognition. These processes are also thought to be subject to social and cultural influences.

Downs (1970) for example argues that,

"Perception studies concentrate on the cognitive understanding that man has of his environment and the way in which this knowledge is stored and organised in the mind: that is, they are concerned with the image of the real world. One of the principal under-pinnings of the perception approach is that spatial behaviour is a function of the image, where the image represents man's link with his environment. The focus is on such problems as the nature of the image, its relationship to the real world, the processes which influence the transformation of the real world into the image and the precise effect of images on decisions. In addition, these problems have a dynamic aspect through time and vary across different groups of people." (p 70)

The similarity, or commonality which runs through the various defined fields, as listed earlier, is demonstrated by comparing Downs discussion of 'perception studies' with that of Moore and Golledge (1976) below, who state that,

"Environmental Cognition is the study of the subjective information, image impressions and beliefs that people have of their environment; the ways in which these conceptions arise from experience and the ways in which they affect subsequent behaviour with respect to the environment." (p 3)

It is possible to isolate similar definitions for each of the fields of study already suggested and it is clear therefore that these terms should be regarded as synonymous.

It is the case however, that many psycholgists are critical of the use of the terms 'perception' and 'cognition' in the context to which they are referred here. Goodey (1974) for example suggests that 'conception' or 'understanding' might in fact be better terms to use,

"... and at times the rather free use of terms like 'perception' or 'cognition' must disturb psychologists and others who recognise a very precise meaning for these terms." (p 8)

It is just this lack of precision that leads Burgess (1979) to suggest that the supposed relationships between psychology and geography in this area are somewhat tenuous. She suggests that not only might psychologists be critical of use of terminolgy, but also of research methodology and measurement techniques employed in studies within this field. It is clear from Goodey's comments above however, that geographers are conscious of these criticisms and it was this that led Moore and Golledge to refer to their recent edition of collected papers as essays on 'Environmental Knowing'. Similarly it is possible for geographers to be critical of psychological use of terminology, for the term 'environment' is psychologically conceptualised as micro-scale laboratory settings, (Burgess 1979), or refers to social and interpersonal influences on an individual with little or no reference to the characteristics and attributes of the physical environment. (Wohlwill 1970)

While one should not underestimate the contribution made by laboratory experimentation, research that isolates man in an artificial environment runs the risk of sterility and irrelevance and phenomena studied may never occur outside that setting. As Proshansky (1976 p 63) comments,

"Since at a very minimum the person's awareness of his being in a given physical setting is a requirement for his behaving and coming to terms with that setting, no laboratory or other artificial setting, no matter how contrived can serve as a substitute for such a reality. No matter how well a research setting duplicates the real physical world of the individual, his knowledge that it is not the actual setting immediately invalidates the integrity of any person - environment phenomenon being studied in relation to that real world setting ... "

Geographers adopt a different interpretation of 'environment' to that of the psychologist. The Gersons (1976) for example suggests the term environment is taken to mean,

"...places and the characteristics of those places."

It is clear therefore, that geographical conceptions of an environment are on a much larger scale and concerned with the environment as it is, rather than an abstraction of a limited aspect of reality, whatever reality might be.

The difficulties of definition raised here, lead Burgess (1979) to suggest that the fusion of ideas evident during the late 1960's is now fading "... as researchers return to their parent disciplines and a more traditional pre-occupation about appropriate research topics and methodologies." (p 321). If this is true, some might regard it as unfortunate. In 1970 Wood suggested that studies linking geography and psychology may have a unifying value for the realm of the social sciences and in a geographical context, Burton (1963) commented that,

> "Perception may soon come to merit a place alongside the quantitative revolution in terms of significant viewpoints." (p 157)

In his review of the status of perception studies until 1970 Downs commented however, that even the most fervent proponent of the view that human spatial behaviour patterns can be partially explained by a study of perception would admit that the resultant investigations have not yet made a significant contribution to our understanding. More recently Pocock and Hudson (1978), Canter (1977) and Spencer (1973) would refute this claim. Similarly, as Moore and Golledge point out (1976 p 22) the exchange across disciplines has facilitated the development of theoretical constructs which are comprehensive and not discipline bound.

Despite the criticisms mentioned here, the range of studies stimulated by the field of man-environment interactions is vast and is still growing. In a review of research revised until 1975, Goodey, Spencer and Daniels listed over 1,250 pieces of research based on this theme and this collection they recognised as representing only a partial selection of the available research.

(ii) 'Perception' and 'Cognition' in the study of Environmental Knowing

It is clear from the discussion so far that perceptual and conceptual development are central to the processes underlying how we come to know and understand an environment. In the light of criticisms levelled earlier it would seem important to clarify the meanings associated with these terms. Whilst conceptual development will be dealt with in a later section, the role of 'perception' and 'cognition' in the development of 'Environmental Knowing' will be discussed here.

Dictionary definitions of 'perception' trace the root of the term to the latin 'percipere', to take hold of, feel or comprehend. Goodey (1971) refers to Webster's (1962) dictionary which lists the following interpretations (p 1,085)

1. Consciousness, awareness.
2. The awareness of objects or other data through the medium of the senses.
3. The process or faculty of perceiving.
4. The result of this; knowledge, etc gained by perceiving.
5. Insight or intuition, as an abstract quality.

Perception might be regarded therefore as the process of being aware. It is true to say that most work on perception has been undertaken by psychologists, yet, as a process it is still one about which psychologists are not totally agreed. This is reflected in Saarinen's (1969) reference to the International Encyclopaedia of the Social Sciences, in which the definition and discussion of 'perception' is allocated some 50 pages. Bartley for example commented,

> "Nowhere in the literature can we find in concise and adequate form a well rounded account of what perception is, what its characteristics are and or how it relates to other aspects of behaviour." (1958 p 449)

and more recently in discussing perceptual development, Bryant (1971) commented,

> "The central problem in perceptual development is whether there is such a process at all." (p 200)

In the study of perception, psychologists have considered a variety of topics, the perception of shape, depth, form, movement and perceptual illusion, as well as that of time, race and other variables. (Vernon 1969, Wohlwill 1960). To the psychologist, it is clear that perception is not only a process of seeing, but also of hearing, tasting, touching and smelling and empirical research has led to the construction of general theories of perception and the role of perceptual processes in behaviour. The particular interpretation adopted, often reflecting the psychological perspective of the researchers involved (eg Behaviourist, Psycho-analytic, cognitive or humanistic).

Moore and Golledge(1976) in their discussion of 'perception' recognise a variety of contexts in which the term is used, by psychologists, and other behavioural and social scientists. To the experimental psychologist they recognise a very limited definition, that is the reception of external stimuli through the 'psychological excitation of peripheral sense receptors." (p 6) Whereas to social and personality psychologists, perception refers both to the sensory awareness of people as social objects and more broadly to the overall impressions that people form of each other. To behavioural psychologists, social geographers, sociologists and political scientists, the term has become an all encompassing one, referring to perceptions, images, memories, preferences and attitudes. In fact to all the psychological factors assumed to affect large scale spatial behaviour.

This range of interpretations is reflected in the available literature. Allport (1958) for example argued that perception has,

> "... Something to do with our awareness of the objects or conditions around us. It is dependent to a large extent on the impression these make on our senses. It is the way things look to us, or the way they sound, feel, taste or smell. But perception also involves, to some degree, an understanding awareness, a 'meaning' or 'recognition' of these objects ... We can include all senses and interpret perception as covering the awareness of complex environmental situations as well as single objects ... things can and do look differently from the way they 'are' and when we realise this fact and begin to explore the reasons for it we shall have gained some light of the meaning of perception and the problem it presents." (p 14 - 15)

Probably the foremost psychologists studying the nature of perception are the Gibsons. Eleanor Gibson (1969) for example describes perception in functional terms, as the process by which we obtain firsthand information about the world. As a process it has a phenomenal aspect, that is, the awareness of events presently occurring in the immediate surroundings and a responsive element, which entails discrimination, a selective response to the stimuli in the immediate environment. The stimulation potential is considerably more than the individual's ability to register, as a result of which perception is seen by Gibson to be selective. Progressively the individual learns to selectively discriminate from the available information in an environment and this is a direct result of experience and maturation. This implies therefore that some recognition of the processes involved and the individual differences that exist in perceptual learning, would appear to be of importance in developing an understanding of how individuals come to 'know' their world. It would also seem essential that teachers are informed of the varying perceptual influences and levels of perceptual functioning that one might expect of children of varying ages.

It now seems clear from the work of Bower (1964, 1966) Fantz (1964) Saayman, Ames and Moffett (1964) and Salapatek and Kessen (1966) that the human infant is born with the ability to distinguish shape, distance and colour. If these basic perceptual mechanisms are innate, it is very tempting to suggest that they are also fixed and unchangeable. The most convincing attempt to show that this is not so comes from the Gibsons (Gibson and Gibson, 1955; Gibson, 1966; Gibson, 1969 and more recently Bryant, 1971, 1974). Their hypothesis suggests that what a person perceives is the end product of considerable selection and this selection changes with age. They claim that a person's perceptual world differs along several stimulus dimensions and that some of these are likely to be relevant to his on-going behaviour while others are not. He attends primarily to those that are relevant and ignores those that are not. The child's major perceptual task, according to this hypothesis is to detect the relevant distinctive features. As he grows older, his knowledge of the significance of different dimensions increases and the actual significance of some dimensions may change, so that dimensions that were previously irrelevant become relevant. What an individual perceives therefore, is dependent upon his understanding of what is significant for him in his environment. Whilst the research of the Gibsons and Bryant focusses upon simple contexts such as the orientation of lines and figures, it is an easy task to translate the hypotheses outlined to more complex environmental situations and envisage a similar developmental process at work. In part this is what studies of Environmental Knowing have attempted to do.

The most recent developments in perception research is that being undertaken by physiological psychologists and neurophysiologists (Blakemore 1978, Oatley 1972, Hubel and Weisel 1965). The main focus of attention in these studies is an attempt to explain behaviour in terms of the workings of the central nervous system and the brain's functioning mechanisms. This research is clearly on a micro-scale and investigates the functioning of individual and/or groups of nerve cells, but as Oatley (1972) comments,

> "Individual nerve cells carry out only quite simple logical operations; it is rather their inter-connections that give rise to the complexity of behaviour and enable the brain to represent symbolically and to represent situations and events in the outside world. It is upon this capacity that we depend for perception, purposive behaviour, learning, memory, thought and language,"

in fact, to our coming to terms with the environment around us. In these neurophysiological investigations, perception is regarded as the interpretation of information sensed through our various receptors. Oatley (1972) suggests that man's development has been influenced by his environment and that in this context, perception must be associated with the ability to interpret patterns of receptor stimulation as objects within this environment, the attributes of these objects and their relationships with each other. Experience then creates in the mind of the perceiver a model of the world to which he responds. To this extent the world is created in the minds of man out of the mass of impinging sensory stimulation. Thus as well as classifying and grouping the patterns we perceive, perception is regarded as an interpretive process. Perception in a neurophysiological sense is not just a problem of pattern recognition, but also

> ...."includes being able to describe visual scenes, to first see a wall then the rows of bricks and to see a world full of objects and people with which to interact in an indefinite number of ways." (Oatley 1972)

Research in to the workings of individual nerve cells, especially the influence of different orientations of light on different parts of the retina has provided an important stimulus in the field of artificial intelligence. Computer programmes have been developed which have helped further the understanding of the perceptual process. Patterns of light impinging on the retina, it seems are decomposed into their constituent elements, and this begins to demonstrate the importance of being able to describe and interpret the relationships between these parts. The faculties of decomposition, description and interpretation are pre-requisites for adequate classification of objects within a scene. Since we do not respond directly to patterns in the retinal image, we need to decompose and interpret these patterns into the domain of real things in the real world. It is only then are we able to identify features and regularities within our environment and respond to them appropriately. As Bruner (1957) suggests, man naturally attempts to order the perceptual chaos he meets and learns to order his various percepts in an established and accepted framework. This framework is built up and elaborated upon as the child develops. Perceiving the environment through all of his senses, man is required to interpret the various components that he meets (ie colour, movement, form etc etc) He forms hypotheses on the basis of these perceptions and accepts or rejects them as a result of previous experience.

From the previous discussion therefore, perception is more than the immediate sensory stimulation of our various receiving mechanisms. Ittelson (1973 pps 1 - 19) suggests that perception should be viewed as a middle stage in the process of sensory awareness between 'Sensation', the initial unorganised response to a stimulus and 'Cognition' a general awareness, or a summary of all previous stimuli. The close association of perception and cognition is recognised by many researchers in this field and as such perception is regarded as a function of cognition (eg Allport 1955, Bruner 1957, Brunswick 1956, Gibson 1969, Ittelson 1951, 1960, 1973, Neisser 1967, Piaget 1969, Pick and Pick 1970, Vernon 1962, Wapner and Werner 1957 Wohlwill 1960).

Wapner and Werner (1957) for example treat perception as a subsystem of cognition, where knowledge about the world may be constructed by many means, of which perceptual judgements are but one. As development proceeds Wapner and Werner argue that perception becomes of less importance, subordinated to higher mental processes.

Piaget (1969) makes an important distinction between two types of knowing. Figurative Knowledge, which is related to the 'percepts' or 'images' of successive states of the world by direct or immediate contact. This is immediate experience and momentary configurations. Visual perception is regarded by Piaget as an example of Figurative Knowing. Operative knowledge on the other hand relates to the operations that intervene between successive states and are the means by which a person transforms perceived parts of the world in to recognised schemata (patterns of activity which are co-ordinated and act as integrated wholes, as distinct from strings of separate responses) and mental structures. Piaget argues that intelligence or cognition is based upon the operative mode. Like Piaget, Epstein (1967) suggests that the standard criteria for perception are '<u>immediacy</u>' and '<u>stimulus dependency</u>'. Immediacy implies that a behavioural response, whether overt or covert immediately follows or accompanies 'energistic impingements' on the sense organs. Stimulus dependency implies that a great proportion of the variance of perceptual response can be accounted for by the physical properties of stimuli. Some stimuli are more complicated than others. There are some perceptual responses that do not accompany or immediately follow stimulation, and others that are not totally dependent on the immediate stimulus, but considered and explained as a result of past experience, as for example in perceptual illusion. Furthermore, most perceptual tasks require an interval between stimulus presentation and an individual's response. It may be questioned therefore, if pure perception ever exists and as suggested it is probably better to regard perception as a facet of 'Cognition' which refers to,

> "... the various means of awareness or knowing that intervene between external energy impingements in the present and the past and the entire gamut of human behavioural responses present and future ... thus subsumes the more specific concepts and substages of perception, imagery, retention and recall, reasoning and problem solving and judgement and evaluation. As such it includes the various processes by which visual, linguistic, semantic and behavioural information is selected, encoded, reduced and elaborated, stored, retrieved, decoded and used." (Moore and Golledge 1976 p 6)

(iii) <u>The Senses</u>

The experience upon which perception and cognition focus is registered through the senses and although it is conventional to consider the senses as those of taste, touch, smell, sight and hearing, Gold (1980, p 50) reminds us of the four tactile or skin senses of pressure, pain, cold and warmth and the two body senses of balance and Kinesthesis. Gold believes that spatial information is derived from all the senses, as is demonstrated in Banz's (1975) analysis of the sources of information in the urban environment, which is described in terms of those features which might be regarded as sensually stimulating, as opposed to those which might be repulsive to an individual.

Fig. 1 SENSUAL SOURCES IN THE URBAN ENVIRONMENT

Direct Experience	Visual	Positive:	Stimulation (beauty, excitement)
		Negative:	Repulsion (ugliness, chaos)
	Aural	Positive:	Stimulation (wind rustles leaves)
		Negative:	Confusion (pneumatic drills, car horns)
	Kinetic	Positive:	Stimulation (solar radiation, textures)
		Negative:	Abrasion
	Olfactory	Positive:	Stimulation (agreeable smells)
		Negative:	Revulsion (offensive smells
Communication	Interpersonal	Positive:	Face-to-face
		Negative:	Confrontation
	Mass	Positive:	Stimulation through mass media
		Negative:	Distraction

(After Banz 1975 p 165)

Further Skurnik and George (1967) suggest that the detection range of individual senses varies enormously with only the 'distance' senses of sight, hearing and smell able to receive stimuli from parts of the environment beyond the tactile zone. Of these, sight is probably the most important source of spatial information. Dodwell (1966) points out that over ninety per cent of human knowledge about the external world is received through our eyes. Visual information is recognised as precise and more detailed than that derived from the other senses, yet it is important to recognise that on some occasions smell, hearing or even tactile experience can extend the range beyond that of the immediate visual field. In an urban environment for example the sounds of moving traffic, smells from local factories, or the vibrations experienced from an uneven road surface can provide important additional information and probably of greater significance, can stimulate affective aspects of our spatial understanding and knowledge.

(iv) Images of the Environment

To the psychologist, the objective environment that we as individuals all see is unknowable, because as has been suggested earlier, it is a personal construction. In our interpretation of any individual's understanding or knowledge of his world we are forced to rely heavily on inference, which is one of the major problems of cognitive psychology.

As Neisser suggests.

> "We have no direct immediate access to the world, nor to any of its properties ... Whatever we know about reality has been mediated." (Neisser 1967 p 3)

It is obviously of importance to consider the information processing capacities of the human brain, for at any one moment the individual can absorb only a tiny fraction of the potential stimuli in an environment. For the visual sense alone, it has been estimated that the environment supplies some ten million units ('bits') of information every second. In the same period of time, Held and Richards (1972) suggest that the brain can only absorb around twenty five units. Similary, Lowenthal comments that other research has suggested that an individual is able to monitor some eighteen separate images or sense impressions every second, (Lowenthal 1961 p 78) and further Miller indicated that the processing of such information is limited to consideration of up to seven pieces at any one time. (Miller 1956 pp 81 - 97). This supposed limitation of the processing facility of the brain reveals another difficulty of investigating individual's environmental understanding but it further explains the natural filtering system which human beings possess. This system limits the variety of environmental information that it is possible for any individual to consider. Without such a filter, the condition of information overload would result in confusion and mental imbalance. (Oatley 1972) Pocock and Hudson (1978) suggest therefore, that,

".... familiarity holds the Key"

or as in Boulding's (1956) words,

".. part of the image is the history of the image." (p 174)

The idea of the 'image' standing as a 'representation' of an individual's environmental knowledge is a theme which consistently appears in the available literature. In one sense this 'representation' may be taken to refer to the re-presentation of something by symbolising the absent thing, as for example when a painting represents a landscape. Alternatively representation can be taken to mean 'Knowledge' or 'thought' itself. It is in this context that the term is used when various writers talk of the 'images' people have of their environment (eg Lynch 1960, Strauss 1961, 1968) or of the personal constructs by which one organises knowledge of the environment (eg Harrison and Sarre 1971) or of the ways in which one 'construes' the environment (eg Wapner et al 1973).

Piaget (1951 pps 67 - 72) for example distinguishes between two interpretations similar to those described. For the first he suggests that 'symbolisation' might be a more appropriate term, but where representation is taken to refer to knowledge or thought itself, Piaget suggests a more appropriate description would be 'conceptual' or 'cognitive' representations, which are internal and refer to knowledge which is not directly observable. As a result such internal representations have to be inferred. Moore and Golledge (1976 p 8) raise important questions in relation to the non-observable nature of 'cognitive representations' in terms of their logical status. They suggest there are three possible interpretations. Firstly, the term is used as a '<u>hypothetical construct</u>' as a proposition about hypothetical entities, processes or events which are not directly observable. The second possible interpretation is as an '<u>intervening</u>

variable' where the term 'representation' is seen as a summary of the variables in a statement of the relationships which exist within an environmental framework. The third interpretation they suggest is a more metaphorical use which is an 'as-if' or 'unreal' usage, as for example when Tolman (1948) describes men and rats as having 'cognitive maps'. This interpretation is one that has raised problems in the study of environmental understanding and produced a proliferation of commonly used, and often misused terms, eg mental maps or cognitive maps (which will be discussed in more detail in a later section). The first attempt to demonstrate environmental images in this concrete form has been attributed to Lynch (1965) who suggested that when attention is turned to the content of the individual's mental image, one of the major components is the basic physical structure, what is contained within the image. Lynch (1960 pp 46 - 90) hypothesised that an individual simplified the physical characteristics of his environment by organising it in terms of five main elements. Paths are channels along which the individual moves, Edges are linear elements which provide the outlines to areas, and often a form of barrier, Districts are distinctive areas of an environment, Nodes are the strategic points within an environment, often converging points of paths and finally Landmarks are single prominent elements within an environment. Although Lynch recognised that an individual's image of his environment was a result of both physical form and meaning, he concentrated deliberately on the importance of form, developing the central hypothesis that an individual's knowledge of an environment (Lynch was primarily concerned with city environments) was a function of its 'imageability', which he defined as,

> "... that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, colour or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment." (Lynch 1960 p 9)

Lynch empirically tested his hypotheses and demonstrated how the images of the central areas of Boston, Jersey City and Los Angeles were constructed. His research methods have been replicated in various cultural settings. More recently, Lynch (1977) has co-ordinated a UNESCO investigation based on these ideas, which monitors children's perceptions of city environments in varying cultures. Research teams in Argentina, Australia, Mexico and Poland investigated the way groups of adolescents use and value their spatial environment.

All lived in low-income areas in homes that were limited in space and often lacking basic amenities. It was clear from this study that the immediate social environment, parents, neighbours and friends all had their impact on the development of spatial understanding and the children's image of their environment and were all part of an important socialisation process.

More recently, Lynch's ideas have been subject to criticism and modification. Gold (1980) identifies four major deficiencies in Lynch's approach. The first concerns methodology, particularly the use of freehand sketch maps as a means of eliciting an individual's knowledge of his environment. As has been stated, this particular process will be discussed in more detail in a later section, but in principle, the validity of the technique depends upon the map being a true representation of a person's cognition of the environment. Spencer (1973) found the technique both difficult to administer and suspect in its results when studying a working class community in Birmingham and concluded that Lynch's sample were obviously more familiar with maps and had the requisite skills to draw them. Similarly Graham (1976) finds the whole concept of 'mental maps' conceptually dangerous, and lacking in coherence.

A second criticism is the emphasis on visual components of environmental knowledge. Lynch has himself moved away from visual information towards considering additional forms of sensory information, drawing attention to the important affective properties of the non-visual senses. Southworth (1969) for example, studied the sonic environment of Boston and demonstrated the contrasting environmental experiences derived from different senses and more especially the close relationship between hearing and emotion. For example, the Boston water front was described as monotonous by a person deprived of hearing, but thought of as delightful by one who was blindfolded.

A third point argues that Lynch ought to have considered the functional and symbolic use of space in urban environments. Steinitz (1968) who re-examined the area of central Boston that had been studied by Lynch considered functional meaning to be fundamental to urban life, simply because it is of importance to know what is happening and where. In support with a previous study by Gulick (1963), Steinitz argued that the imageability of a city was determined by visual differentiation of physical form as suggested by Lynch but in combination with significant social or behavioural associations. Individuals and groups can and do impose their own meaning on their environments, as was demonstrated in Lynch's (1977) UNESCO study.

The validity of Lynch's five environmental elements has also been questioned. Sarre (1972) for example added 'function' in his study of Bath. Goodey et al(1971) altered the typology more radically in the 'City-Scene' Project, which had obtained sketch maps from individuals in response to articles in a regional newspaper. In their analysis Goodey et al found difficulty in differentiating between some of Lynch's elements without the respondents there to explain to them. They condensed Lynch's typology to paths, node/landmarks and edges. Similarly Pocock (1975) in his study of Durham classified the elements that appeared on sketch maps into point features, linear features and areas, which is comparable with Gold's (1980) sub division of environmental elements into buildings (monuments and landmarks), paths and areas. Gold also criticises Lynch for ignoring the influence of emotion and attitudes in his early studies of individual's perceptions, for our expectations, intentions and feelings about places are certain to influence how they are conceived or 'imaged' as well as how an individual might behave or react in them.

(v) Motivation, Emotion and Attitudes

Theories of motivation can be classified in one of two ways, those that suggest man is motivated by a desire to overcome the stresses imposed by his environment and to the reduction of tension (Evans 1976) and those that suggest human beings desire novelty, excitement and stimulation and thus actively seek to increase tension (Berlyne 1950, Wohlwill 1968, White 1959). Underlying such interpretations is the concept of needs. Some needs require satisfaction for continued survival, as in the case of food and shelter. Other needs are more social and personal and incorporate the importance of acceptance and recognition by one's peer group, as opposed to those which drive individuals to fulfil their own self image. Emotion is an area of psychology which is associated with research in to human motivation. Some emotions accompany motivation, as for example when an individual strongly desires something, the accompanying emotional state increases the strength of desire to achieve the goal. Other emotions result from motivated behaviour, such as the feelings experienced when a course of action succeeds against all odds.

Although little research has attempted to identify affective aspects of the physical environment and their relationship to behaviour, some interesting exploratory studies have been undertaken. Rapoport and Kantor (1967) analysed people's affective responses to the built environment and have suggested possible design implications from their results. Mehrabian and Russell (1974) suggest that the information load of different environments coupled with the 'characteristic emotions associated with personality' stimulate primary emotional responses which they sub divide into three types (Pleasure, Arousal and Dominance). These three dimensions of emotion then mediate the behavioural response to the environment, either positively (approach) or negatively (avoidance). This means that an environment that an individual feels is arousing, unpleasant and in which he feels submissive is to be avoided, whereas one that gives a feeling of low arousal, mild pleasure and in which he feels dominant, is likely to be confortable and attractive to him. Although an important advance in studying the association of emotion and environmental knowing, Moore (1977) suggests that the ideas described by Mehrabian and Russell are only concerned with a limited range of variables and leaves much behaviour unaccounted for.

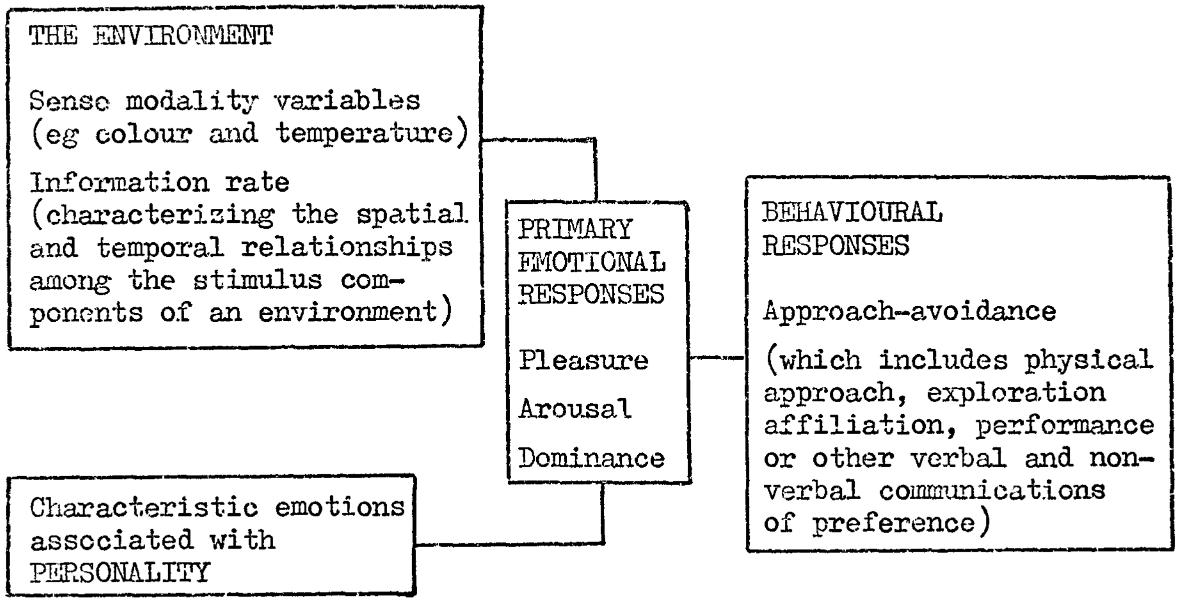


Fig. 2 '<u>The Relationship of Emotion and Behaviour</u>'
(After Mehrabian and Russell 1974 p 8)

The concept of attitude would also seem of importance in any behavioural study for it brings together both internal mental life (including cognition, motivation and emotion) and overt behavioural responses within one framework. Fishbein and Ajzen (1975) suggest that an attitude can best be described as a,

"... learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object," (In Gold 1980 p 23)

In this context, an attitude would appear to contain three basic elements. Firstly, it is learned, secondly it effects behaviour and predisposes an individual to certain forms of action and finally it is relatively stable over time. These points are aptly demonstrated in Chaplin and Krawec's (1974) interpretation of attitudes,

"Attitudes may be considered to be enduring cognitive states which are motivational in the sense that, where strongly held, they predispose the individual to react in a certain way."

Triandis (1971) conceived of attitudes as possessing three main elements, a cognitive element where the individual was regarded as having thought about his beliefs, although often he need have no coherent reason for believing in the way he does; an affective element related to his feelings associated with a particular attitude and a behavioural element which consists of actual overt actions associated with expressions of attitude. The inter-relationship between these elements is demonstrated in the following diagram.

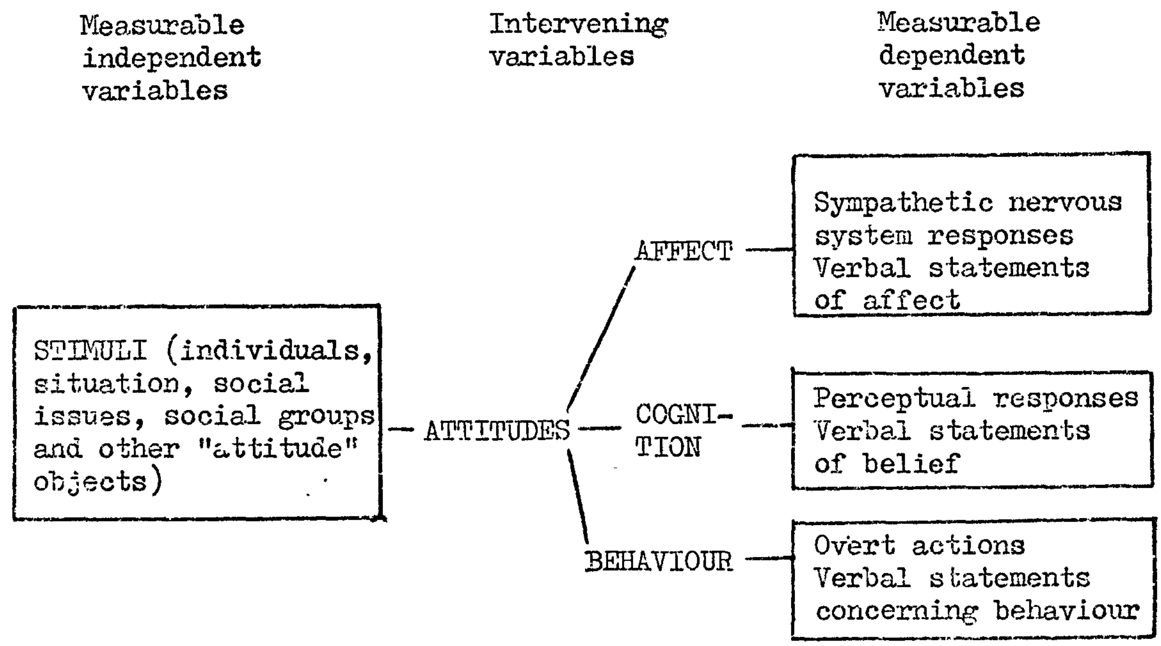
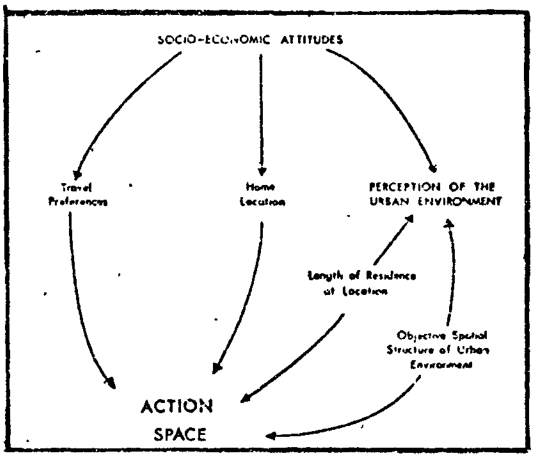


Fig. 3 <u>ATTITUDES</u> and the Environment
(After Triandis 1971 p 3)

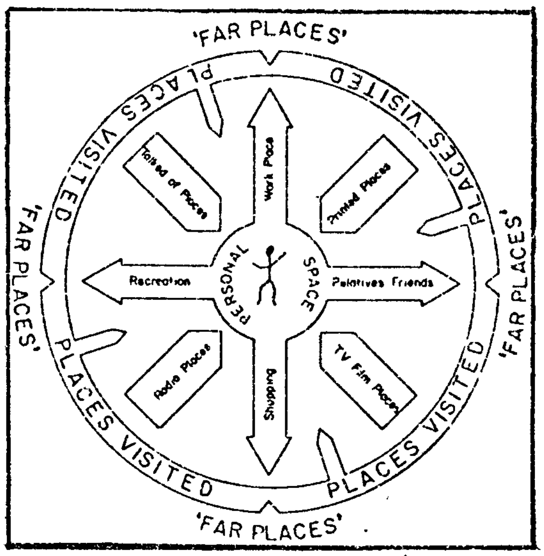
Gold (1980) suggests that an attitude also incorporates a variety of other concepts such as bias, belief, doctrine, faith, ideology, opinion, judgement, stereotype and value. Many of these concepts share the common characteristic of supplying a rapid, if frequently erroneous, interpretation of environments and environmental experiences. They are all ways by which individuals arrange and order their experiences within a particular environment. Attitudes it seems are mostly learned in childhood and, once formed are pervasive and evidence exists to show that attitudes can withstand extensive presentation of contrary evidence. (Tunstall 1970, McQuail 1972). Of obvious interest is the question of attitude change, in knowing whether attitudes can be altered and whether this effects behaviour. O'Riorden (1973) demonstrates that if attitudes were changed in some way, a change in behaviour need not result, for there is frequently a gap between stated attitude and actual behaviour. It is still the case, however, that attitudes are a further influence on an individual's perception of his environment and need to be considered in any analysis of an individual's perceptions.

(vi) Models of Environmental Knowing

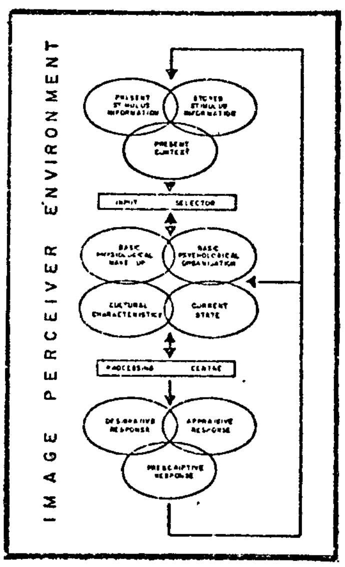
The variety of factors mentioned to date as influencing an individual's perception of his environment are reflected in the various models of 'Environmental Knowing' which have been constructed. Figure 4 presents a representative selection of such models, those developed by Horton and Reynolds (1969) Goodey (1973) Pocock and Hudson (1978) and Gold (1980.) When the constituent elements are analysed considerable similarities are demonstrated as can be seen in the tabulated analysis which follows Fig. 4, as well as progression and elaboration as the models become more recent, it is possible to identify an increased emphasis on psychological explanation.



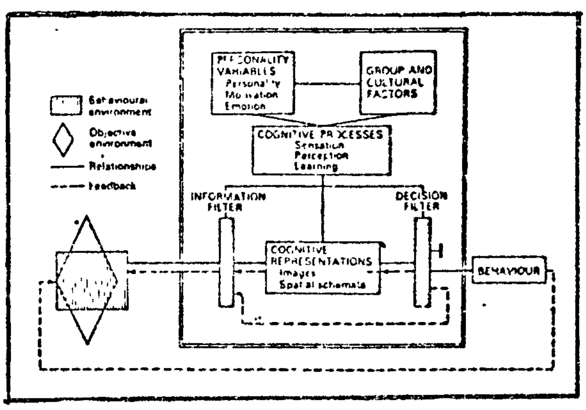
Horton and Reynolds (1969)



Goodey (1973)



Pocock and Hudson (1978)



Gold (1980)

Figure 4. Models of Environmental Knowing.

ION and REYNOLDS (1969)	GOODEY (1973)	POCOCK and HUDSON (1978)	GOLD (1980)
Uses 'urban experiences' that help to explain why individuals perceptions differ	1. Conceptualises the various environments within which man operates	1. Distinguishes between 'the Environment', 'the Perceiver' and 'the Image'	1. Focusses on the 'Behavioural and Objective Environment' Mechanistic, reflecting influence of behavioural psychology, and models developed in cognitive psychology
The influence of Lewin is seen in 'Action Space'	2. Lewins influence is seen in 'Life/Personal Space'		
	3. Demonstrates a progression of the Immediate and known to the distant and less well known (but about which we hold perceptions)		
Major Influences: Travel, Socio Economic Attitude length of residence, structure of the Environment (Is it imageable in Lynch's terms)	4. Major Influences: Previous Experience of people and events group; Culture; Media, printed, spoken and photographic. Differences will depend on an individual's movements, perceptual abilities and stimuli received.	4. Major Influences: Previous Experience and Information; present situation; Individual phycho-logical characteristics; cultural and social influences.	4. Major Influences: Personality Variables; Group and Cultural Factors; Cognitive Processes
	5. Man is located in a Dynamic - constantly interacting Spatial framework	5. A continually expanding cycle of learning and development	5. The model demonstrates a 'dynamic process' of man environment interactions and stresses the relationships which exist
Feedback is seen as an important feature of the model	6. Feedback is seen as an important feature of the model	6. Feedback is seen as an important feature of the model	6. Feedback is seen as an important feature of the model
	7.	7. Perception: an Intervening filter between man and the environment	7. An information and decision filtering process operates which influences the final image
Delineates Man's 'Action Space' in an Urban Setting	8. Results in 'Man's Perceptual Map'	8. The resultant 'Image' of the environment possesses 3 main elements (1) Designative: describes and classifies the elements upon which the image is based. (2) Appraisive: Evaluative/Preferential, and reflects personal associations of value and worth about the environment (3) Prescriptive: Reflecting the influences of the previous two. This gives the image depth and continuity and incorporates previous experiences.	8. Results in an individual's 'Cognitive Representations', Images or Spatial schemata - which have a direct influence on the Individual's BEHAVIOUR

Table 3.I A Tabulated comparison of 4 models of Environmental Knowing.

Each of the models analysed in the previous tabulation emphasise the main elements with which this field is concerned, namely how does an individual come to know his environment, how is it conceived, what are the major influences on this conception and how does this relate to behaviour? Although individual differences are represented, the importance and influence of the social and cultural setting is recognised in them all, for as Boulding (1956) argues, the sharing of similar needs, ideals and loyalties induces common or group images. In this context, the term 'public image' is used and defined as being a,

> "... basic bond of any society, culture, sub-culture or organisation." (Boulding 1956)

A similar theme is pursued in one of the seminal works in this area, that of Lynch (1960) which was discussed earlier. Lynch talks in terms of 'collective images'. Pocock and Hudson suggest that there is an obvious overlap between an individual's perception and the common image derived from group norms. The extent of overlap could in fact be regarded as a measure of an individual's socialisation or even indoctrination into a particular culture or subculture.

The extent to which an individual's experience of, and interpretation of his environment is unique is a factor recognised by Sonnenfeld (1969) who suggested the concept of an 'Environmental Personality' which he defined as the

> "... predisposition to behaviour in the non-interacting geographical environment."

Sonnenfeld argued that each of us are selectively sensitive to environmental cues, quite apart from that resulting from social cultural influences. He suggests that this might be a fruitful avenue for research, that is, the identification of factors influencing these degrees of sensitivity.

As a conclusion therefore, it seems possible to conceive the varying influences and perceptions an individual might hold in the form of a series of continua which incorporates the Individual as opposed to the Group and the Known as opposed to the Unknown

Environment. The individual exists in a continually expanding and changing milieu, as he responds to the varying influences impinging upon him. Figure 5 attempts to depict this diagrammatically, where it can be seen that an individual's schema or image is undergoing constant modification as a result of the influences listed below. It is a dynamic process in which the individual modifies what he experiences by being selective in what he attends to and in turn is modified by the experience. As Bryant (1971) suggests for cognitive development, the way an individual conceives his environment probably effects his behaviour in it and this determines the experiences upon which the the further development of the image is based. Any individual image would therefore contain considerable similarities to that of the prevailing group conception, which of course would vary in relation to who the 'Group' might be, but it would still be the case that an individual's personal experience would ensure that there were elements that differentiated his image from that of others. The similarity of his image with that of others would then depend on the closeness of his association with the other members of the group, hence the suggestion of this dimension being viewed in the form of a continuum.

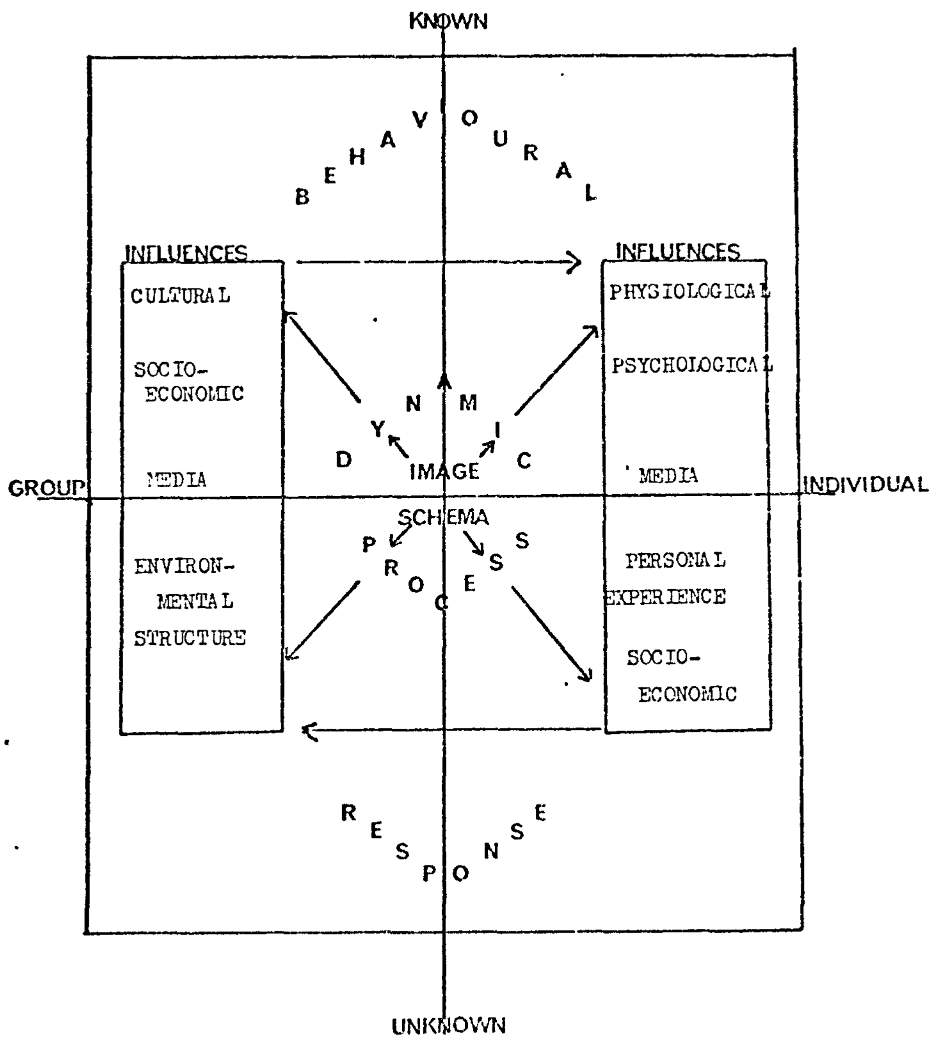


Fig. 5 A COMPOSITE MODEL OF MAN ENVIRONMENT INTERACTIONS

The image a person might possess would also vary across the dimension Known-Unknown. The image of the known environment would be clearer and more specific than that of the unknown, and limited knowledge or experience of some places would not prevent someone from possessing an image of an unknown place, and often an erroneous one at that. In this conception the image is seen as multi-faceted, expanding with experience and providing a broadening basis for the future experience of new places.

(vii) The epistemological Basis of the Study of Environmental Kowing

Having discussed the fundamental elements of the field of environmental knowing, it would seem pertinent to at least consider the epistemological bases of this growing area of knowledge. Moore and Golledge (1976 p 11) identify three fundamentally different stances from which the relationship between the environment and behaviour have been conceptualised; Empiricism and Environmental Determinism; Rationalism and Nativism; and Interactionalism and Constructivism. Each of these perspectives rests on different assumptions about what influences behaviour, the nature of reality and the way in which knowledge is acquired. Each has therefore adopted different questions, research methodologies and modes of interpretation and explanation. Moore and Golledge suggest they represent a continuum where on the one hand behaviour and experience are treated as determined entirely by external environmental influences and at the other extreme experience and behaviour are the direct result of heriditary and biological influence.

'Empiricism' can be traced to the writings of Locke, Berkley and Hume, the eighteenth century British philosophers. This particular viewpoint argues that behaviour in general and knowledge in particular are strictly under environmental control. Reality in this view can only be contained in sensation and knowledge of reality is built up from successions of sensations impressed upon a 'tabula rasa', a blank slate. This was an idea which was continued by late 19th and early 20th century philosophers of the 'positivist' school (eg Compte, Mill, Wittgenstein) who saw sensation as the one source of knowledge.

Any ideas of an 'image' in the mind in this context would be regarded as a copy or reflection of matter, an accumulation of sensed data. Despite this, the role of thought in the organisation of this data is accepted by some neopositivists (Bochenski 1966).

The extension of this perspective came with the Environmental determinists who define behaviour in terms of patterns of responses which result from the environment impinging on a passive organism. The world therefore acts on people and we are the products of forces outside ourselves, and therefore the world is regarded as a 'reality' with an objective existence independent of the observer. Within this framework, three main interpretations can be identified.

(1) Stimulus - Response Theories

(2) Mediational Stimulus Response Theories

(3) Cognitive - Behaviourist Theories

In the extreme versions of environmental determinism such as those of classical conditioning (Pavlov 1941) and operant conditioning (Skinner 1938), behaviour is treated as determined directly by the environment, therefore no form of representational activity is assumed on the part of the individual. In more moderate versions such as Osgood's (1953) 'Mediational' S - R theory or Watson's (1914) interpretation, or Tolman's (1948) cognitive-behaviourist-theory, some form of 'mediational reaction', 'intervening variable' or 'cognitive map' is assumed to mediate between the stimuli of the environment and overt behavioural responses.

Representation from this perspective, which has obvious associations with behaviourist psychology, are built up through sensation arising from experience and they are learned and strengthened or weakened and eliminated according to the behaviourist principles of learning and reinforcement.

An alternative to the Empiricist, Positivist, Environmental Determinist viewpoint is that of 'Rationalism' - which is the second phisophical root identified by Moore and Gollege. Rationalism starts from the contention that knowledge is immediate, innate and exists for us before experience. It is this 'pure' thought that opens reality to us. All of our environmental experience in this viewpoint, therefore unravels our own innate ideas about the environment. Sensation creates individual images which are innate, and which arise from our own powers of intellect. Innate concepts precede and determine the data we sense and behaviour is assumed to be determined primarily by genetic and biological factors. We are born with predispositions to react to the world in predetermined ways. In short therefore an individual acts upon the world and the world is formed and structured from human consciousness existing before the world is experienced. Innate ideas thus precede and determine the form of data to be sensed and experience in the environment simply allows for the manifestation of these ideas in particular instances. This particular viewpoint Moore and Golledge suggest can be traced from 17th Century philosophers such as Descartes, Spinoza and Leibniz, through to Chomsky's (1965) discussion of innate linguistic capacities and Jung's (1953) manifestation of archetypes.

An attempt to synthesise the two extremes discussed so far can be grouped under the 'interactionist','constructionist' or 'transactionalist' philosphy initiated by the nineteenth century German philosopher, Kant.

Kant argued from a totally different position to either the empiricists or rationalists. Instead he distinguished between the 'matter' or 'content' of knowledge as that which corresponds to sensation and the 'form' of knowledge as that which causes the matter to be organised in a particular way. As with empiricism, Kant saw 'matter' as arising through experience and as with the rationalists he believed the 'form' of knowledge is given 'a priori'. Knowledge of the world therefore, is seen as a synthesis, that the subject,

"constructs out of the formless stuff of experience."
(Bochenski 1966 p 4)

The importance of 'construction' is further seen in Kant's view that instead of ever being able to represent reality, what we take to be real is a product of the act of knowing, that is a 'construction of thought'. Kant identified two ways of knowing, the scientific method and an exploration of the processes by which reality is formed in the mind. (As for example in the field of 'genetic epistemology' developed by Piaget). Two of the main approaches to philosophy during the 19th Century were extensions of these sub divisions. Moore and Golledge distinguish between the constructionist position and the two previous interpretations, "The position is taken, therefore, that knowledge, or cognitive representations, as a particular form of behaviour, far from being simply given through sensation and reinforcement leading to covert responses and far from being given by innate ideas before experience, are formed through an active construction of thought influenced by both the person and the environment and by the transaction between the two"(p 15)

The main differences between the constructionist position and that of the 'rationalists' and 'empiricists' therefore are firstly that there is a distinction between 'reacting to' and 'knowing about' an object or environment. Secondly, rather than being formed through the reinforcement of response to stimuli, knowledge is intentionally constructed by an individual. An important consequence therefore is that in the constructionist approach rather than distinguishing between an individual and his environment, what is taken to be the environment is not a reality defined independently of the observer, but a world established and constructed by persons in the context of ongoing transactions in environments.

Moore and Golledge conclude their discussion of the epistemological roots of studies of environmental knowing by emphasising the importance of recognising, "... the underlying assumptions about the nature of knowledge, the nature of human beings, the nature of the organism-environment - relation and the implicit models of 'man' on which we base our specific ideas and investigations. But whether or not acknowledged outright, assumptions on these issues are implied in all research on the human condition". (p 16)

(viii) The Historical Roots of the Study of Environmental Knowing

The more recent historical antecedents of this area are wide-ranging. The first systematic experimental investigation into human knowledge of the large scale environment appears to have been conducted by Trowbridge (1913), who investigated peoples methods of orientation and their 'imaginery maps'. Trowbridge identified two fundamental methods of orientation, a domicentric method closely related to the immediate known environment and features within it, and orientation in terms of cardinal directions.

The earliest reported study with children appears to have been undertaken in 1908 by Gulliver, who found that young children just starting school could not use cardinal directions for orientation, but relied consistently on their own body position and idiosyncratic orientation. Generally, an interest amongst psychologists in the physical environment as a focus for research, as opposed to micro-scale laboratory settings, is comparatively recent. In 1947 MacLeod, an American psychologist suggested that studies of perception should focus on 'what is actually there for the individual' and he proposed a branch of psychology which he referred to as 'psychological geography'. Geographical interest in how individuals conceived of and related to their environment have been traced by Saarinen (1970) to the writings of Von Humboldt, who over 100 years' ago asserted,

> "... in order to comprehend nature in all its vast sublimity, it would be necessary to present it under a twofold aspect, first objectively, as an actual phenomenon and next subjectively as it is reflected on the feelings of mankind." (p 62)

Von Humboldt felt that early impressions exercised a powerful and lasting effect and that such impressions are derived from a variety of sources such as, literary description, landscape painting and direct contact with the environment. Humboldt advocated the opening in large cities of panoramic buildings containing pictures of landscapes from different cultures and different zones of elevation so that the public might enhance their understanding of their world.

Wood (1970) suggests that as a result of psychological investigation into perception and the philosophical questioning about the nature of reality, an awareness of the value of perception in the study of man-environment relations began to filter in to the behavioural sciences in the 1940's. In 1947 for example, Wright, an American geographer proposed the discipline of 'geosophy' which was supposed to concern itself with 'man's sense of space', especially in terms of the individual differences across cultures. The importance of such study was demonstrated by Fonaroff in his (1930) analysis of the Federal government's attempts to rationalise the economy of the Navajo Indians. The attempt failed, and Fonaroff attributed this to,

"... their lack of understanding of the Navajo's view of his environment; the Navajo ideas about nature being markedly different from those of European-descended administrators." (Wood 1970 p 130)

Similar attempts to focus attention upon cultural and individual differences in perceptions of environments are found in the writings of Hall (1959) who described the concept of 'proxemics' as,

"... the study of man's use of space as a specialised elaboration of culture."

Boulding (1956) advanced the discipline of 'Eionics', which would focus upon the study of the images and perceptions held by people. Boulding argued that humans do not apprehend the nature of reality directly, but through a highly learned interpretive process. As such, he suggests that there are no such things as facts, only messages filtered through a complex of images. These images represent an individual's impressions of different aspects of the world, and are a major influence underlying behaviour.

In 1948, Tolman discussed the 'cognitive maps' of rats and men and referred explicitly to individual's cognitive representations of spatial environments. In 1952, he elaborated upon his ideas of the ways in which environments, scenes and routes are mentally represented by proposing the concepts of 'behaviour spaces' and 'belief value matrices'. Behaviour Spaces were conceptualised as,

"... a psychological space of objects with distance and direction, as perceived by a person at any given moment." (Pocock and Hudson 1978 p 5)

and belief value matrices as,

"... learned differentiations and categorisations related to objects and behaviour in space." (Pocock and Hudson 1978 p 5)

Thus Tolman sees people as possessing mental images of environments and environmental situations which result from previous learning and are of central importance in influencing behaviour. Thus in order to understand an individual's behaviour one needs to know something of how he conceptualises his environment. A similar notion is advocated by Simon (1957) who argued that people construct simplified mental models of their world in order that,

"... they might successfully chart a course through life's complexities."

The roots of the ideas proposed by Tolman and Simon are to be found in the writings of Lewin. Using gestalt psychology and with reference to topological geometry, Lewin (1935) developed the concept of psychological 'life space'. This space consists of the individual and the psychological environment that exists for him, together with unconscious states which have effects upon him. Lewin saw the individual personality as being broken in to 'regions' separated by 'boundaries' which become less permeable with increasing age. Lewin used his concept of life space to consider the sum of all the facts that determine a person's behaviour at a given time and conceived of his task as that of analysing and explaining behaviour as a description of the life space at any given moment.

"Lewin's theory predicts how a psychological structure spontaneously changes under the pressure of its own internal dynamics." (Baldwin 1967)

Canter (1977) an Environmental Psychologist, traces the origin of this area to the work of Bartlett (1932) and his studies of perception. Bartlett believed that,

"... an examination of normal perceptual processes leads directly and inevitably to an investigation of mental processes and in particular to the study of imagery and recall." (Canter 1977 p 13)

Bartlett's main idea was that there are internal representations which each individual calls upon as a reference when attempting to reconstruct an image or scene. Bartlett referred to these images as 'schema' and saw inter relations between these mental representations as a growing and elaborating system which structured the ways we approach and deal with our surroundings. These schema he believed were actively constructed. Some twenty years after Bartlett's publication, Lee (1954) one of his students, applied the notion of schema to the context of the physical environment, where he described the way in which our daily interactions contribute to the development of these schema.

"There is a continuous input of sensory information from the physical and social objects in the urban locality, arising from our repeated transactions with neighbours, tradesmen, buildings, bicycles, parks, walls, children, shops, pubs, bus-conductors and so on. These impressions are not alloted an equal sized pigeon hole and stored ad infinitum or until such time as they may be called upon. Many are rejected at once, either because they don't fit in with what is there or because they don't contribute anything new. The rest make their mark and leave their impress. They modify the schema that is building up and then they are finished in their original pristine form, living on only in so far as the schema is different because they happened." (Lee 1973 p 95)

(viii) Geography and Perception Studies

Geographical attempts to fit perception studies into a geographic framework date from the 1950's. In 1952, Kirk, as an historical geographer, was interested in the way that societies in different places and times interpreted and responded to their environments. He suggested that people acted according to their 'environmental perceptions'; views of the world that might differ from reality but were heavily influenced by the particular culture of which an individual was a part. Kirk attempted to introduce conceptions derived from Gestalt Psychology in to geographical thinking, the central feature of which was the importance of perception as an intervening variable between stimulus and response. Gestalt Psychologists argued that perception proceeded as a result of innate capacities and arranged environmental stimuli into coherently organised forms or patterns which were referred to as 'Gestalten'. Behaviour was mediated by the perceptual process and was a result of the way a stimulus was perceived rather than the particular stimulus properties of any environment. A central element of Gestaltist doctrine was the belief that, 'the whole was greater than the sum of its parts', and the subdivision of 'Gestalten' in to component parts would be rejected because this would not produce an understanding of the operation of the perceptual process as a whole. In keeping with

Gestalt Psychology, Kirk (1963 p 366), distinguished between the objective or phenomenal environment and the behavioural environment. The former was the physical environment coupled with any changes made by man and the latter was a 'psycho-physical field' in which phenomenal facts are arranged into patterns or structures (Gestalten) and acquire values as a result of their particular cultural context. Kirk did not discuss how the behavioural environment evolved, but once formed he regarded it as the basis of rational human behaviour. One way in which the behavioural environment was represented by Kirk is seen in the following diagram,

Image redacted due to third party rights or other legal issues

[redacted]

Fig 6. "The behavioural environment of a decision maker"
(After Gold 1977 p 41)

The social and physical facts of the objective environment only become part of the behavioural environment when they have penetrated a highly sensitive filter of cultural values. Such values vary tremendously, so one would expect that the same information would have different meanings for people of different cultures or even for the same society at different times.

Kirk's behavioural environment corresponds to the 'psycho-milieu' proposed by H and M Sprout (1965) which consists of an individual's images and ideas which are derived from the interaction between what an individual selectively receives via his senses and his own values, memories and information which is subconsciously stored.

Downs (1970) expresses the same ideas as an inter-related system, between People, Their Environment and the images they produce, which in turn effects their behaviour. In order to break into this system, one must study images Downs suggests, which are the points of contact between individuals and their environments. Whilst Downs stresses the need for investigations into the relationship of peoples Images to their environments, Wood (1970) also emphasises the importance of the relationship between images and human behaviour.

Morley (1968) believes that images individual's hold of their environment should be studied within

"... the framework of the personal interpretation of space,"

which emphasises the uniqueness of individual experience and interpretation. Morley's concept of 'personal space' is clearly derived from Lewin's concept of 'life space' and underlines the suggestion that the level of knowledge available about an environment is related to level of experience within that environment.

Gold (1980) associates the development of geographers' interests in environmental knowing with 'behavioural' geography. The aim of which is to,

> "... replace the simplistic and mechanistic conceptions that previously characterised much man-environment theory with new versions that explicitly recognise the complexities of behaviour." (p 3)

For Gold, behavioural geography seeks to explain patterns of spatial behaviour in terms of the cognitive processes underlying such behaviour and he identifies four major characteristics. Firstly, that the 'environmental cognitions' upon which people act may well differ from the nature of the true world, that is we are selective in our perceptions. Secondly, that research must recognise that the individual shapes, as well as responds, to his physical and social environment. Thirdly that behavioural geography focuses upon the individual rather than the group and finally that it is a multi disciplinary study.

Gold further suggests that during the 1960's and 70's the relevance of geographical study was under discussion. (Berry 1972) Such discussion crystallized around three main issues, firstly that more should be done to study issues of contemporary social concern such as pollution, poverty and welfare. Secondly that geography should have a more direct influence and contribution to public planning and policy making. Thirdly that geographers should be conscious of the value laden nature of their enquiries. Each of these Gold (1980 p 34) believes acted as a stimulus for the development of behavioural geography.

> "It is a branch of inquiry that is intimately concerned with environmental and social issues, it is strongly policy oriented and recognises that geographers, as well as the human subjects of their research, are individuals with a distinct outlook on the world rather than detached value free observers."

Further, Gold (1977) examined the current state of 'behavioural geography' by surveying courses of geography in British Institutions of Higher Education. He found that behavioural geography appeared in two main forms, as a component of wider human geography courses and in a small but growing number of departments as a specialist subject in its own right. It was also clear that such teaching was research-led, where advanced research developments were actively being diffused into student courses. Despite the best endeavours of course organisers however, Gold (1980 p 40) comments,

> "... teaching programmes reflected the somewhat disparate state of the research literature, with confused terminology, conflicting aims and objectives and poorly integrated conceptual and empirical material."

(x) Environmental Cognition - Research

In a review of Environmental cognition research, Hart and Moore (1973) distinguished two main sub groups studying fundamentally the same problems. Developmental Psychologists, they argued, were undertaking investigations into environmental understanding as a means of further understanding the development of spatial concepts, whilst geographers, urban planners and others are concerned to develop knowledge of how large scale environments come to be known. Moore and Golledge (76) identify five main contributary disciplines, although as with Saarinen (1970) recognise a passing interest from others.

> "... such as the work on personal space by the anthropoligist Hall and the psychologist Sommer, the sociological studies of neighbourhoods in England by Lee and in France by Bardet, the work of pschologists,architects and others on the perception of space; the ideas of Barker and his colleagues on ecological psychology, Craik on Environmental Psychology and the pioneer perception study of city planner, Kevin Lynch." (Sarrinen 1970 p 66)

Of the contributory disciplines, Moore and Gollege identify Urban Planning, Anthropology, Sociology, Psychology and Geography, as the major participants in the on-going debate. Urban Planning is typified by the work of Lynch (1960) which was discussed earlier, that is an interest in the 'imageability' of an environment, how well different cities or parts of cities stand out and can be recognised and organised in to coherent patterns or systems in people's minds. Anthropologists on the other hand are more interested in cross-cultural comparisons of different cognitive systems, (Tyler 1969) which seeks through inverview, observation and where possible experimentation, to discover some part of the system of meanings by which different people organise their world. From Sociology, Strauss (1961) for example works from the premise that it is not possible to fully understand social behaviour in cities, or other processes of urbanisation, without at the same time learning something about what people think of the places where they live. He and other sociologists therefore are interested in the 'total holistic fabric' of the structure, function and meaning of urban and non-urban environments. Psychological interest, apart from conceptual understanding, is somewhat different. Rather than a concern for specific conceptions of the environment, or even of specified environments, Moore and Golledge (1976) suggest that psychology has been more interested in the construction of overall general explanatory theories, however as Kaplan (1973) has argued,

> "... the structure underlying the spatial map of the world ... is not different from the structure that underlies all cognitive processes."

Attempts have been made to relate current major theories of psychology to certain aspects of the available data, as for example Moore's (1972) discussion of Piaget's developmental theory, and Harrison and Sarre's (1971, 74) and Donnelly and Menzie's (1973) consideration of the role of personal construct theory in the measurement of environmental images. Other psychological studies have focussed on the development of children's knowledge of the spatial layout of their home areas, Blaut and Stea (1971, 74) and these will be discussed later. Moore and Golledge (1976 p 20) list a variety of other studies in which psychologists have shown interest, for example Bycroft's (1974) study of the relationship between cognitive mapping and spatial ability, the work of Pick and his students on children's knowledge of spatial layout (Pick et al 1973, Kosslyn et al 1973) and the recent work of Wapner and others on age and value differences in reaction to different large scale environments. (Wapner, Kaplan, and Cohen 1975)

The contribution of geographers to the study of environmental knowing have been classified in various ways. Moore and Golledge (1976) identify four main lines of research:

(1) Studies of contemporary conceptions of aspects of the spatial environment

(2) Studies of conceptions of the environment over historical time

(3) Studies of cognitions of the environment across different cultures and

(4) Studies of cognitions of the environment of various social groups.

Downs (1970) identifies three main elements within the research, the analysis of structure, or what is the nature of the perceived world; the analysis of evaluation, what are the major features of the perceived world that affect decisions; and the analysis of preference, how are objects and features of the environment evaluated with respect to each other. Goodey (1970) distinguishes between studies of Environmental Perception, which consider man's awareness of features in the immediate environment, Extra-Environmental Perception which concentrate upon man's awareness of features outside the immediate environment and studies of 'Preferential Perception, which consider man's preferences for movement toward particular places. A similar division of the research can be identified within Bordessa's (1969) analysis which distinguished between studies of Environmental Perception, Attitudes and Responses, Preference and Behaviour. It is clear therefore that research to date can be classified in terms of those which focus on the individual, where group perceptions are assumed to be the sum of individual images (Kates 1967) and those which focus on the social unit and assume that individual conceptions are not independent from each other, but are derived from the prevailing group conception. (Buttimer 1972) Moore and Golledge also identify a sharper distinction between two essentially different research methodologies. A quantitative approach, based upon interviews and questionnaire scales, (as for example in Kates 1967, and Shafer 1969) and a more qualitative analysis of literature and other introspective materials (Lowenthal 1961, Tuan 1977) Moore and Golledge (1976) argue that both methods have a place but recognise that,

> "... survey research methods, although 'objectively quantifiable,' may prevent the investigator from appreciating the richness and multiple interconnectedness of phenomena ... those who are concerned that content analyses, while rich, may be overfashioned by the eyes and biases of the investigator and may, therefore, be non reliable and non-repeatable." (p 19)

Viewed as a whole, most geographical studies have focussed on conceptions of different specific geographic environments and almost no attention has been given to systematisation of individual differences which might exist, or the reasons why and how such individual differences might be accounted for.

In their analysis of geographic perception studies, Wood (1970) Saarinen (1970) and Pocock and Hudson (1978), rather than differentiate in terms of underlying trends, concentrate on the particular focus of study. Saarinen (1970) for example, differentiates between studies at a world level, the level of 'the country', of larger conceptual regions and of the city and smaller areas. Wood (1970) and Pocock and Hudson (1978) discuss the studies in terms of specific topics. Wood (1970) identifies Landscape studies, Hazard studies, Recreation studies, Urban studies, Movement studies and Space Preference studies. To these Pocock and Hudson add the more specific elements of Industrial Location, Urban Territoriality, Neighbourhood and City Images both regionally and nationally, retailers images of their operating environments and Urban and regional historical geography studies. They cite examples for each of these types of study. (Wood 1970 pp 132 - 136, Pocock and Hudson 1978 pp 7 - 15)

In an attempt to analyse the range of studies undertaken to 1974, in terms of the contributing disciplines, Goodey (1974) produced the following list, within which he distinguishes those areas that are well developed, developing and neglected and as can be seen, geography makes a significant contribution to many of them. It is also noticeable that limited reference is made to individual differences which might exist in perception of the environment.

Theme	Disciplines/Professions
1. '*Fairly Well Developed*'	
- Perception of Environment/ Personal Space	- Anthropology: Architecture (especially medical and institutional): Medicine: Psychiatry: Psychology (including Social Psychology)
- Perception of Environment/ The City	- Architecture: Building Technologies: Civic Design: Geography: Landscape Architecture: Planning: Psychology: Sociology
- Perception of the Visual Environment	- Various branches of Medicine and Psychology
- Perception of Environment/ Aesthetics of Large Architectural Space	- Architecture: Civic Design: Geography: Landscape Architecture: Planning: Psychology: Sociology
- Perception of Environmental Hazards	- Chemistry: Engineering (various branches): Geography: Life Sciences: Physics: Public Health
2. '*Developing*'	
- Effects of Sensory Stimuli on Urban Populations	- Highway Engineering: Planning: Psychology: Public Health
- Perception of Landscape (Aesthetic/Historic)	- Aesthetics: Archaelogy: Architecture: Art Criticism: Geography: History: Landscape Architecture: Tourism and Recreation Planning
- Perception of Environment/ Roads and Pathways	- Architecture: Highway Engineering: Landscape Architecture: Planning: Psychology: Public Health: Safety
- Perception of Acoustic Surroundings	- Acoustic Engineering: Acoustic Architecture: Planning: Public Health

continued .....

Theme	Disciplines/Professions
3. '<u>Neglected</u>'	
- Perception of Environment/ Larger Conceptual Regions (Natural Beauty and Open Space)	- Agricultural Sciences: Geography: Life Sciences: Tourism and Recreation Planning
- Cross- Cultural Perception	- Anthropology: Geography: Psychology
- Indicators of Perceptual Quality and other Quantitative Measures	- Geography: Recreation Planning: Regional Planning: Resource Planning
- Perception of Environment/ Countries	- Geography: Journalism: Peace and Conflict Studies: Political Science: Psychology: Sociology: Social Psychology

Fig. 7 The Study of Environmental Perception
(After Goodey 1974 p 32)

(xi) The Problems of Measurement

As has been suggested earlier in this discussion, one of the major problems facing the researcher interested in determining the extent, organisation and characteristic features of an individual's knowledge of the environment, is that of 'Measurement'. In studying Environmental Knowing, one is concerned with attitudes, opinions and impressions, all of which are aspects of the individual and therefore extremely difficult to measure. They cannot be observed, and have to be approached through a variety of measurement techniques, all of which are open to misunderstanding on the part of the respondent and misinterpretation by the researcher. The confusion that exists in the problem of measurement is not helped by the inter-disciplinery nature of this field, each contribution tending to have its own methodological and philosophical perspectives. As Pocock and Hudson (1978) comment,

> "A coròllary of this theoretical diversity is the wide range of methodologies used to measure environmental images, methodologies that are often at variance or even contradictory in the assumptions on which they are based and the evidence which they produce." (p 36)

Although each individual necessarily has his own unique cognitive understanding of environmental information, Golledge (1976) argues that there is abundant evidence to indicate that many people are aware of the existence of the same things,

"Awareness can be generated by any of our senses and differences of opinion as to what is in the environment may occur when different senses are used in the information extraction process, when physiological qualities of the senses differ among observers, when different transactional modes are used to elicit information and when socio-cultural values of individual observers differ. It is quite critical therefore, to become aware of the range of methods that utilise different skills to extract information from the environment." (p 300)

Before considering the various techniques employed in research of this kind, it would seem pertinent to make some reference to the purpose of measurement, in order to relate the methods to be discussed to some kind of measurement rationale.

Kaplan (1964 p 177) argues that,

"Measurement in the most general terms can be regarded as the assignment of numbers to objects (or events or situations) in accordance with some rule."

It is important to recognise however, that measurement is not an end in itself, but a means to an end. Measurements are made such that hypotheses can be tested more objectively. Downs (1970) suggests that there are three important factors to be considered in any discussion of the purpose of measurement. Firstly, that measurement procedures are defined for a specified task. The observer or researcher develops a technique to provide data for testing a particular hypothesis or series of hypotheses. Secondly, the whole procedure of measurement and the subsequent analysis of the resultant data, are inter-related. It is important to consider the nature of measurement techniques in association with techniques of analysis. Thirdly, as Kaplan (1964 p 176) suggests,

"Whether we can measure something depends .. on how we have conceptualised it, on our knowledge of it and above all on the skill and ingeniuty which we bring to bear on the process of measurement which our enquiry can put to use."

The role of measurement can be expressed as the translation of ideas in to concrete information or data which can be used for later testing and analysis of hypotheses. Downs (1970) suggests that measurement can be seen therefore as the link between the imagined or conceptual world and the real world (p 93). In relation to the measurement of Environmental Images and understanding, Downs discusses some of the problems facing the researcher. The major difficulty is the distinction between an 'individual' and 'group' image of an environment. Can they be isolated and do they actually exist? The question of the nature of such images is crucial and will require extremely sensitive measuring devices which have to beware of imposing upon people ways of thought and conceptualisation which are not their own. Lynch (1976) remains convinced that this is possible and argues for the use of a variety of techniques to fully capture an individual's beliefs, feeling and ideas, and that,

> "... the graphic language is just as central as the verbal one. Not just maps incidentally ... but all kinds of graphic expressions: eye level sketches, photographs, video tapes, diagrams, models." (p vi)

Downs (1970) suggests that the most appropriate measurement technique for coping with the complexities of this field of study are to be derived from psychology. In particular he recommends the use of multi dimensional scaling techniques which Guilford (1954 p 146) suggests should be used with complicated stimuli, whose physical dimensions are not well known and where there are no recognised physical dimensions for judging psychological qualities. Downs argues that this set of criteria relate exactly to the study of environmental knowing, Images both individual and group are complex and multifaceted, relationships to the physical real world uncertain and with no clear means of physical expression. Downs (1970 p 100 - 101) attempts to apply the technique using two examples which demonstrate the very complexity of applying methods derived from other fields of the social sciences.

Pocock and Hudson (1978) following Harrison and Saare (1971) consider the measurement process in terms of three central features, those of Specification, Scaling and Generalisation, and Inference. Specification refers to the conceptualisation of what is to measured in a measurable form. Thus, as an example, there has been a strong tendency in the literature to link the development of an 'environmental image' to the development of spatial concepts. (Hart and Moore 1973, Kaplan 1976) Scaling is a process of assigning numbers to objects to represent attributes of those objects and is a common technique used by researchers. While a comparatively straightforward process in the case of physical objects, it is more complicated when one is dealing with 'unobservable' images people purport to possess, or which researchers suggest they possess. Finally the type of inferences one might be able to derive and the degree of generalisability of the results is directly dependent upon the quality of the data obtained, that is the basis upon which data is collected and the technique employed for the collection of data. Pocock and Hudson conclude their discussion however by stating,

> "Perhaps the most important point to establish is that despite the numerous problems encountered, environmental images can be measured, if not always as precisely as might be wished. (1978 p 46)

(xii) Measurement Techniques

Craik (1968) recognises four main issues in investigations in this area. How to present the situation to an individual, which behavioural reaction to elicit and record, which are the relevant attributes of the situation and whose comprehension to study. Thus an individual's actual ability to comprehend a given method becomes crucial. Evidence exists that biases between people in terms of socio-economic group or level of education are possible.

Reiser (1972) attempted to analyse the methods of measurement techniques which had been adopted in terms of the type of stimulus presentation.

Fig. 8 A TYPOLOGY OF METHODS OF STIMULUS PRESENTATION

Form in which presented to respondent

Type of stimulus presentation	Structured* or Constrained	Less Structured* or Open
'Reality' (A)	Take respodent through actual route or area. Record required reactions at go and at return. Or measure sensory reaction, ie eye movement camera.	Unguided and undirected trip or exposure in actual area. Controlled for groups, ie experience/knowledge of area.
Iconic (B)	Series of photographs: describe what is in between recognised ones, or fit in order. Motion film of area: stop projection, ask what comes next.	Show a large selection of photos of area; respondent picks out those recognised
Iconic (C) Discontinuous ≁	Recognition of a series of photos taken at regular intervals; may also state if in/out of area.	As above. Spatial continuity will emerge, especially with probing.
Graphic (D) continuous ≁	Present with street map, draw a line around specified area, ie central city or home area.	Sketch area on blank sheet of paper. Little control of respondent's interpretation of requirements.
Graphic (E) discontinuous ≁	Identify individual streets and elements directed on map.	As above. Extent of continuity will emerge from the sketch.
Verbal (F)	Object or place named or described. Respondent explains how to get there if recognised. Repeat until composite image.	Describe requested area ie name or describe streets, places etc and their locations
Verbal discontinuous ≁	Names or descriptions of places on individual cards. Pick out those of specified area recognised.	As above. Will depend on description and extent of probing.

* Structured/less structured refers to how specific the stimuli are and so how constrained are the responses.

≁ Continuous/discontinuous applies to the spatial form inherent in the different kinds of stimuli presentation. This will depend on secondary controls and the amount of inference made from responses.

(After Reisser 1972)

As can be seen in the diagram, Reiser distinguishes between 'Real' experiences, 'Iconic' images, 'Graphic' images and 'Verbal experiences', which were either structured or open and then discusses each of them in terms of what might be experienced by the subject. Again it becomes very clear that different types of stimulus situation require different skills and clearly the way in which the respondent interprets the stimulus is crucial.

Ittelson, Proshansky, Rivlin and Winkel (1974) remind researchers that all research is simply the gathering of information. It is the objectives of the study that determines the most suitable procedure. In their discussion of the techniques used in Environmental Psychology, they identify five categories of research technique. 'Experimental research' is usually conducted in a laboratory setting with some formal control over the setting and the variables to be investigated. 'Holistic' research on the other hand concentrates on the relationships which exist amongst a range of variables rather than the study of selected features. Broadly speaking research of this type is qualitative seeking underlying themes of a situation rather than the relationships existing between isolated variables. As Weiss (1968) suggests,

> "Holistic research takes as its problem the nature of the total system rather than a particular process within the situation." (p 343)

'Survey Research' employs questionnaires, interviews, tests and simulations. This procedure is widely used in finding out how people think and feel about certain specific issues, and in general explore attitudes rather than behaviour. The 'field study' uses existing data, such as demographic information and the investigator has no control over the raw material.

> "Field studies correlate the social, physical, and psychological data in an effort to find relevant associations that may indicate a causal relationship among specific variables ... "
> (Ittelson, Proshansky et al 1974 p 210)

Finally, 'exploratory research' like the holistic model, can be used to study complex environments. The material collected however, is more likely to be quantified and correlated in to possible sets of significant relationships. In effect exploratory research is frequently a preliminary to a more precisely formulated and narrowly focused design in which an attempt is made to investigate certain causal relationships.

Additional techniques which Proshansky (et al) regard as especially pertinent to environmental research include 'simulation', in which one attempts to create 'mock environments' in order to predict behaviour in a comparable real environment. Similarly, 'Gaming', uses simulated situations or processes in an effort to elicit behavioural traits which the individual may not always be aware of. Games create 'dramatic representations of the real problem being studied.' (Abt 1970 p 13)

A more recent analysis of the methods employed in the investigation of Environmental Knowing by Golledge (1976) has attempted to analyse each technique in terms of the skills required by the respondent. Not only does it provide a detailed breakdown of experimental procedures and required skills, but also describes the form of representation that the subject is expected to produce as well as examples of research employing that particular technique. Golledge suggests that most of the research undertaken to date can be classified in three main ways. Firstly, there is a reliance on inference based on naturalistic as opposed to experimenter controlled behaviour. Secondly, there is a distinction between those inferences made from directly observed behaviour as opposed to that taken from the past. Finally, he makes a distinction between those responses elicited directly from individuals using participatory or self report procedures, as opposed to second hand inferences from a variety of indirect judgemental tasks.

Fig. 9 METHODS OF EXTRACTING ENVIRONMENTAL COGNITION INFORMATION

Method	Procedure	Subject Skill	External Representational Form	Example
Experimenter observation in naturalistic or controlled situations	Experimenter observes or tracks movements through actual environments (e.g., crawl patterns, search behavior, overt spatial activity, actual way-finding, etc.)	Cognitive Concrete Psycho-motoric	Observations Reports Maps Tables	Lynch (1960) Marble (1967) Ladd (1970) Jones (1972) Devlin (1973) Zannaras (1973) R. Kaplan, Chap. 3
	Experimenter infers degrees of cognitive knowledge from behavior in unstructured "clinical" situations	Cognitive Concrete Motoric	Charts Profiles	Werner (1948) Piaget and Inhelder (1956) Hart (1974)
	Subjects reveal environmental knowledge in the process of sorting or grouping elements of actual or simulated environments	Cognitive Abstract Relational	Lists Tables Composite maps	Downs (1970a) Wish (1972) Zannaras (1973) Golledge et al. (1975)
	Subjects adopt roles or perform acts in simulated and/or real environments	Cognitive Abstract Relational	Photographs Tables	Ittelson (1951) Milgram (1970) Saegert (1973) Acredolo, Chap. 13
	Subjects arrange toys or objects representing environmental elements or model environments, and experimenter observes the sequence of acts in positioning elements and/or using the environment	Cognitive Concrete Motoric	Analog models	Piaget et al. (1960) Blaut and Stea (1969) Laurendeau and Pinard (1970) Mark (1972) Hart (1974)
	Experimenter deduces cognitive information from nonhuman activities (e.g., animal acts, machine simulation)	Cognitive Psycho-motor	Observational schedules Tables	Tolman (1948) Peters (1973)
Historical reconstructions	Experimenter deduces environmental knowledge from written descriptions (novels, poems, etc.) and/or past pictorial representations of environments, usually from horizontal or oblique perspectives	Affective Psycho-motor Linguistic	Novels Poems Paintings Philosophies Sketches Diaries Content analysis	Lowenthal and Prince (1964) Heathcote (1965) Gleason (1972) Bowden (1975) Tuan, Chap. 23 Shin, Chap. 24 Lloyd, Chap. 25
Analysis of external representations—participatory activities	Subjects are asked to write descriptions of what they are aware of in environments	Affective Psycho-motor Linguistic	Written reports Contact analysis Item analysis	Lynch and Rivkin (1959) Carr and Schissler (1969) Appleyard (1969a) Winkel et al. (1969)
	Subjects are asked to describe orally a given environment	Affective Linguistic	Oral reports Type Transcriptions Interview Protocols	Lynch (1960) Carr and Schissler (1969) Gittins (1969) Craik (1970a) Moore (1973a) Zannaras (1973)
	Subjects draw sketches or sketch maps representing environments	Affective Graphic Relational	Pictorial sketches Sketch maps Quantitative and structural analyses	Lynch (1960) Shemyakin (1962) Stea (1969a) Appleyard (1970b) Ladd (1970) Moore (1973b) Wood (1973a)

Fig. 9 (continued)

Method	Procedure	Subject Skill	External Representational Form	Example
	Subjects arrange toys or make models representing environments	Affective Cognitive Concrete Motoric Relational	Models Arrangements of toys	Piaget et al. (1960) Blaut and Stea (1969) Mark and Silverman (1971) Stea (1973) Hart (1974) Stea, Chap. 9
	Subjects show existence, location, proximity, or other spatial relations of environmental elements; use of symbols to represent such elements	Cognitive Graphic Abstract Relational	Base maps with overlays Notation systems	Lynch (1960) Thiel (1961) Appleyard (1969a) Wood and Beck, Chap. 32
	Subjects asked to identify photographs, models, etc.	Affective Motoric Abstract Relational	Verbal Protocols	Piaget and Inhelder (1956) Laurendeau and Pinard (1970) Stea and Blaut (1973b) Zannaras (1973)
Indirect judgmental tasks	Selection of constructs which reveal environmental information, adjective checklists, semantic differentials, repetory grid test, etc.	Cognitive Abstract Relational	Word lists Tables Graphs Grids	Kelly (1950) Downs (1973) Honikman, Chap. 7 Harrison and Sarre, Chap. 34 Golant and Burton Chap. 33
	Paired proximity judgments and other scaling devices that allow specification of latent structure in environmental information	Cognitive Abstract Relational	Maps Tables	Briggs (1973a) Lowrey (1973) Golledge et al. (1975) Cadwallader (1973) Golant and Burton, Chap. 33
	Projective tests (e g , T A.T.)	Affective Abstract Relational	Verbal stories	Burton et al. (1969) Saarinen (1973b)

After Golledge (1976) (pps 303 - 305)

In his discussion of the various techniques, Golledge offers examples representing the range of studies within each of his subdivisions of the available research. Research based on observation in Naturalistic and Controlled situations ranges from tracking people through known and unknown environments and observing their responses to different features of the environment, to making inferences from behaviour in various 'clinical' situations. 'Way finding' is typical of this kind of study, Zannaras (1976) for example, took individuals to a particular place in an urban environment and asked them to make their own way to a specific destination. She then considered the factors which influenced subject's decisions about appropriate routes.

Golledge identifies four different strategies that have been employed for observing behaviour in controlled or partly controlled experimental situations. Firstly, what he calls 'subject controlled classification procedures' which requires subjects to sort environmental occurences or experiences into classes. These can be specified by the experimenter, or left to the discretion of the respondent. In the latter situation though, it is much more difficult to establish how the sorting procedure is decided upon. Wish (1972) has adopted this approach in his investigation of peoples cognitive configurations of world nations and Rivizzigno and Golledge (1973) have also used this method to discover which parts of a city are thought to be near to each other. The second strategy identified by Golledge for behavioural observation is when subjects are placed in role playing situations. This technique is a standard tool of clinical psychology, and little used outside psychology itself. A great deal of the work on perceptual illusion has used this technique, as have investigations into the interaction of people to different environments. (Proshansky, Ittelson and Rivlin 1970)

Another category of observational techniques involves the use of constructive toy play and model building activities. Mark (1972) for example used an artificial environment to examine childrens toy play patterns and then attempted to reconstruct environmental information by observing both the locational patterns or positional arrangements of toys and the action patterns of the children with respect to these arrangements. (Similar studies have been undertaken by Siegel and

Schadler 1977, Hagen, Lockman and Pick 1978, Stea and Taphanel 1975, Kaplan 1976, Acredolo 1976 and Hart 1979).

The fourth observational method identified by Golledge involves making inferences about environmental knowledge and understanding after observing varying forms of animal behaviour. Again this approach has largely been confined to psychology and is demonstrated in Tolman's (1948) study, which has already been discussed.

The second major category of research described in Golledge's table concentrates on those studies which are based upon reports written by individuals about different environments. These can be whilst actually undergoing an experience, or based upon memory. In such studies, there appears to be a mixture of direct experience and recall and as such are open to criticism in terms of objectivity and accuracy. Shin (1976) for example, comments on the day to day written experiences of travellers in the South Western United States of America and analyses impressions of the physical environment. Lloyd (1976) has used novels as his source for the investigation of urban experience at the turn of the century. Tuan (1976, 78) is much more general in his approach and draws on various written sources, fictional, factual and philosophic. In each case however, he focusses on the cognitive structure of the knowledge that the writers have about the external environments with which they are concerned. Much of the research in this vein falls under the umbrella of Environmental Perception and in geography can be attributed to the stimulus of Lowenthal. In his 1961 paper on 'geographical experience and imagination' it is possible to identify the bases for many studies of this type. In 1964 Lowenthal and Prince attempted to reconstruct what people observed in the landscape in the present and past. A fundamental aim of which was to show how perception of and attitudes towards different environments influenced the course of history. In this context, Golledge also comments on the potential usefulness of paintings and other art forms as a source of environmental knowledge. This area he suggests is virtually untapped by social and behavioural scientists and it may well become as fertile a source as literature.

The third major category of research involves the analysis of external representations. Investigators ask subjects to produce information about an environment by such means as self report methods, verbal and written, free-flowing conversations and map and model-making techniques. In the early stages of environmental cognition research one of the most widely used techniques was a sketch map upon which respondents recorded information which he or she thought significant. These maps could be drawn from memory, or whilst in the actual environment to be mapped. This particular technique will be discussed in more detail in a later section but in most early research no control was attempted for cartographic knowledge or skills and one example of a map was often taken as representative of an individual's knowledge. Similarly it is often inferred that either what is not said is not known, or that what is not pointed out is of relative insignificance for the individual. As a result, Golledge 1976 comments,

> "The resulting analyses were frequently invalidated by investigators trying to compile information from such sketches at a data level that was highly inappopriate in terms of each individual's graphic representational abilities." (p 308)

The implication of Golledge's comments are that an individual with limited graphic representational capabilities will find difficulting in demonstrating the extent of his or her knowledge and the inferences that can be drawn from the results must be questionable. Appleyard (1970) argues that this problem is not so important at an adult level, because as adults we are more able to structure our thoughts and produce external representations which more truly reflect levels of knowledge and understanding. The extent to which this is true is obviously open to debate. (Kuhn 1970)

More recently, Bycroft (1974) has suggested that measurement of environmental images by this technique is methodologically unreliable and he suggests a range of means by which a greater degree of reliability can be achieved.

A more innovative use of sketch maps has been developed by Moore (1973) who attempted to distinguish between levels of representation, which he then associated with developmental theories of cognition. In this case, no attempt was made to consider what was mapped, instead the information was used to

> "draw conclusions about the comparative internal structuralisation and representational abilities of the subjects, rather than to provide information on how much information subjects had about a place." (Golledge 1976 p 308)

Another alternative approach comes from the work of Ley (1972) who asked youths to define the places within their home area that they would not venture in to and then asked them to show where they were on a map. He found that many of the places so described had never been visited, which reveals important gaps in an individual's spatial knowledge and also some explanation of individual bias in spatial preferences.

The final category of study represented in Golledge's diagram are described as 'indirect judgemental tasks'. In using such techniques, subjects may be asked to select adjectives that best describe their feelings about places and the experimenter then deduces an individual's or group's knowledge about a place from their responses. Typical of these techniques are the Semantic Differential technique first developed by Osgood, Suci and Tannenbaum (1957) and demonstrated in the study by Golant and Burton (1976). Osgood (et al) describe this method as follows,

> "We provide the subject with a concept to be differentiated and a set of bipolar adjectival scales against which to do it, his only task being to indicate for each term the direction of his association and its intensity on a seven point scale. The crux of the method, of course, lies in selecting the sample of bi-polar terms. Ideally, the sample should be as representative as possible of all the ways in which meaningful judgements can vary and yet be small enough in size to be efficient."
> (Osgood et al 1957 p 20)

This is an example of a 'multi dimensional' scaling technique which was referred to earlier. Such an approach attempts to impose a structure on the information obtained by examining paired comparison judgements made by individuals about places in an environment. (Golledge et al 1975). In this method, individuals are asked to scale the degree of separation of all possible places in an environment. The responses are then put in to a variety of multi-dimensional scaling algorithms and the configurations of these places then obtained in diagrammatic form. For example, Golant and Burton (1976) attempted to assess how much knowledge individuals have about environmental hazards such as storms and floods. What was revealed was the individual variation that exists in the interpretation of such concepts. Many subjects had different views of what constituted a 'flood' or 'serious damage' and emphasises the multi-dimensional nature of such terms. Factors such as frequency of exposure to the hazard proved to be critical to an individual's assessment. Rooney (1967) for example demonstrates this. In the North West United States snowfalls of 4 - 6 inches are generally accepted as typical winter occurences by individuals and local government. Residents in Eastern cities however, regard similar levels of snow as extremely hazardous and city governments spend a considerable part of their budgets to overcome what they regard as a hazardous situation. Similar responses can be identified in British reactions to recent severe weather conditions. It is also the case that increasing use is being made of Personal Construct Theory as a means of eliciting environmental images (Bannister and Mair 1968, Harrison and Sarre 1971, Donnelly and Menzies 1973, Harpham 1979). Personal construct theory is derived from the work of the psychologist Kelly (1955) who believed that individuals created conceptual models of the world which they used in deciding on future action. Kelly operationalised his model of the mind via the Repertory Grid methodology, which many researchers have used in their investigations into this area.

Constructs which supposedly represent an individual's perception of his environment are elicited from subjects by asking them to name places to fit an interviewer's definition, as for example in Sarre's (1973) study of Bath when he asked for 15 to 20 places important to them in their everyday life. In another study, Sarre (1974), reported in Harrison & Sarre (1976), subjects were asked to supply specific places to fit experi menter definitions like: your local pub, your children's school, the best building in town, the worst eyesore in the city. The 'constructs' are then arrived at by asking subjects to discriminate amongst the elements by 'triad' sorting, where they are asked to consider three elements at a time and to state an important way in which two were similar and the other different. This produces a difference in adjectival terms and after some reworking one arrives at adjectival pairs (which are opposites) and taken as verbal representations of personal constructs. For example, in the Bath study, one respondent compared 3 areas, one as Georgian and two as modern. Sarre elected to change Georgian to old and modern to new to produce the construct dimension 'old - new'.

(xiii) Cognitive Maps and Cognitive Mapping

On a number of occasions in the discussion so far, reference has been made to one particular technique which has been extensively employed in the research, but about which many questions have been raised. The use of sketch maps in one form or another is a major way in which research undertaken to date has attempted to articulate individual's representations of their environments. The concept of a 'cognitive map' the product and 'cognitive mapping' the process has been a direct result of the application of this technique, and can be traced back to Tolman (1948) who as explained earlier, in his experiments with rats suggested that they constructed 'mental images' of the maze routes they were forced to follow in the experimental situation. Tolman in fact likened the rat's brain to the central office of a map-making agency.

> "The stimuli, which are allowed in, are not connected by just simple one-to-one switches to the out-going responses. Rather, the incoming impulses are usually worked over and elaborated in the central control room into a tentative, cognitive-like map of the environment. And it is this tentative map, indicating routes and paths and environmental relationships, which finally determines what response, if any, the animal will finally release." (Tolman 1973 p 31)

As defined by Downs and Stea (1973 p 9), cognitive mapping refers to the process by which people acquire code, store, recall and decode information about the relative locations and attributes of phenomena in the everyday spatial environment and Sarre (1973) for example describes a cognitive map as,

> "... a model of the environment which is built up over time in the individual's brain." (p 16)

As a research technique, the collection of some element of an individual's cognitive map has tended to require individuals to draw recall maps often of their immediate environment. Within the literature it is possible to identify two major sources of criticism of this approach. Firstly, many assumed that Tolman's map analogy meant that people actually carry cartographic representations of their environments in their heads. Psychology in general has been rather confusing on this point. The inner representation of external reality ranges from an image in the real sense of a 'visual duplicate' to an abstract transformation of the event or scene. Gibson (1970) suggests that this might be seen as a continuum, which represents a series of related multi channelled storage-recall systems which are available to the individual depending upon the demands of the situation. Kaplan (1976) is adopting this interpretation, when he envisages the brain as a series of layers. The first layer receives information about features in the environment from the sensory analysers and constructs a model closely tied to this sensory experience. The second layer receives input from the previous layer and would come to contain a model of the model of the environment and in this way we develop representations of classes of objects and regions. Layers then become progressively more abstract, less tied to sensory experience, with an organisational structure weaker than the previous one. Higher layer representations will tend to develop later argues Kaplan, since their input is largely from lower layer representations than from feature analysers. The proposed mechanism, which derives from studies of information processing, Kaplan suggests achieves considerable economy of storage. Neisser (1968) regards seeing and visual imagery as employing the same mechanisms which are integrally linked to short and long term memory. Initially a scene is retained in image form as part of short term memory but then decoded and abstractly transformed into neural connections to become part of the long term memory. To some extent therefore it is possible to conceive of individuals as carrying pictures in the mind, as Gregory (1966) suggests, "We do have 'mental pictures', but this should not suggest that there are corresponding electrical pictures in the brain. It is possible to represent things in symbols (Gibson's abstract transformation, Bruner's iconic representations) but symbols will generally be very different from the things represented. The notion of brain pictures is conceptually dangerous. "

The extent to which the visual system is able to hold pictures is to some extent plausible therefore, but the extension of this facility to retain complex systems of cartographic connections in space is more difficult to accept. Graham (1976) questions where such maps are likely to be stored and suggests that it is ridiculous to suppose that it is possible to find such patterns imprinted on the brain. Maps are not the kind of things, she says, that one finds during a surgical operation. As a result Graham, like Gregory, considers the concept of a mental map as conceptually limited. Research undertaken so far has not produced an acceptable theoretical basis and this she suggests is a direct result of the basic incoherence of the central concept. It does seem however, that Graham's criticisms are aimed at a more metaphorical interpretation of 'mental maps' as was suggested earlier, (p64) rather than a consideration of the concept as a useful descriptive tool in the investigation of individual's environmental perceptions, and the sketch map technique as one method by which it is possible to collect some information about individual's environmental knowledge.

A second major criticism of the recall map technique, is the assumption that an individual's understanding, knowledge or feelings about an environment can be realistically portrayed in representative detail within a sketch map. Ability to draw or respond to cartographic maps depends to a great deal on education and thus a response to cognitive mapping exercises may be an imperfect representation of spatial cognition.

Gold comments (1980) (p 112 and 224) that if researchers are not careful such exercises become a test of map comprehension rather than a true measure of aspects of individual's environmental knowledge, "In the case of freehand sketch maps, the finished product may tell more about cartographic skills than externalise the cognitive representations of space that are in the respondents mind." (p 244)

Catling (1979 p 7) sums up the various limitations that have been described for children's cognitive maps

1. The child may not be able to display his understanding in a conventional fashion. (Siegel, Kirasic and Kail 1978)
2. He may be constrained by the act of trying to represent a large scale space on a smaller sheet of paper. (Herman and Siegel 1978)
3. He may lack the manipulative ability to draw well. (Webley 1976)
4. Detail may be excluded which would have been noted in an alternative method of eliciting recall information. (Spencer and Lloyd 1974, Spencer 1973)
5. The way the child constructs the drawing may influence its final form. (Biel and Torrell 1977)
6. He may have limited experience of the particular environment and therefore find it difficult to depict the spatial layout accurately. (Siegel and Schadler 1977)

Murray and Spencer (1979) reiterate many of the comments critical of the use of sketch maps as a research technique and attempted to test the hypothesis that differences in cognitive maps result from two factors. Firstly, that drawing skill is an important variable and secondly, geographical mobility is of importance. They suggest that individuals who have experience of a considerable number of places develop an approach to both novel and familiar areas which allows for a rapid, structured and efficient 'imaging' of such places and as a result they are able to produce better cognitive maps than those people who live predominantly in one location. It was also argued that the map task is likely to influence the resulting product and since most research has employed only one mapping task, Murray and Spencer elected to use a range of tasks, in an attempt to tap individual's abilities rather than 'sub-sets of information that subjects possessed.' Respondents were therefore asked to produce five maps of vastly differing environmental scales, as well as a drawing of their own homes with which to compare the maps for drawing ability. The five maps requested were of the immediate locality, the town, a route map, a regional map, and a world map. The sample studied were representative of highly mobile, of medium mobility and low mobility individuals. The results confirmed that geographical mobility was a significant influence on the maps produced when analysed in terms of Organisation, Features displayed and Complexity of inter-relationships displayed. As expected, basic drawing ability was also found to be significantly related to mapping ability, but whilst drawing ability is related to performance on the mapping tasks it only accounted for between 10 and 25% of the variance between individuals which suggests that the importance of this relationship should not be overstated. They concluded,

> "The use of mental mapping techniques to examine the individual's environmental cognition has already received much criticism ... and the present paper, in showing that basic drawing ability is an important intervening variable in mapping, could be taken simply as another such criticism. We believe, however, that for most subjects in our study, even if the tasks proved difficult, they also involved and did indicate something of the considerable differences that exist between high - , medium - , and low - mobility individuals in their construing of the local and (more particularly) more distant environments. Mental mapping techniques may be flawed, but they do reflect differences in the skill of cognising the environment which could only otherwise be brought out by laborious interview or questionnaire technique." (p 391)

Like Murray and Spencer, Wood and Beck (1976) questioned whether sketch maps are capable of generating data reflective of anything but the ability of the mapper to cope with a set task and comment that in the light of criticisms described, it is surprising that the technique has survived. They accept, however, that a sketch map can be used to convey a considerable amount of information and could reveal much of a respondent's knowledge if he was able to communicate with confidence through this medium. Wood and Beck believe that the reason why communication through sketch maps is not as successful as it might be is because of a lack of clarity over the symbolisation to be used. As a result they have developed a mapping language described as 'Environmental A' which they employed in studies of American teenager's perceptions of cities visited for the first time. (Wood and Beck 1976 b). The 'language' consists of a vocabulary of signs, marks and name labels for points, lines and areas within a city, as well as a set of rules for manipulating these symbols. They comment,

> "... there is no way for the group or most subjects in most cognitive mapping exercises to communicate what they know; not only of the connective structures of which they must at some level been aware in order to navigate the city in question, but of anything more elemental or symbolic at all. Before a sketch mapper may be expected to communicate something to a researcher he or she must be taught a language that both understand. Any work investigating reported cognition of large scale environments employing sketch maps as primary data must bear this in mind." (Wood and Beck 1976)

Lynch (1976) however, commenting on this technique argues for instructionless mapping, since it produces maps of lesser comparability but without any imposition from the researcher. The researcher's language obviously changes the way a mapper might see the environment. Prince (1976) makes similar comments,

> "Your approach to the techniques of mapping are, it seems to me, heavily authoritarian. It is simply not true to assert that maps are unintelligible unless they obey a set of grammatical rules (like a language) or theorems (as in maths). Pictograms of very idiosyncratic construction may be read by all sorts of people without too much formal teaching. How much of what is represented in the maps is Wood and Beck directed and how much is spontaneously kid-directed? Would the kids in Lord of the Flies have set about mapping their island in the way you recommend? Can you say what the kids discovered for themselves from the experience?." (In Moore and Golledge 1976 p 352)

Lynch (1976) suggests that a map however naively drawn indicates many things. It can be looked at he says for the sequence in which it is made, its connections and its gaps, its style, the particular things graphically emphasised and those left out, the evidence of indifference or emotion, the variance in detail, the confidence or timidity with which different parts are drawn, the total structure and even to some extent the scale distortions (although the purposeful communication of distance and direction in a map is a special skill, which usually requires special teaching). A disconnected or distorted map does not necessarily indicate an unco-ordinated image, instead Lynch (1976) believes that the very unfamiliarity of the task, like the unexpected question, releases impressions that might otherwise have been surpressed. It is also the case that it is often ignored that verbal communication is also difficult for some people. Sketch maps offer an alternative and are usually only one means by which information is obtained.

Criticisms such as those described can be made of all methods of recall map reconstruction, whether drawn, verbalised, modelled or enacted in the original environment. As Catling (1979) suggests, such comments are valid if care is not taken to assess any recall sketch map in the light of such criticism and more recent research has attempted to do just that. (Nagy and Baird 1978, Biel and Torrell 1977, Bycroft 1974).

Bycroft's (1974) major criticism of the use of sketch maps, is the lack of objectivity in the analysis of the finished articles. To overcome this problem Bycroft incorporated five major ways of assessing the maps, which were undertaken by a panel of judges. The first technique was a 'wholistic' sorting to differentiate generally amongst the maps. The judges were provided with standardised criteria by which to undertake this analysis. A second technique was based on a Goodenough - Harris (1963) type checklist of children's drawings and for the area studied three detailed accuracy checklists were constructed. The remaining three forms of analysis had their origins in the cognitive mapping literature. The first, after Applyyard (1970), involved the sorting of drawings based on their content, and the second, again after Appleyard was based on the structure of the drawings. The final technique was based on Ladd's (1970) representational criteria, of 'pictorical', 'symbolic' or 'abstract' (map like) categories. Again for each of these the judges were provided with standardised criteria by which to categorise the maps. The ratings given by the four judges on each sorting task were intercorrelated, both to provide credence to the objectivity of the sorting procedures and also as a means of establishing a single score on each measure for each sketch map based on the pattern of sorting of the four judges used. Factor analyses of Bycroft's study, which attempted to relate cognitive mapping ability to spatial and general ability, revealed three major factors. Firstly, that general ability was of considerable importance for the types of map produced and secondly factors of environmental familiarity were of importance. (eg Residential location and length of exposure) which could be taken to contradict the results of Murray and Spencer 1979. The final point, and probably of most significance for 'cognitive mapping' was the discovery of an Urban Spatial Ability factor, which Bycroft suggests gives impetus to the contention that previous cognitive mapping measures have confused process with product,

> "They have tended to treat elicited sketch maps as typologies reflecting inner representations rather than protocols resulting from inner processes." (Bycroft 1974 p 75)

Downs (1976) makes a similar distinction and argues that it is essential to recognise a separation between cognitive mapping as a process and the cognitive map as the product. He also warns geographers of the tendency of their background in cartography to allow the metaphoric nature of cognitive maps to dominate thinking about the form and function of the cognitive map. Downs believes that by emphasising the process, and concentrating on the way aspects of the spatial environment are learned and come to be understood, will reduce the need to conceive of cognitive maps as actual maps in the mind. Cognitive maps are generated to serve a purpose and do not necessarily exist in a given structured form. What does exist are sets of information and sets of rules for generating maps and it is to this that Downs suggests we should turn our attention.

> "... we should treat much of the conventional wisdom of cognitive mapping with a healthy degree of scepticism, since it lacks supporting data of other than a personal, introspective nature. It is especially true that we lack solid evidence as to the unfolding of the cognitive mapping process in a temporal context." (Downs 1976 p 69)

Catling (1978) however, argues that asking children to draw 'cognitive maps' can serve three important purposes. Firstly, as a diagnostic instrument, which provides insights into the child's perceptions, representations and levels of learning. Secondly, as an instructional activity which can be utilised by the teacher to develop children's cartographic abilities and their spatial and environmental perception. Finally as an Informative guide as to the focal points of the local environment. What are the features and places of importance for the child? Catling also points out that the type of question asked will influence the type of map which is produced. For example 'Draw a map of the way you come to school' as opposed to 'draw a map of the way you come to school and the areas you pass through, putting on and naming all those features you can remember or you think are important'

Blaut and Stea (1971) suggest that children are able to engage in many of the fundamental processes of map making and map reading such as rotation from horizontal to vertical views, reduction in scale and abstraction to semi-iconic signs long before they are exposed to traditional maps. Further, Hart (1979) demonstrated that children can use maps to solve simple navigational problems. With very young children, their limited graphic and linguistic skills, it is accepted by Blaut and Stea, does raise considerable difficulties for the research, but Bruner's comments seem particularly apposite here,

> "We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development." (Bruner 1963 p 33)

More recently Catling (1979) has argued that it is perfectly feasible for young children to understand and use maps, provided you approach any mapwork with the children's developmental stage in mind. Blaut and Stea (Blaut, McClearly and Blaut 1970, Stea and Taphanel 1975) have proposed two hypotheses about the development of cognitive mapping abilities in young children. They argue that the construction of any cognitive representation is based upon a set of three cognitive transformations, Scale, Perspective and Abstraction each of which can be hierarchically described as seen **overpage.**

Fig. 10 The Criteria of Analysis adopted by Klett and Alpaugh

Five Point Rating Scales of Developmental Transformation of Scale, Perspective and Abstraction

1. Scale
   - i Subfocal: own immediate personal space (point-like)
   - ii Focal: what an individual could see about him
   - iii Local: area experienced over time (not all elements could be seen at once)
   - iv Valliudinal: displays concept of valley as whole (surrounded by mountains, valley lower than surroundings, shape)
   - v Macro: valley represented as part of some larger system

2. Perspective
   - i Ground level: view as seen from ground (line of sight parallel to ground)
   - ii Mixed: some elements viewed as from ground, some viewed as from a point above ground
   - iii Downward oblique: view is consistently from a point above the ground (line of sight at acute angle with ground)
   - iv Partially overhead: some elements viewed from overhead and some viewed in downward oblique mode
   - v Mainly overhead: almost all elements viewed from overhead (line of sight perpendicular to ground plane)

3. Abstraction
   - i Realistic: attention paid to detail (much effort made to make things look like they are); for example, windows in buildings are put in regular rows
   - ii A: intermediate class between realism and abstraction (combination of both)
   - iii Schematic: still some attention to detail but things are more represented; for example, buildings still look like buildings but windows are randomly distributed
   - iv B: intermediate between schematic and symbolic
   - v Symbolic: very little attention to detail, things are highly represented; for example, buildings are just squares with no windows.

(Klett and Alpaugh 1976)

Blaut (1970) further hypothesised that the abilities required to achieve each of these transformations are all associated, so that they will be approximately the same at any given point in a child's developmental sequence, but accepts that in the early years one would expect the developmentally 'primitive' transformations of scale and perspective to develop earlier than abstraction. Klett and Alpaugh (1976) attempted to test these hypotheses with children aged 6½ years, 9½ years and 10½ years. The resulting drawings of the San Fernando Valley were estimated by a jury on each of the three ratings. If there was a majority opinion a drawing was assigned that rating. If there was no majority opinion the drawing was discussed by the jurors until a majority opinion was achieved. Using these scores it was possible to test Blaut and Stea's hypotheses that the ability related to each of these transformations should be about the same at any given point in a child's development and that the younger children's drawings would be found to be developmentally primitive and rated higher on the scale and perspective ratings than the abstract rating.

Each of these hypotheses were confirmed at the 1% level, more detailed analysis showed that a greater proportion of the younger children achieved higher levels on the abstraction scale than the scale and perspective categories. There were also more 9 year olds in the upper levels of all categories than classic development theory would lead one to anticipate. One possible explanation offered by Klett and Alpaugh is that development is achieved and stabilises earlier since in a mobile society travel is emphasised and even young children are exposed to considerable spatial experience. Interestingly in a follow up study, Klett and Alpaugh identified a decline in level of achievement beyond the age of 9 which they attribute to a variety of reasons. Firstly, as argued strongly by Balchin and Coleman (1965) the school pays relatively little attention to the development of the skills of 'graphicacy'. Secondly the request for a sketch map could result in the child emphasising features in their environment as a description of perceptual space rather than a representation of their understanding of conceptual space. Thirdly they also find drawing a difficult medium of expression and finally for young children, space is primarily understood in terms of personal activity. At about the age of 8 or 9 there is a move away from egocentrism, from a concrete and personal space, towards one that is more static, abstract and impersonal. The decline in achievement identified by Klett and Alpaugh may have arisen as a result of these changes, as the child re-orientates his spatial understanding.

(xiv) The Development of Environmental Knowledge and Understanding

Within the research of Blaut and Stea and Klett and Alpaugh it is possible to begin to detect the influence of general theories of cognitive development, which has been another approach to environmental cognition which has shown considerable promise (Gold 1980). In particular such theoretical frameworks have been used to explain the process by which cognitive maps are produced.

The theories of Piaget and Werner for example are based on the evidence of extensive empirical study and systematic observation of children and suggest that as the child grows he will have a view of the world and have developed levels of spatial understanding that are qualitatively different from when he was younger. Spatial learning therefore is not merely a question of acquiring more spatial information but also of developing and expanding sophisticated schema within which to organise this information.

Hart and Moore (1973) and more recently Moore (1976) proposed a framework within which the various ideas of Piaget and Werner might be applied to large scale spatial contexts. Within the literature on developmental psychology, Moore identifies six fundamental principles for an environmental theory of development. Firstly, spatial knowledge is neither innate, nor a result of passive copying of reality, but in line with Kant's philosophy results from an individual actively constructing his view of reality through direct contact and active involvement in the world. Secondly, spatial cognition itself develops as a result of the dynamic interaction between the internal mental characteristics brought by an individual to a situation and the demands that the situation makes upon that individual. Third, Moore emphasised the importance of the child's active exploration of his environment in the learning process, with cognition arising out of the transactions between the child and his environment.

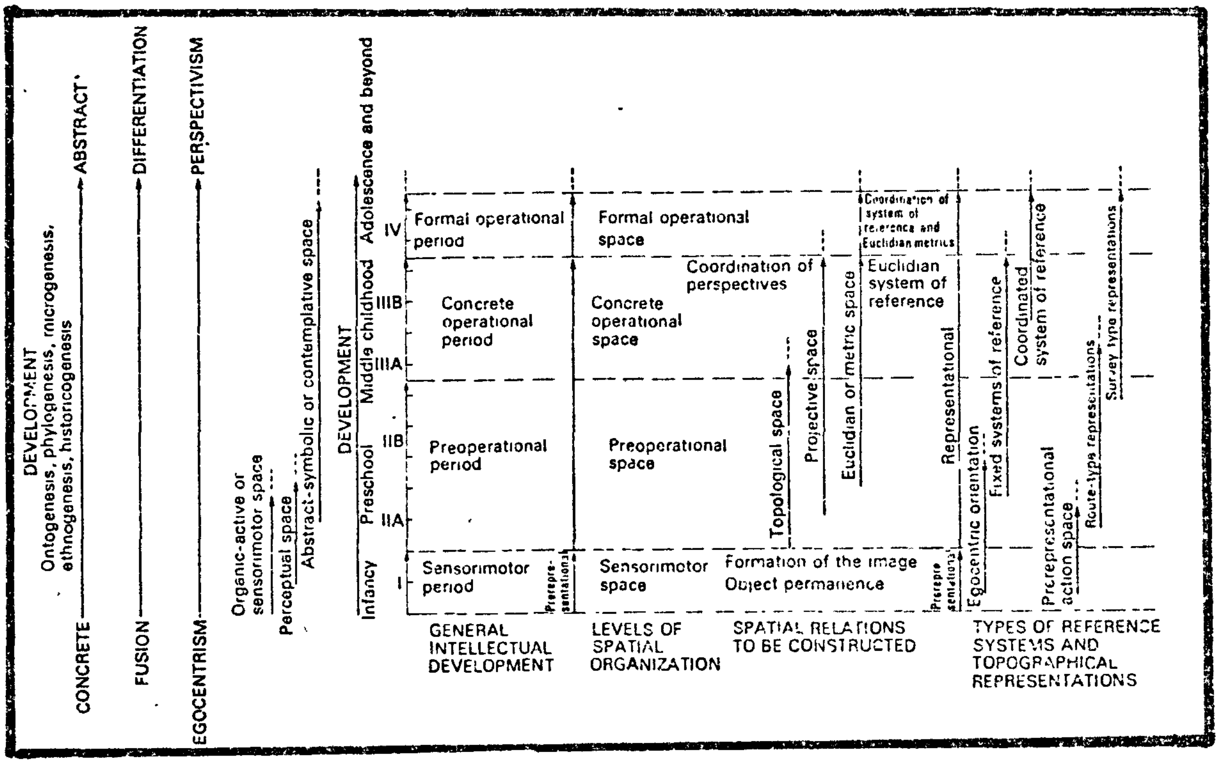
Fourthly, spatial knowledge builds upon existing cognitive structures, suggesting that cognition is likely to be influenced and interpreted in terms of past experience. A fifth important feature is that there are likely to be qualitative as well as quantitative changes in a child's spatial cognition over-time, with more complex structures replacing, or expanding the simpler ones of earlier years. Finally, our understanding of the more advanced levels of spatial knowledge, will only result from a comprehension of the process of development. Moore, it seems is suggesting that process is of greater importance than product, a tenet which was discussed earlier in terms of cognitive styles and also made earlier in terms of cognitive maps.

Central to Moore's interpretation is the Piagetian concept of adaptation and the overall 'equilibration process'. This process monitors and aids the development of intellectual functioning from the lower modes of biological and reflexive functioning, through action oriented and perceptual functioning, to higher modes of conceptual and symbolic functioning.

The key to learning in Piagetian terms is adaptation and although intrinsic to all human beings, it is not intelligence itself that is inherited but a mode of intellectual functioning composed of two functional invariates assimilation, the process by which the individual forms schemata of the outside world and accommodation, the readjustment of schemata to cope with assimilation. The balance between them is called equilibrium.

Hart and Moore (1973) offer the following framework within which to understand the growing development of spatial processes. As can be seen in the diagram overpage they rely heavily on the Piagetian stages of development generally and the concept of space in particular. During the sensorimotor period from 0 - 2 years on average, the child can visualise things only in terms of actions that are performed on them. Space is viewed egocentrically and although there are the rudiments of understanding distance and direction, the child lacks the ability to represent space conceptually. In the next major stage that of pre-operations lasting from 2 - 7 years, the child's image of space is un-cordinated, based on memory of previously manipulated, or perceived objects.

Fig II. A DIAGRAMMATIC REPRESENTATION OF THE DEVELOPMENTAL NATURE OF ENVIRONMENTAL COGNITION. (Hart and Moore 1973.)



(After Moore 1976 p 149)

By Concrete Operations, the child is able to conceive of space apart from his actions in it, but his thinking is still tied to real or represented objects. In the final stage it is possible to conceive of space entirely in the abstract, without representations being dependent upon real actions, objects or spaces.

There is also a developmental sequence for the way in which the child learns to construct spatial relations (Piaget 1956). From the age of two the child gradually learns to master topological principles which are concerned with relationships such as order, proximity and separation and whether things are open or closed. Later, projective space introduces perspective and the interrelationship of objects as seen from different viewpoints. This develops in general from about the age of three and evolves alongside the understanding of topological principles, although it is not until about the age of twelve that the child fully learns to co-ordinate perspectives. Euclidean principles emerge from about the age of four and progressively develop towards a culmination in early adolescence. The child gradually recognises the metric properties of space including co-ordinates, accuracy of distance and proportional reduction to scale. By the end of the formal operational period the child will have attained a co-ordinated system which incorporates Euclidean principles alongside those of topological and projective. Moore (1976) has subsequently extended his conceptualisation, incorporating the Piagetian description of development, to the way adults learn about new spatial environments. (Moore 1976)

The relationship between micro-spatial understanding and that of larger scale environments of course is of questionable validity, as is the application of a description of the development of children's spatial understanding to adult conceptualisations. As Gold (1980) suggests, adult cognition has a much greater inferential capacity than is found in children, which may well produce qualitative differences in the developmental process. It is also important to recognise that Piaget's research is not without its critics and recently many of his basic premises have come under considerable scrutiny. (Kuhn 1979, Boden 1979, Smedslund 1978, Brown and Deforges 1979, Anthony 1978, Sigel and Brainerd 1978). Piaget's ideas have been criticised for being too mechanistic and for indicating what the child is unable to do, rather than what he is capable of. This is nicely summed up in the title of a recent article by Duckworth (1979)

> "Either we're too early and they can't learn it or we're too late and they already know it: The dilemma of applying Piaget." (p 297)

Bryant (1974) and Donaldson (1978) are particularly critical of Piaget's discussion of the egocentric nature of children's thinking, especially during the late pre-operational period. In terms of the development of spatial understanding, Donaldson raises questions about the validity of the results of one of the classic experiments employed by Piaget. In the three mountains experiment, children are presented with a model of three mountains of differing sizes and including varying features for distinguishing between them. The child is seated at one side of the model display and a doll is placed opposite him, the child's task is to select a picture which represents the viewpoint of the doll from a range of available photographs. The child therefore needs to decentre his own thinking and consider the perspective of someone else. Piaget discovered that in general, children up to the age of eight or nine find this difficult, and that there is a strong tendency of children aged 6 and below to select the picture which represents what they themselves see. Donaldson (1978 p 20) cites an experiment by Hughes (1975) which is much simpler than that of Piaget, but which demonstrates that children as young as $3\frac{1}{2}$ years were able to distinguish the viewpoints of others. Donaldson suggests that the main difference between the two experiments is that whilst the Hughes experiment is clearly understood by the children, the Piagetian one is obviously not. The mountains task she argues is too abstract and the instructions too difficult for them to comprehend. Comments on experiments such as these by Piaget and Inhelder (1972 and 1978 respectively) suggest that there are always likely to be individual differences when compared with a general description of the form of thought and that such advances are a direct result of the testing experience, where the training was the necessary stimulus for such advance to be made or simply that they had developed the cognitive capacities to cope with the demands of such a situation earlier than the majority.

Other research in to mapping skills and abilities also suggest that children are able to cope with and co-ordinate perspectives, earlier than Piaget's ideas might suggest. As described earlier, the research of Blaut and Stea (1971) suggests that mapping can be achieved in a rudimentary form at the age of three. This was demonstrated when the children were engaged in toy-play activities, building town scenes and then comparing them with aerial photographs. Fishbein, Lewis and Keiffer (1972 p 32) offer an important critical comment on the research of both Piaget and Hughes,

"... that one should be extremely cautious in applying age designations to any stage of thinking ... (methodologically) we have always asked the child to identify the viewpoint of another human being, whereas the other researchers have asked the child to identify the viewpoint of a doll. The latter is in the realm of the hypothetical: 'If a doll could see' or 'if a doll could take a photograph'. Dolls cannot see or take photographs, yet the child is asked to assume that they can. If young children have difficulties in dealing with the abstract or hypothetical, but can readily deal with the concrete ... then methods which employ dolls instead of people should prove to be more difficult for these children."

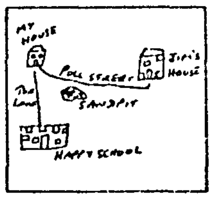
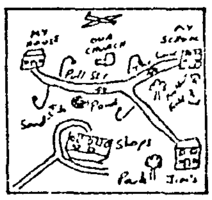
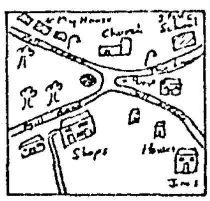
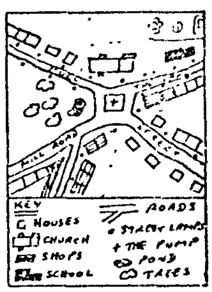
Despite the criticisms levelled at Piaget's ideas, it is still the case that his contribution to child development is unparalleled. He has provided a very detailed framework, of spatial understanding in this instance for researchers to work from. As Bruner (1972) and Brown and Desforges (1979) comment, Piaget's major contribution is likely to be in the direction of questions which he has raised for others to study, rather than his description of the developmental process. It is the case that a number of researchers have followed Moore's lead in using Piaget's ideas. Acredolo (1976) Wood and Beck (1976) and Kates and Katz (1977) have adopted developmental theory to examine large scale spatial environments and Catling (1978, 1979) has attempted to relate the development of cognitive mapping ability (the process) and cognitive maps, (the product) to a similar model as that produced by Moore.

Catling (1979) suggests that whatever the context, the process of cognitive mapping is the same. The extent to which a child can acquire information about a given place or area and his ability to use this knowledge appropriately depends on his level of cognitive mapping ability. Catling attempts to construct a framework to describe the development of this ability; he bases his suggestions on a variety of sources. (Piaget and Inhelder 1956, Shemyakin 1962, Hart and Moore 1973, Siegel and White 1975, Moore 1976, Siegel, Kirasic and Kail 1978 and Hart 1979). From this evidence it seems that there are four main stages through which cognitive mapping ability evolves. Adopting a Piagetian description, Catling refers to the initial stage as that of Sensori-motor spatial action, which occurs during the early months of life and is characterised by the infants' exploratory movements around his environment. It is the stage of initial physical and perceptual interaction with the spatial world. As yet the child is unable to internalise his experiences and his spatial awareness is momentary and his movements haphazard and unco-ordinated. Once he can walk he can explore for himself and begins to initiate interaction. At this stage, the child has not yet begun to draw, but with the development of the ability to internalise his actions through representational thinking, he attempts to draw. His initial efforts gradually evolve into intelligible representations during the next stage of Egocentric Spatial Perception, when he is able to retain an image of a feature, or event and an idea of its location in its absence. (Bruner (1972) describes this as iconic representation). This stage is characterised by the development of a frame of spatial reference which is based upon the child himself. He sees features in terms of a direct link to himself, or a self-substitute such as his home, room or toys. The essence of this stage is a sequential ordering, which originates from within the child, topological structures dominate and specific location and direction are unimportant (Moore 1976, Shemyakin 1962, Siegel and White 1975, Hazen, Lockman and Pick 1978). The child's earliest attempts at depicting environmental relations in recall sketch maps reflect these capacities. They are topological, with the home often as the focal point. Maps tend to be highly personalised and relationships such as relative location, distance and direction unimportant. Features are often drawn as pictures and those features shown are usually those of most immediate pertinence to the child. Those without meaning, or of limited experience, are ignored, but it doesn't mean they are not known.

Increased experience of the immediate environment and indirect contact with a wider world moves the child towards the third stage of Objective Spatial Cognition, when the child comes to realise that relationships between features exist without his presence. The child at this stage has a well developed knowledge of areas with which he is familiar, but is poor at co-ordinating relationships which might exist between these areas. As such he possesses a reference system which is only partly co-ordinated because as yet he is unable to relate parts to the whole. As suggested earlier, Moore (1976) argues that the individual's 'thought space' can be conceived of as containing 'objective clusters', in that he has an objective idea of their internal relationships even though his understanding does not extend to 'cluster co-ordination'. Maps produced by children at this stage include more sophisticated patterns of relationships and are more clearly portrayed, although pictorial representation still tends to dominate. There is still an element of egocentricity, but the child demonstrates a realisation that features exist outside and beyond himself. Known places are connected and some parts of the map are well co-ordinated. It is still the case however, that personally significant features can be over-exaggerated. This stage of map drawing ability comes at a point when the child's cognitive mapping ability, that is the process, is entering the final stage of Abstract Spatial reasoning, when the child realises that the map concept involves the representation of patterns and content from a vertical perspective. Initially, however, he may still be acquiring standardised map conventions. Generally the co-ordination of relationships is sound and proportional and distance relationships are more accurate, but with some over-and-under- estimation. There can often be a mixture of elevated and vertical viewpoints, with more complex features presented pictorially. Many researchers have commented on the use of pictorial representation as opposed to conventional symbols (Conner 1969, Spencer 1974). Goodnow (1977) suggests that in drawing a recall map, the child or adult is attempting to portray the spatial layout of an area, as if seen from above. To do this successfully three problems have to be overcome. Firstly, the individual has to recognise that the environment will look different. He has to also work out how it looks different and finally must decide how to show this on paper, in a way that communicates this viewpoint acceptably. As Catling (1979) suggests, "In effect, the child has to present an equivalent view of the environment. This may well be one that he has never considered before. He finds himself challenged to depict relationships he has not, perhaps, consciously realised. So, he may well fall back on what he can do and employ equivalents he may have developed earlier such as drawing stereotype elevation views of building to show what and where they are." (p 8)

Often when questioned, the child is clear that you can only see roofs from above, but since he has no alternative way of portraying this view he utilises what he knows and includes mixed elevations. This is a transition stage, the ability to correctly represent symbols and plan form emerges after this in the period of Abstract Spatial reasoning when the reference system is abstractly co-ordinated and hierarchically integrated. He is able to visualise an area and successfully relates each of its constituent parts to the whole. At this stage the individual can analyse and assess spatial situations without the necessity of direct experience. His thinking therefore demonstrates the ability to apply abstract reasoning (Piaget's Formal Operations) in a spatial context. The recall maps at this level tend to employ conventional techniques to display information. The individual is aware of the selective and purposeful nature of maps and can locate features accurately and show size and distance in correct proportion. Although, perhaps not entirely conventional as in O.S. or Atlas maps the resultant product may be described as a 'true map'. A recall map at this level shows that the individual concerned is able to rationalise content in terms of the instructions given, can abstract himself to produce an aerial map correct in terms of structure and features, and is able to communicate this information in a meaningful and conventional form. In an earlier piece of research, Catling (1978) presented a diagrammatic representation of the process and the stages of map representation. As can be seen in the diagram below, he bases his analysis here on the Piagetian description of the stages in the development of the concept of space and attributes typical map types to the varying levels of Topological Projective and Euclidean understanding. Empirical Research has revealed that each of these map types are distinguishable within a sample (Conner 1969) and although mental age is of considerable importance in terms of level achieved, experience with maps and range of environmental interaction are also of considerable importance. (Piaget 1956, Uzzel 1976).

Fig. 12 Stages in the Development of Cognitive Map Representation

Stage	Map style	Stage and comments
Topological [Egocentric]		**1. Link-picture map** Highly egocentric Known places connected to home. Solely iconic. Direction orientation, distance, scale non-existant. Unco-ordinated map.
Projective 1 [Quasi-egocentric]		**2. Picture map** Still egocentric Partial co-ordination and connection of known places, direction more accurate. Road in plan form, but buildings iconic Scale and distance inaccurate Little development of perspective.
Projective 2 [Quasi-abstract]		**3. Quasi-map** More detailed and differantiated. Better co-ordination; continuity of routes. Some buildings in plan form Direction, orientation, distance and scale improved. Better perspective.
Euclidean [Abstract]		**4. True map** Abstractly co ordinated and heirarchically integrated map. Accurate and detailed Direction, orientation, distance, shape, size, scale all roughly accurate Map in plan form No symbols highly iconic, so key necessary.

(Catling 1978 p 121)

Catling (1979) also argues for the importance of careful assessment of recall maps. Much previous research he believes has tended to confuse the different representational elements in their evaluation. As suggested earlier he identifies three main elements to a recall map, each of which needs to be evaluated separately.

Firstly, he suggests, recall maps can be assessed in terms of their Cartographic Representation, the extent to which they conform to cartographic norms. This however, should not be confused with questions about the extent of an individual's spatial understanding which would be evaluated in the second category Spatial Representation. This considers to extent to which an individual is capable of communicating his understanding of the structure of spatial relationships in a graphic context either topologically, projectively or by displaying a Euclidean understanding showing location distance and direction accurately. Finally, Catling argues that recall type sketch maps are also statementsof Place Representation, since they display knowledge of, and reaction to an area. What is included will probably depend on familiarity and how it is noted may provide some indic ation of feelings associated. It is also important to consider why things are excluded. Does it mean they are not known, unintentionally excluded, or thought to be unimportant for the specific task in hand. Or as Ladd (1970) suggests, is it because of fear of entering a particular area, or that one is prevented from doing so? Of course one needs to be careful in distinguishing between these elements and a map which is conventionally drawn may be assessed to be of a higher level in all categories than is actually the case. Similarly someone unfamiliar with an area may produce a map which would be assessed at a lower level than greater experience would indicate. It would appear that 'talking' to the mapper is essential.

Despite many of the reservations discussed here the problems should not be over-emphasised. Recall map drawings are important ways of representing knowledge and understanding and provided they are carefully assessed, in conjunction with other techniques, they can provide considerable information about an individual's knowledge of his environment and what is important to him, as well as some evidence of his abilities to reconstruct and communicate his view of the world at a given time. As Pocock (1979) comments,

> "The elicited mental map tells us something about the environment, the respondent and the underlying cognitive processes ... within the context and constraints of the actual elicitive technique used." (p 282)

Goodey (1971) supports this assertion and comments that once we can accept the idea that the map which does not conform to standardised conventions is not 'wrong' and once we can discuss maps and plans produced by the 'untrained' in the same way that many parents view their children's paintings and drawings (as an interesting personal expression rather than an accurate representation), then we have at our disposal a most promising technique.

One final element which requires discussion, is the means of scoring cognitive maps, Bycroft (1974) in his review of research associated with the analysis of children's drawings, refers to the work of Martin and Damarin (1951) which isolated three main types of analysis which Bycroft argues are consistently demonstrated throughout the cognitive mapping literature. They are:

1. The analytic or quantitative analysis of detail which correlates with chronological age, and most highly of these three factors, with intellectual ability.
2. The comparative or qualitative method which measures the symmetry and proportion of the drawings as a whole and most probably correlates highly with spatial ability.
3. The presentation of the drawing in terms of stroke and representation.

Bycroft comments,

> "All have parallels in sketch map scoring methods currently used in Environmental Psychology, to such an extent that it seems redundant to reiterate the highly probable relationship between cognitive abilities and what have been traditionally termed cognitive mapping measures. Ladd's (1970) measure is essentially representational (3, above), Appleyeard's (1970) and Moore's (1973) is qualitative (2) and most of the cognitive mapping studies since Lynch (1960) have included some measure of accuracy or detail (1 above)." (p 29)

(xv) Children's Perceptions and Understanding of their environment

Uzzell (1976) argues that it is perfectly justifiable to consider children's perception of the environment as a topic in its own right as there do seem to be important differences between adult and children's conceptions. Maurer and Baxter (1972) for example comment,

"... although children's imagery bears some relationship to adults, there are ... impressive differences. There is a quality of intricacy and attention to detail not found in similar adult tasks ... the individuality of houses, interest in animals, the unnerving confrontation with huge streets and bothersome trains ... gives an interest and vitality lacking amongst adults."

Lynch (1960) demonstrated that adults tend to concentrate on the larger details of their environment, with little or no mention of colour, sky, wall materials and items above ground level, probably because such detail is irrelevant in their eyes for the task in hand. Streets often appear as barriers in adult maps. Bishop and Foulsham (1973) demonstrated that landmarks for children are those that are of the greatest significance to them and that architectural elements have very little importance. Bishop and Foulsham also found that the maps of primary school children tended to be rather pictorial and not very comprehensive. Consideration of scale was limited, but directional sense was clearly demonstrated. In their study of two primary schools an interesting factor which emerged was associated with the complexity of the environment in which the children lived. The one school environment produced maps which contained a high level of 'connectivity' between the elements of the children's maps. The particular area was one which was physically more consistent, with a very clear organisation of road and path networks. This is obviously more 'imageable' in Lynch's terms. On the other hand, the low 'connectivity' of the elements of the children's maps in the second school Bishop attributes to the complexity of that particular area with a great deal of isolated environmental cues and often meandering routes.

Bishop followed up this study with a similar experiment in London with 9 year olds, who produced considerably less pictorial maps, which were more comprehensive. Bishop suggests this might be attributed to the greater sophistication of London children, or more probably to the contextual situation in which the children live, a tightly ordered lay out of streets. This study also included a consideration of secondary school children, whose maps demonstrated a definite move away from pictorial representation, which demonstrates a developmental growth of skills in association with age. It was still the case however, that some of these children were neither consistent nor comprehensive. The most marked differences were those between the sexes. Boys were generally less consistent, but less pictorial and more diagrammatic. Girls tended to include considerably more detail. Bishop suggests that the girls were able to produce better maps than the boys in general, but with less use of diagrammatic **detail** and conventional mapping techniques.

Bishop also noticed that the primary school children have a clear image of routes and are clearly conscious of staging posts, of important features and objects along these routes. With age, the number of objects decreased. Bishop suggests that it is unlikely that the older children forget these. What is more likely is that they are responding to the demands of the task, providing what they think is required, whereas primary children he suggests are too egocentric for that. Sieverts (1967) and Hart (1971) found that secondary school children employ 'categories' to a greater extent than younger children. That is, with increasing knowledge categories become more inclusive, away from an egocentric descriptive to a more abstract classification system.

In his study of Harwich, Bishop (1973) found that for secondary school children large landmarks emerged to be of minimal importance and again in association with practical use. Thus the toilets in front of the lighthouse assume more importance than the lighthouse itself in the children's maps. The telephone boxes were mentioned by many, as were the pubs, yet the school and church got a low response. As one might expect, the sweet shop attains a high score. Several children named all the shops in the High Street and the roads leading off in the right order, where the system became more complex, some are omitted, or the system is simplified. **as** is demonstrated in the recent study by Byrne (1979).

Bishop raises an interesting point about the maps of 11 - 13 year old children in his sample whose maps tended to include a high level of conformity to group norms. They are told what is acceptable and what is not, and 'art and the picturesque' in maps is certainly to be avoided. Uzzell comments,

> "Our whole system is geared to perceive and interpret in terms of stereotypes and any move away from this is condemned as being incorrect. Development is required to proceed towards the perfect stereotype that is culturally and educationally acceptable."
> (1976 p 17)

Another example of the differing perceptions of adults and children was demonstrated in an undated study by Wood. The children in the study were required to locate an hotel on a fictitious island. The physical constraints had been organised such that, in adult terms, there was only one obvious place to locate the hotel which was in a sheltered sandy bay. The vast majority of children however, sited it on a cliff top, facing strong winds and overlooking a rugged coast with a shark infested sea.

It is interesting to consider when a child's means of interpretation moves away from such idiosyncratic, often personalised interpretations towards more adult-like abstract interpretation? Children's usage of the environment tends to be functional and multi-purposed, taking on a variety of diverse roles, rather than clear cut and specific as is the case for many adults. In another part of the study by Wood, two slides were shown to a sample of 40, 9 year old children. One was of an alley in a New town with two girls walking and another child cycling; the other was of a lakeside scene with two boys playing. The children were simply asked which scene they preferred. The result was an equal choice twenty for slide 1 and 20 for slide 2. Sex analysis however, revealed clear sex differences. 80% of the boys selected the alleyway, because they could cycle on the pavements and climb on the walls. A second series of slides were also shown to this group, of a sand dune beach, a mountain snow scene, a forest, a rural area and an area of terraced houses in a state of decay. Wood then asked the children to rank them in order of preference. The children were from an area which most resembled the final slide, and Wood hypothesised that areas of familiarity are not favoured or preferred and this was not demonstrated by the results. Many of the children ranking the picture like their own environment highly. Bayliss and Renwick (1966) asked children to describe what they saw in a photograph of the area where they lived, which was in an Industrial city. The children aged between 7 and 11 showed that they had little difficulty in naming the main elements in the photograph, though the emphasis was on particular features with no attempt at generalisation about the area as a whole. For example, only five of the sample of 95 children thought the hill, which dominated the picture, worth mentioning.

Calland (1973) investigated which features a small sample (24) of children could recognise on a photograph of the area around their school and which features they marked on a map of their route from home to school which was within one mile of the school. A distance decay principle seemed to operate. Most features recognised, lay within a radius of $1\frac{1}{2}$ miles from the school. Their maps showed a clearer idea of the ends of journeys than the middle and certain distinguishable features were identified. (For example the hospital, shops, road features and the motorway, which acted as an edge to the perceptual field of the children). On the whole, ten year olds included more information than 9 year olds and in an analysis of the maps in terms of Lynch's elements, the children seemed conscious of Landmarks, Edges, Nodes and Paths, but not of particular districts or areas within their environment.

Maurer and Baxter's (1972) study of Black, Mexican and Anglo-American children's perception of their neighbourhood revealed that Anglo-American children possess a life-style and an imagery more complex than the other two groups. The reasons they suggest were, more varied transport experiences, there was more likely to be more home stimulation because mothers tended to be at home, there was also a higher degree of mobility amongst this group with shorter periods of residence in a particular place, and finally friends and relations of this group tended to live further away, resulting in greater travel and awareness of other areas. As a result they produced more complex maps which included a high degree of regularity and order and neighbourhoods were subsumed within a larger geographic area, suggesting both a familiarity with and a clear image of the inter-relationships of their environment. The other groups' maps were marked by a more restricted view of their environment, yet the black children's maps contained more elaborate detail than for the other two groups combined. Maurer and Baxter suggested a Complexity - Constriction hypothesis, as a result of this study, whereby life style and the image of an environment which results places one somewhere on a position between these bi-polar attributes. In terms of ability to cope with differing environments, and environmental complexity, Carr and Lynch (1968) maintain that most environments become boring with repeated experience, which is particularly true for children who during summer vacations are often limited in the extent of travel and movement possibilities. Lynch suggests that environments need to change continually, or the individual must be motivated to search for new levels of experience and meaning in an environment that offers successive levels of complexity. This was demonstrated in Lynch's (1976) UNESCO study which was referred to in an earlier section.

Ladd (1970) in his investigation into black youths view of their environment suggested that the organisation and complexity of children's maps reflected their sense of coherence and understanding of the area where they lived. At the lowest level of organisation in cities he suggested that the street is usually the central organising factor, which tends to reflect a highly personalised view of the neighbourhood revealing a narrow egocentric viewpoint. At a more sophisticated level, the organising factor goes beyond the street where the subject lives, towards some more abstract factor such as an intersection or main commercial thoroughfare which is obviously less personal, more abstract and objective. One interesting feature to emerge from Ladd's study was that 15 year old children's maps contained fewer landmarks than 13 year olds, which Uzzell (1976) suggests might imply a greater ability to select and consider the demands of the task more abstractly, but surprisingly the most sophisticated 'mappers' in the study included more landmarks than any other group which one would imagine would not suggest superior selection skills. In Ladd's study only one child made reference to the external features of his house when asked what was liked or disliked about present housing. Uzzell (1976) suggests that facades seem to have little significance for children.

In the study by Maurer and Baxter, items mentioned most frequently by children included houses, streets, traffic, other children, fences and grass play areas. Nearly all the children began by naming the streets and then described the sights, sounds and smells associated with their environment, but in two case studies cited by Maurer and Baxter of a description of the route taken to school by two white American children, a 13 year old boy and a 12 year old girl. Both children mentioned roads and buildings far more frequently than other perceptual cues, including people, olfactory and auditory features.

In the UNESCO studies (1973, 1977) children were questioned about the nature, extent and frequency of their journeys out of their own areas. The visiting of friends and relatives was the most common response, followed by shopping, drives with friends and attendance at social and sporting functions. School is one of the least mentioned and presumably least memorable travelling experiences. In response to questions about, where children feel most comfortable, or feel like an outsider, most children it seems feel most relaxed in their own homes, especially their own bedrooms, whereas they are unhappy in areas unknown to them or excessively overcrowded places.

Downton (1973) and later Lynch (1977) asked questions concerning dangerous, beautiful, ugly and holy places. Roads are seen as the most dangerous, along with heavy or fast traffic. The river also is often regarded by children as a hazard. Certain areas are feared because of the potential for gang fights in them. (Ladd 1970).

As far as beauty is concerned, the natural environment, gardens, parks and anywhere with trees tend to be mentioned, especially by children living in cities. It would be interesting to consider how far this view is supported by children living in environments, other than those described here, as for example in rural village communities.

Factories are most frequently referred to as being ugly, along with poor housing, pollution and dumped rubbish. City buildings are disliked because they are cold, tall and concrete and churches are obviously the most frequently mentioned holy place.

Downton (1973) also comments that planners often see the use of open space in terms of sporting facilities, whereas most fourteen year olds tend to look for a more adventurous use of space. The primary use of space by this age group is a social one, the meeting of one's peer group and raises the important question as to whether the social use of the environment is more important for children than the physical? It was also found that children find streets more interesting than open play spaces, because they are more dynamic and lively, with plenty going on.

Lukashok and Lynch (1956) carried out a study of adults' childhood memories of a city and despite the problems of studies of this kind, the results confirmed many of the findings of studies with children. Adults it seems remember the importance of not only play spaces often citing the generic term of Play Places, but the whole of the environment, including streets as a central meeting and play-space. Many of their recollections included important emotional elements. What was remembered, being closely associated with why it was remembered.

Uzzell comments that one aspect of urban imagery not covered in previous adult perception studies is that of means of transport and its effect on knowledge. In studies of children however, the use of transport is quite well documented and the effect of travelling by car, bus, bicycle and on foot have been considered. Maurer and Baxter (1972) maintain for example, that mode of transport effects the quality of the imagery and that for those travelling by forms of transport, other than by foot, there is a high incidence of structure in their maps. Those who walk, tend to rely more heavily on natural environmental objects and prominent landmarks. Downton (1973) suggests that some transport forms result in limited route knowledge. In a car, for example, only limited attention is paid to the route and the surroundings passed through. Bishop (1973) also found that the information obtained and remembered can often be highly specialised, often dominated by one side of the street, depending on an individual's seat in the car. Similarly bus travellers, who produce prodigious amounts of information tend to concentrate on one side of the street.

Tindall's (1971) study demonstrated that the environmental range, the extent of the area experienced, was different for urban and sub-urban children. He found that urban children's range was smaller than that of sub-urban children and as a result they tended to have a more constricted view of their environment. Boys tended to have a more extensive environmental range than girls at all age levels and the strongest single relationship was found to exist between home range and school grade level. Home range increased progressively with grade level, which Uzzell takes to suggest a clear indication that home range is a developmental process.

Sieverts (1967) study of Berlin demonstrated that for children there is not just one perceptual image of the environment, but several, depending upon the problems raised. Maps of a navigational route through the city produced considerable differences when compared with maps of the city as a whole. Sieverts also found that the centre of Berlin was over dimensionalised, perhaps expressing its subjective importance.

Sieverts maintains that the growth of a perceptual image of an environment (ie a town) is parallel to the development of personality. In childhood he suggests, the image consists of a series of disconnected districts in which one's own residential district is the centre. This he referred to as a 'domicentric' viewpoint. By the end of adolescence the perception of a town as a whole emerges, with the town centre at its heart, an 'exocentric viewpoint'. Although somewhat simplistic, this suggests that perceptual images are developmental, which has been demonstrated in Bishop's (1973) study, and Appleyard's (1970) classification of the development of networks and is referred to diagrammatically by Catling (1979). Gulick (1963) however questions whether the placing of a location as a central focus on a map indicates its overwhelming imageability, or that it merely demonstrates an inability to draw a well proportioned map.

Gould (1973) also demonstrates a developmental progression in children's preferences within their environment. Gould showed children aged $7\frac{1}{2}$ - 13 a map of Sweden with 70 functional regions demarcated. The children were asked to rank them in order of preference. As one might expect the youngest children found this virtually impossible, but by $9\frac{1}{2}$ a collective image was beginning to emerge which appeared to have been fully developed by 13 where preferences were assigned with considerable care and subtle differentiation (eg between preference for permanent residence and a holiday).

Probably the most detailed analysis of children's perceptions of their environment is that undertaken by Hart (1979). In this study, Hart had considered making reference to the work of Witkin, but in the end elected to actually involve himself in the activities of his sample of children. He spent a year living and working with the children of a small compact rapidly expanding and urbanising town in the United States, sharing as fully as possible with them in their direct experience of the environment. He adopted a largely descriptive and naturalistic approach in this study which attempted,

> "to discover the landscape as it exists for children"

He employed a variety of techniques to investigate the spatial activity of his sample, their place knowledge, place use and the value and feelings they attach to these places. Hart concluded that an important quality demanded of environments for children is its suitability for modification by them, (Hart 1979 p 349)

> "The children of this research demonstrated ... how much they value paths which they have 'found' or made themselves ... They also showed .... how important the freedom to make other environmental modifications is, particularly the opportunity to make places for themselves".

Conclusion

The previous discussion clearly argues that the process of environmental perception is an interactive one in which each individual shapes as well as responds to his environment. Each of us is selective in what we perceive and it appears that there are a variety of ways in which this information is stored and retrieved. The selection process can be explained in part by social and cultural pressures, but such pressures do not explain individual differences in the process of perception, which appears to be a developmental phenomena. There are apparently considerable differences which exist between the child and the adult in their perception of the environment for example.

Goodey (1971) suggests that perception studies offers a rich, but largely untapped resource for education at all levels. It reveals to teachers important distinctions about the ways in which children's views and interpretations of the environment can differ from that of the adult. As Graves (1975) suggests, the teacher has to start from the images held by the children, and Uzzell who comments:

> "... in many aspects of our daily encounters with the environment, the child's world is often significantly different from our own. The question now arises as to what use is this information for those involved in environmental education. One conclusion immediately springs to mind. The courses which we teach are based on our own set of values as to what is important and significant in the environment. Perhaps it would be more constructive and creative if we were now to try and base environmental education on the value system of those we are teaching. That is, to build upon the perceptions of, and the meanings that the child invests in his own environment." (1976 p 18)

Wohlwill (1976) however, believes that what emerges from most studies is a total lack of consideration of the '<u>individual</u>', his own preferences and abilities and ways that might distinguish between individual's perceptions of their environment. It is the central thesis of this study that cognitive styles may offer one useful avenue for such individual differentiation. More particularly, the distinction between an analytic and global cognitive style as identified by Witkin and discussed earlier would seem to offer the potentially most useful avenue for investigation as a result of the perceptual roots of both this cognitive style and an individual's Environmental Image. Further, there seem to be important changes taking place in children's environmental images during the middle years from 10 - 13, at a time when Witkin et al, have suggested the development of field independence is increasing at its maximum rate.

The next section describes the organisation of the empirical investigation in to the relationships between children's cognitive style and their perception of the environment.

CHAPTER 4 Outline of the Empirical Study

In order to investigate the relationships which exist between children's cognitive styles and their perception of the environment, the following research was devised. It was proposed that the study should focus on children in the middle years of schooling, primarily from 10 - 13 years, for a number of reasons. As was suggested at the end of the last section, Witkin has demonstrated that the greatest changes that take place in the development of Field Independence occur during this period. This is also a time at which Piaget's researches suggest considerable development is manifesting itself in children's thinking capacities and the inter-relationships between Field Independence and such developments have been recognised and investigated by Pascual - Leone (1969, 1970) Case (1974, 1977) and Case and Globerson (1974) and were discussed earlier. Finally this is the age range with which the author has most experience.

The research was conducted in two stages. Firstly, an inter-correlational exercise which concentrated upon the inter-relationships between the following elements:

(i) measures of Witkins analytic/global dimension
(ii) measures of ability
(iii) measures of environmental perception
(iv) aspects of personality associated with Field dependence/ independence

This was followed by individual interviews and a further field exercise with a representative sample of children. The focus of this second stage was derived from the results of the analysis of stage one of the project.

The sample for the inter-correlational exercise was drawn from 3 schools, one middle school in a rural environment, and an urban secondary school and one of its feeder primary schools. The number of children participating in this part of the study is as follows:

TABLE 4. 1 The Sample

	10-11 yr olds		11-12 yr olds		12-13 yr olds		
School Type	Boys	Girls	Boys	Girls	Boys	Girls	TOTAL
Rural/Middle	31	45	42	37	55	36	246
Urban Primary	33	26	-	-	-	-	235
Urban Secondary	-	-	44	45	36	51	
TOTAL	64	71	86	82	91	87	481

TOTAL BOYS: 241 TOTAL GIRLS: 240

The various measuring techniques employed in stage one of the study were as detailed below:

1. Measures of Cognitive Style:

As suggested by Vernon (1972), three measures were adopted to investigate the cognitive style of the sample in terms of Witkin's analytic/global dimension; the Embedded Figures Test, the Rod and Frame Test and the Articulation of Body Concept Scale. To counteract previous criticism (Vernon 1972) the procedure for each of them followed those prescribed by Witkin et al. The first measure was the Group Version of the Embedded Figures Test developed by Witkin, Oltman and Raskin (1971) and is divided in to three sections each of which is timed. The norms are based on standardised testing times of five minutes each for the second and third sections and two minutes for the first section. In a small pilot study (Witkin 1971), the test was found to differentiate among 9 and 10 year old children when the time limit was extended to 10 minutes each for the second and third sections, so for the younger children in the sample an extended time period was observed. As was explained in Chapter 2 , the Group test requires subjects to identify a simple figure in a more complex shape, to 'disembed' in Witkin's terms. A sample of simple and complex figures found in the test can be seen in Appendix 1, along with the standardised procedure for undertaking the test.

The second measure of cognitive style was the Rod and Frame Test. For this, a portable apparatus was obtained. * The procedure for this exercise, which is undertaken individually in a semi-darkened room, was kindly provided by Dr Philip Oltman, a colleague of Witkin, who developed the first portable rod and frame apparatus. The procedure was adapted slightly to suit the age range under study. A copy of the standardised instructions can be seen in Appendix 1. The apparatus measures a subject's ability to overcome the perceptual effects of another shape when attempting to align a rod to the vertical, again demonstrating the ability to 'disembed'. A successful (field independent) subject will achieve a low deviation score over the eight trials of the test, whereas a less successful subject (field dependent) will achieve high deviation scores and is distracted by the surrounding visual field.

The final measure of cognitive style, the Articulation of Body Concept Scale requires subjects to produce two drawings, one of a man and one of a woman. These are then assessed on a five point scale representing the degree of differentiation within and between the drawings, in terms of the form of the figures, sex differentiation, the level of detailing and the articulation of features. Because of the highly subjective nature of such analysis three judges were used to assess the drawings. The details of inter-judge reliability will be discussed in a later section and a copy of the directions and criteria for analysis can be seen in Appendix 1 (The details for this exercise were again kindly provided by Dr Oltman of the Educational Testing Service at Princeton).

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* Grateful thanks to Peter Jobbins at the Institute of Education's Technical Resources Centre.

2. <u>Measures of Ability</u>

(i) In Chapter two it was suggested that the relationship between field dependence/independence and aspects of intelligence is still not very clear, with considerable question as to whether the style identified by Witkin is in fact merely a representation of general ability and more particularly of spatial ability. (Vernon 1972, Satterly 1976, 1979). To further investigate these questions it was proposed to include various measures of ability in the study. AH3, devised by Heim, Watts and Simmonds (1978) was adopted as the measure of general ability. It is divided into three sections and provides an assessment of Verbal, Numerical and Perceptual Reasoning, (in this test 'perceptual' denotes material which is either diagrammatic or pictorial) as well as a measure of 'general ability' in the final score. The test can be used successfully with children aged from 9+ and consists of a series of 40 questions for each section. Each section is timed and requires 15 minutes, 15 minutes and 12 minutes for the respective sections. Norms are provided for children aged 9+ to 15+ who attend Comprehensive schools throughout England and Wales, which is probably a more appropriate comparison for the children of the sample schools. The results of this test would also allow the study to identify any particular loading which might exist between aspects of intelligence and the three measures described in the previous section. (As was discussed earlier Karp (1963) had identified an association between measures of Field Independence and an 'analytic' sub factor in the Weschler Intelligence Scale)

(ii) To investigate the relationship between the measures of Field Independence and Spatial Ability, NFER Spatial Test 2 was used. Previous research (Bycroft 1974) had identified a relationship between elements of the test and cognitive maps produced by a small sample of English Secondary schoolboys. This test was adopted to serve a dual purpose therefore, as a comparison with performance on the tests of Field dependence/independence, as well as a measure of the association of spatial ability with the maps produced by the sample. The test itself consists of a series of five sub-tests and is designed to investigate children's ability to deal with three dimensional material. Each sub-test is preceded by a short practice test and requires a total of 45 minutes for administration. Extracts of the test and the standardised instructions employed can be seen in Appendix 1.

(iii) In the discussion of the Articulation of Body Concept Scale, (Ch 2 and earlier in this chapter), drawings of a man and a woman are used to indicate subjects ability to demonstrate clear identity and sex differentiation of the figures, which Witkin et al (1974) suggests is closely associated with the ability to 'disembed', hence its use as a measure of psychological differentiation. If Witkin's distinction is to be accepted as a 'cognitive style' it is to be expected that all associated measures satisfy the requirements presented in Chapter two, in particular that performance on any exercise is not a direct result of intellectual maturity or ability. The work of Goodenough (1926) and more recently Harris (1963) suggests that detailed analysis of drawings of a man and a woman provides evidence of a close association between quality and detail in the drawings produced and increasing intellectual maturity. It was felt that by analysing the drawings resulting from the Articulation of Body Concept Scale in the terms described by Harris (1963), it might be possible to examine the relationship between Articulation of Body Concept and Intellectual maturity, a factor which seems to have been ignored in discussions of the Articulation of Body Concept Scale. The Goodenough-Harris Draw-a-man test (1963) examines individual elements included on the drawings of a man on a 0 - 72 point scale and the woman on a 0 - 69 point scale. Detailed information is given for each item considered. A breakdown of the elements considered for each of the drawings can be seen in Appendix 1.

3. <u>Measures of Environmental Perception</u>

(i) To date only one study has examined the relationship between Field Independence, as measured by the Embedded Figures Test and aspects of Environmental Knowing. This is the study by Satterly (1979) which was discussed earlier, in which a positive correlation was identified between performance on the Embedded Figures Test and two tests of 'geographical ability'. (0.386 and 0.398), These tests for a group of 10 - 11 year olds consisted of a series of exercises of orientational ability, i.e. left, right and cardinal direction when using simple plans. For this study the exercises were modified as a series of straight orientational problems, the first involving a series of small plans and the second based on a more detailed street plan, to these exercises was added a further orientational exercise developed by Conner (1969) which required subjects to match small map extracts with an appropriate picture of the information contained on the map. Details of each of these exercises can be found in Appendix 1 with the standardised instructions for their execution.

(ii) As a further measure of Spatial Ability, but with potential implications for children's perception of the environment, the Draw-a-Plan test, devised by Thorstad (1974) was undertaken by the children in the sample. The test requires subjects to draw a plan of the lower floor of their house. An ability to draw a plan horizontally, Thorstad (1974) suggests, implies that a child understands space as a Euclidean grid of intersecting horizontal and vertical planes. Before drawing the plan, the child has to imaginatively put together the spaces that he lives in and take a point of view from above, which is not possible in reality and then the information has to be transposed from 3 into 2 dimensions, which is employing similar skills to map drawing. The ability to draw a plan Thorstad argues is an outward manifestation of the child's stage of conceptual development, the development of which occurs mainly in the stage defined by Piaget as the Concrete Operational Stage. The scoring of the plans is undertaken on a 0 - 40 point scale and the scores are standardised, elements such as proportion, structure, and connectedness are considered. A copy of the test with the standardised instructions are included in Appendix 1.

(iii) The main technique that has been used extensively in Environmental Perception research is the 'Cognitive Map'. As was discussed in Chapter 3, this is a technique which has been the subject of considerable criticism, yet despite such criticism, research employing this technique has revealed valuable information concerning peoples knowledge and understanding of place. Bearing such criticism constantly in mind, with a view to further constructive criticism of the technique, the 'cognitive map' was adopted as one of the measures for this investigation. Rather than rely on one map, however, as much of the previous research has done, subjects in the sample were requested to produce two maps, one of the area where they lived and one of the route from home to school. These were undertaken as separate exercises a week apart. Following Catling's (1979) comments that what subjects are asked to do influences their response, the instructions for each of the mapping exercises were standardised and printed at the top of the response format. (Copies of these can be seen in Appendix 1).

To allow further opportunity for the children in the sample to reveal their knowledge and preferences about the area where they lived, they were asked to complete a questionnaire. The questions included were based on previous environmental perception research and asked about favourite places, disliked places, beautiful and ugly places etc. (A copy of the questionnaire, which had been tested prior to the study with a small sample of primary school children to ensure clarity and lack of ambiguity, can be seen in Appendix 2). Although criticism might be levelled at the highly linguistic nature of this exercise, it was intended as flexible a medium as possible for obtaining further information. During the completion of the questionnaire the author was always present, as was the class or geography teacher . Questions were invited and further explanation was given wherever necessary. There was no time limit set for the exercise and all subjects were allowed as much time as they required. Children with reading or language difficulties were identified prior to each session and the class or geography teacher attempted to ensure that they were clear about what was intended of them and offered help on the completion of questions if it was required. On such occasions it was arranged that reference would first be made to the researcher to attempt to achieve some level of consistency across the sample. (In actual fact the exercise caused little difficulty and the sample completed the questionnaire with very few problems encountered). Whilst completing the questionnaire, the map that they had drawn of their home area was returned to them for reference. They were invited to add to it or amend it if necessary, in order to obtain as complete a picture of their 'perceptions' as possible. Throughout the exercise the children were asked <u>not</u> to consult with each other.

The resulting maps drawn by the pupils were analysed in a variety of ways, based to a great extent on criteria developed in previous research, but modified for this particular undertaking *1. The criteria for the first stage of the map analysis was tested on a cross-sectional sample of the maps by two judges *2 who analysed the maps in the terms specified. (The details of the criteria and the instructions for this analysis can be seen in Appendix 3). Once satisfied that the criteria were clear and that it was possible to analyse the maps in such terms, each map was considered in the following way. (Correlations between the judges on the scales used will be discussed later in this chapter).

Map 1
(The Area where subjects lived)

1. The Extent of the Area depicted
2. The degree of Abstraction demonstrated
3. The Perspective Adopted
4. Accuracy or Quality
5. Map structure or Style

Map 2
(The Route from Home to School)

1. The degree of Abstraction demonstrated
2. The perspective adopted
3. Accuracy or Quality
4. Map structure or Style

Each of these elements were scored separately on a 0 - 5 point scale (and 0 - 4 scale in the case of Map Style). The scores for the degree of abstraction demonstrated, the perspective adopted, the accuracy or quality of the map, and the map style were then combined to produce a Total Map score for each of the maps, as can be seen in the following example.

		Abstraction	Perspective	Quality	Structure	Composite Map Score
eg	Map 1	5	4	3	2	14
	Map 2	3	3	3	1	10

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*1 The breakdown of the criteria and the research upon which they are based is discussed in Appendix 3.

*2 The researcher and Mr Michael Younger of the Geography Dept at Homerton College, to whom I am most grateful for this lengthy undertaking.

The individual scores for each element and the final scores for each map were included in the statistical analysis, for as can be seen later in this section, it is hypothesised that there are likely to be close associations between success on each of the scales and performance on the tests of Field dependence/independence. It could be argued, as Gold (1980) has suggested, that these forms of analysis will provide more information about the cartographic skills of the children involved rather than their perceptions of the environment. so the maps were also analysed in the following terms:

1. Labelling. A recent study by Mathews (1980) had demonstrated an association of the degree of labelling and the quality of maps produced by a sample of 11 - 18 year olds. Simple percentage comparison of his results revealed that all maps of children aged 14 and above contained some form of labelling whilst 17% of eleven year olds and 11 per cent of 12 year olds did not differentiate features semantically. This study would serve as a comparison for the 11 and 12 year olds, and offer additional information for those children aged 10.

2. Map Structure: Lynch's classification of the structure of maps, although criticised (Pocock 1977, 1979) has been employed in a wide range of studies. Mathews (1980) suggests that there is a preference for the inclusion of a wider array of features as age increases. In his study, paths, nodes and landmarks were included by large proportions of his sample and for the youngest children individual buildings rather than routes were emphasised, stressing the functional significance of the environment for them. Each of the maps in this study were analysed for inclusion or absence of each of Lynch's characteristics and results could again serve as a comparison with studies such as those of Mathews (1980) and Calland (1976) and the detailed review of such studies by Moore and Young (1978).

3. Elemental Content. As suggested above (Mathews 1980) previous research has identified an association between age and the number and type of features included on cognitive maps. Similarly, other studies (Bishop and Fousham 1973) have noted young children's concern with the minute and incidental as compared with adults. Each of the maps in this study were examined for type and range of features

included, with the possibility of an association between them and tests of Field dependence and independence.

The Questionnaire was analysed separately, then compared with the information portrayed on the Area maps. The organisation and results of this analysis will be discussed in a later section.

As a final element of stage 1, it was proposed that some measure of Personality and its association with the factors under study should be included. As was discussed earlier, certain personality characteristics have been associated with each of the extremes identified by Witkin. These are discussed in Witkin and Goodenough (1976) and Witkin, Moore, Goodenough and Cox (1977). Similarly Cattell (1969) had suggested that the Q4 'Independence' factor of his 16 PF Personality Inventory was likely to load significantly with tests of Field Independence. The only known association of Personality and Environmental Perception is Sonnenfeld's (1969) suggestion of the existence of an 'environmental personality' which predisposes one to behave in certain ways in any environmental setting. As was mentioned earlier, Sonnenfeld suggested that each of us are selectively sensitive to cues from the environment and that the identification of factors influencing these degrees of sensitivity might be a useful avenue for research. In this context it might be argued that a bias for field dependence or independence might predispose an individual to behave in certain ways in any environmental setting and as such influence what he perceives to be of importance in that environment.

The major difficulty of including a consideration of personality however, was that of finding an appropriate research instrument. Despite obvious problems of reliability, it was decided to adapt a scale which had been devised by the Open University for their course E 201. (Floyd 1976). In this course, it was suggested that research evidence exists to support the association of the following personality characteristics with the Field dependence - independence continuum.

Factors associated with Field Independence	Factors associated with Field dependence
Leader	Follower
Solitariness	Gregariousness
Introvert	Extravert
Individualistic	Conformist
Perseveres	Gives up Easily
Independent	Dependent

In the examples presented in the Open University course each of these pairs were seen as opposites with an individual tending towards one extreme or the other. Thus a predominantly field independent individual would tend towards the left hand side of the diagram and a predominantly field dependent subject towards the right hand side. It was felt however, that scores on continua scales hide more than is revealed, so the characteristics listed above were treated as separate personality features and presented in random order. The children's year tutors were then asked to make an assessment for all of the children in their year group, when compared with their peers, for each of the characteristics listed on a 5 point scale, from it not being a feature of their personality, to it being a dominant feature of their personality. Year tutors were selected to reduce the number of teachers making an assessment for each child and because of their close pastoral care and personal knowledge of the children. The instructions for the exercise were standardised and printed on each response format, a copy of which can be seen in Appendix 1. The results would therefore produce separate scores for each child for each of the characteristics and scores could be combined in the terms described by the Open University to produce scores for those factors which research had suggested were associated with Field dependence and Field Independence. The major problem with analysis of this kind however is consistency and inter-judge reliability. This is accepted and recognised. It was to some extent overcome in that the year tutors undertook the task and in the rural school it was taken as a very serious exercise indeed, with the teachers of the various year groups participating in the analysis over several year group meetings. In the urban schools it relied on four different teachers, the two primary class teachers and the first and second year year tutors in the Secondary school. Consistency was attempted by standardising the instructions and the researcher constantly being available for advice whilst the forms were being completed. Despite the potentially low level of reliability, it was felt to be a worthwhile inclusion to give at least some indication of the relationship which might exist between style, personality and environmental perception.

This concludes a review of the measuring techniques employed in the first stage of the empirical research. The next section presents data on the reliability of these techniques and the following diagram describes the techniques in tabulated form.

TABLE 4. 2

MEASURES EMPLOYED IN STAGE 1 OF THE STUDY

1. Cognitive Style	Detail	Score	
SFT	Simple Figures hidden in more complex shapes	0 - 25	
RFT	Degree of deviation from upright over 8 trials	3.5° - 223.5	
ABC	Degree of differentiation of drawings	1 - 5	
2. Measures of Ability			
AH 3	Verbal Numerical and Perceptual Reasoning	0 - 40	Total 120
ST 2	5 sub tests of ability to deal with 3 dimensional material	0 - 20	Total 100
DAM	Drawing of a Man and a Woman	0 - 72	Standardised
		0 - 69	Scores for Each
3. Measures of Environmental Perception			
Orientation	Exercise 1 Simple Plans	0 - 9	Total 0 - 43
	Exercise 2 Street Plan	0 - 22	
	Exercise 3 Relating Map Extract to Pictures	0 - 12	
DA Plan	Drawing of Lower Floor of House	0 - 40	Standardised Scores
Maps 1 and 2	Areal Extent (Map 1 only)	1 - 5	
	Degree of Abstraction	1 - 5	Combined to produce a score for each map out of 19
	Perspective Adopted	1 - 5	
	Accuracy	1 - 5	
	Style	1 - 4	
	Labelling	1, 2 or 3	
	Structure (Paths, Landmarks, Nodes, Edges, Districts)	Presence or Absence	
	No and Type of Features Included	Individually analysed and for the sample	

3. Measure of Environmental Perception (Contd.)

Questionnaire	Favourite Places (and Reasons)			
	Disliked Places (" ")			
	Comfortable Places			
	Uncomfortable Places			
	Dangerous Places			
	Beautiful Places			
	Noises			
	Smells			
	A series of Guide Photographs			
	Sights shown to Child, Relation and Other Adult			
Personality Characteristics	Leader	0 - 4	Follower	0 - 4
	Solitary	0 - 4	Gregarious	0 - 4
	Introvert	0 - 4	Extravert	0 - 4
	Individualistic	0 - 4	Conformist	0 - 4
	Perseveres	0 - 4	Gives up easily	0 - 4
	Independent	0 - 4	Dependent on others	0 - 4
	Field Ind. Score		Field Dep. Score	

Scoring, Inter Judge reliability and the Reliability of the Measuring instruments

Two of the measuring techniques employed in the study were more open to criticism because they involved less objective scoring. These are the Articulation of Body Concept Scale and the analysis of the maps for Areal Extent, Abstraction, Perspective, Accuracy and Style. In an attempt to achieve a greater degree of objectivity, panels of judges were used in the marking of these tests.

As was discussed earlier, the Articulation of Body Concept Scale considers the degree of 'psychological differentiation' (Witkin et al 1971), demonstrated in children's drawings of a man and a woman. These drawings are scored on a 1 to 5 point scale, a score of 1 representing the most 'articulated' drawings and a score of 5 representing the least 'articulated' drawings. The detailed criteria for this analysis can be seen in Appendix 1 along with examples of drawings for each of the five categories. A panel of three judges * scored the drawings collected for this study using the criteria provided by Dr Oltman. The correlations between the judges were as follows:

J 1 with J 2	:	0.8306	$p<.01$
J 1 with J 3	:	0.9087	$p<.01$
J 2 with J 3	:	0.7609	$p<.01$

(These compare most favourably with previously reported measures of reliability by Witkin et al 1974).

Final grades for each child were assigned by comparing the grades of the three judges. If two judges scored an individual in a particular category, it was assigned to that category. Any drawings where this did not apply were discussed and assigned to an agreed category. As can be seen by the correlations above, these occasions were rare and the degree of correspondence between the judges highly significant. However, each of the judges questioned how carefully

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* 1. Mr John Ball of the Psychology department of Homerton College Cambridge, who has a particular interest in psychological aspects of children's drawing.

2. Mr David Spence of the Art department of Homerton College Cambridge

3. The Researcher. My grateful thanks to my colleagues.

they were following the stated criteria, as opposed to looking at the drawings in terms of progressive development of drawing skill. This was a question raised earlier and it was proposed to further investigate this by analysing the drawings in the terms specified by the Goodenough-Harris Draw-a-man test, the results of which will be discussed in the next section.

As has been explained, a major element of the map analysis considered each of the maps produced by the sample in the following terms:

1. The Extent of the Area depicted (Area Map only)
2. The degree of Abstraction demonstrated (Both Maps)
3. The Perspective adopted. (Both Maps)
4. The Quality/Accuracy of the Map (Both Maps)
5. The Map Style employed (Both Maps)

Each of these categories are derived from previous research into the analysis of cognitive maps and the derivation of each of them is explained in detail in Appendix 3. These categories were also selected as elements likely to demonstrate close association with the measures of field independence. As can be seen in Appendix 3 each of the categories were presented as a progressive scale representing successive improvement in the maps, (Thus the first four categories listed above were scored on a scale from 1 to 5 and the last category, of map style on a scale of 1 to 4) the lower scores representing maps of poorer quality. This technique of scoring cognitive maps is one which is regularly demonstrated throughout the research (eg Appleyard 1970, Klett and Alpaugh 1976) but it is open to considerable criticism as Bycroft (1974) has demonstrated.

In an attempt to achieve greater objectivity in the analysis of the maps, it was proposed to follow Bycroft's example and use a panel of judges. However, the demands of scoring nearly 1,000 maps for each of these categories was an overwhelming burden to place on others, so as a compromise, a random sample of 100 different maps were analysed for each of the categories by a panel of two judges*

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* 1. Mr Michael Younger of the geography department at Homerton College, to whom I am most grateful.

2. The Researcher.

which meant 500 of the maps were considered by them for at least one of the categories. The correlations between the two judges for this exercise were as follows:

Areal Extent :	J 1 with J 2	0.83	$p < .01$
Degree of Abstraction :	J 1 with J 2	0.94	$p < .01$
Perspective :	J 1 with J 2	0.93	$p < .01$
Accuracy or Quality :	J 1 with J 2	0.97	$p < .01$
Style or Structure :	J 1 with J 2	0.94	$p < .01$

This proved to be a most useful exercise and after minor refinement to the scales each of the maps were then graded by the researcher following the final guidelines which can be seen in Appendix 3.

Other reported measures of reliability for the tests employed in the study were as follows:

Embedded Figures Test. Witkin et al (1971) confirmed the reliability of this test for various age groups in the following table

Age Level	Sex	N	Reliability
10	M	51	.86
	F	52	.81
11	M	21	.84
	F	24	.74
12	M	25	.78
	F	26	.74
13	M	26	.61
	F	25	.85
15	M	25	.92
	F	25	.74
17	M	23	.84
	F	25	.61
College Students	M	51	.82
	F	51	.79

(The reliability coefficients cited here were computed by the Spearman Brown Method)

2. Rod and Frame Test. Oltman (1968) reported Spearman-Brown split half reliabilities of 0.95 for the portable rod and frame apparatus.

3. Articulation of Body Concept Scale. Witkin et al (1962, 1974) reported reliability correlations of 0.84 between two judges' ratings of drawings of 30 ten year old boys. They also cited an unpublished study of 20, 12 - 15 year old Israeli children whose drawings were rated by three judges. The correlation between the judges were 0.99, 0.98 and 0.84. In another study by Fuller and Lumney (1965) the drawings made by 104 children aged between 7 and 17 (66 males and 38 females) were rated by two judges and found to correlate at 0.91.

4. AH3. Heim et al (1974) report test-retest correlations over a 10 month gap of 176 eleven year olds as follows:

Verbal	:	0.81
Numerical	:	0.83
Perceptual	:	0.76
AH3	:	0.91

Split half correlations of 100 technical college students (40 females - 60 males) revealed the following results:

Verbal	:	0.84
Numerical	:	0.86
Perceptual	:	0.70
AH3	:	0.92

5. Draw-A-Man. In a dated, but detailed study of the reliability of the Draw-a-Man, McCarthy (1944) reported inter-scorer correlations of 0.81, 0.90 and 0.92 between three scorers when considering the drawings of 386 children aged 7 - 13. Similar correlations are reported by Harris & Goodenough (1963) who comment that examiner effect and art training were found to be a negligible influence on test results.

6. Draw-A-Plan. Thorstad (1974) reports split half reliability coefficients of between 0.82 and 0.98 for her sample of 1,900,7 - 14 year olds, scorers reliability coefficients were all above 0.90.

7. <u>Cognitive Mapping Studies</u>. Bycroft (1974) reported detailed measures of inter-judge reliability for each of his analyses. In the wholistic sorting of maps inter judge reliability was high, ranging from 0.64 to 0.76, similarly analysis of map content produced high measures of agreement ranging from 0.62 to 0.79. The comparison of the structural analysis of the maps were not as positive however and revealed correlations between 0.096 and 0.486 for his five judges, nor were the results of the 'presentation measure' a consideration of the maps in terms of pictorial, symbolic and abstract representation. Correlations for this section ranged from 0.017 to 0.533. Klett and Alpaugh (1976) although not reporting measures of reliability, compared the successful rating of maps within their categories. (Scale, Perspective, Abstraction) and reported the results as percentages. Approximately 786 of the drawings were successfully rated. In cases where no initial majority opinion amongst their three judges emerged, the drawings were discussed and a majority opinion achieved. In only 6% of cases was no majority opinion reached.

Unfortunately no reliability details were available for the measures of orientational ability or for Spatial Test 2. The reliability of these tests with the sample used in the present study and all of the techniques described above are discussed in a later chapter. The next section considers the organisation of stage two of the empirical study, the follow up study with representatives of the extremes of field dependence and field independence.

The Follow Up Study

For the second element of the empirical study, two subgroups were selected to represent the extremes of the sample in terms of field dependence and field independence. As was discussed earlier, previous research has tended to rely on the results of one test, usually a version of the Embedded Figures Test and has designated those at either ½ a standard deviation from the mean (as in the case of Doebler and Eicke, 1979) or one full standard deviation from the mean (eg Case 1974) as representing the extremes of field dependence and field independence. For the purposes of this study it was proposed to include all children in a follow up study who demonstrated consistency across the three measures of cognitive style (eg EFT, RFT and ABC) but at 1½ standard deviations from the mean for their age groups. ~~This~~ it is was felt provides a clearer indication of true field dependence and independence in Witkin's terms and goes some way to satisfying the criticisms of Vernon 1972, Satterly and Brimer 1971, Goldstein and Blackman 1978 and Arbuthnot 1972. It was also hypothesised that any differences which exist between field dependent and field independent individuals in their perception of the environment is more likely to be demonstrated by such extreme groups.

Analysis of the full sample in these terms produced a possible group of 19 extreme field independent individuals and 23 extreme field dependent individuals which were spread across age groups, sexes and schools. Of the 23 field dependents, six were classified by their respective schools as remedial* so they were withdrawn from the subgroups leaving a possible 19 Field Independents and 17 Field Dependents. It was proposed that each of these children be interviewed individually and that as small groups they would participate in a further practical field exercise. When this was undertaken, for various reasons three children were absent leaving a final subgroup sample of 17 field independent and 16 field dependent subjects made up in the following way: (Although for parts of the follow up study analysis there were 17 in each group).

*Offering further evidence about the relationship between Field dependence and intelligence

		Rural Child-ren 10+	Urban Child-ren 10+	Rural Child-ren 11+	Urban Child-ren 11+	Rural Child-ren 12+	Urban Child-ren 12+	TOTALS	
FI	BOYS	2	2	-	2	2	-	8	17
	GIRLS	-	3	2	1		3	9	
FD	BOYS	2	2	1	1	2	-	8	16
	GIRLS	3	-	2	-	1	2	8	

TABLE 4. 3 The Follow up Study Sample

The interview was based upon further questions, associated with Field dependence/independence research and children's perceptions of their environment. It also allowed follow up questions based on the children's maps and questionnaires completed earlier in the study. The field exercise was the same for all of the children and consisted of a short walk around an area unknown to them. They were asked to note features of importance for them and then required to draw a map of the route they had walked and estimate the distance involved. (More comprehensive details of these undertakings and the standardised instructions employed can be seen in Appendix 4). The maps and interviews were then analysed as described for the other maps and questionnaires.

This chapter outlining the empirical study concludes with a breakdown of the hypotheses investigated in the first part of the empirical research.

HYPOTHESES TO BE INVESTIGATED IN THE FIRST STAGE OF THE STUDY

The following hypotheses are seen as contributory to investigating the underlying purpose of the research, which is a consideration of the relationships which exist between children's perceptions of their environment and cognitive style as defined by Witkin's analytic/global dimension. The following specific research hypotheses were identified with regard to the measures employed and they can be divided into four main categories.

1. Those which investigate further the notion of cognitive style;
2. Intercorrelations between some of the measures themselves;
3. Those which consider relationships with the cognitive map analysis;
4. That which investigates personality and cognitive style.

1. <u>Those hypotheses which further investigate Cognitive Style</u>

1. Research suggests that there will be a positive and significant correlation between the three measures of cognitive style (ie between the Embedded Figures Test, the Rod and Frame Test and the Articulation of Body Concept Scale).

2. Since 'cognitive styles' purport to cut across general levels of ability, one would not necessarily expect high correlations with intelligence (as measured by AH3) and the measures of cognitive style.

3. There are likely to be higher correlations with the perceptual reasoning component of AH3 and the measures of cognitive style than with verbal or numerical reasoning.

4. The Draw-A-Man Test will correlate positively and significantly with AH3 and in particular with perceptual reasoning.

5. The correlation between Draw-A-Man test and the Articulation of Body Concept Scale will prove to be both positive and significant.

6. Research suggests that correlations between Spatial ability and cognitive style will prove to be positive and significant. (This will apply especially to the Embedded Figures Test)

7. There will be a positive and significant correlation between the measures of orientational ability (01 and 02) and the measures of cognitive style. (This was expected to be particularly true of the

EFT and RFT because of the 'orientational' skills required in them).

8. The disembedding skills required in orientation test 3 will correlate positively and significantly with those demonstrated by the tests of cognitive style.

9. Scores on the Draw-A-Plan Test will correlate positively and significantly with the measures of cognitive style.

2. <u>Inter-Correlations amongst the other measures used in the study</u>

10. There will be a positive and significant correlation between ST 2* and intelligence but particularly with perceptual reasoning.

11. Orientation soores will correlate positively and significantly with intelligence, but with perceptual reasoning in particular.

12. Orientation scores will correlate positively and significantly with spatial ability.

13. Scores on the Draw-A-Plan Test will correlate positively and significantly with the measures of intelligence and with perceptual reasoning in particular.

14. Scores on the Draw-A-Plan Test will correlate positively and significantly with the measure of spatial ability.

15. Scores on the Draw-A-Plan Test will correlate positively and significantly with scores on the orientation exercises.

16. Scores on the Draw-A-Plan Test will correlate positively and significantly with those of the Draw-A-Man Test.

3. <u>Hypotheses investigating associations with the cognitive maps produced by the sample</u>

17. Each of the Elements for which the maps were analysed will correlate positively and significantly with the tests of cognitive style with the analytic (field independent) subjects producing better maps.

18. Each of the elements for which the maps were analysed will correlate positively and significantly with the measures of intelligence and with perceptual reasoning in particular.

19. There will be a positive and significant relationship between the elements for which the maps were analysed and spatial ability.

20. There will be a positive and significant relationship demonstrated between the measures of orientation and the elements for which the maps were analysed.

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* ST2 refers to Spatial Test 2 which was described earlier.

21. There will be a positive and significant correlation between the elements for which the maps were analysed and the results of the Draw-A-Plan analysis.

22. There will be a positive and significant correlation between the composite map scores for Map 1 and Map 2. (Thus demonstrating consistency across the maps, and offering evidence to support cognitive mapping as a consistent means of obtaining data).

23. The influence of Age will be reflected across the results of the study and will be demonstrated in particular in the correlations of the Tests of Cognitive Style and those of the map analysis.

4. Correlations between the measures of cognitive style and aspects of personality

24. Composite scores for personality characteristics associated with field independence will correlate positively and significantly with the measures of cognitive style and conversely there will be a significant negative correlation demonstrated between the measures of cognitive style and the composite scores for Personality Characteristics associated with Field dependence.

Each of these hypotheses will be considered for Age and Sex differences and for any differences which exist between those children living in a more 'urban' as opposed to a more 'rural' environment.

The next section presents a statement and discussion of the results of the analysis and investigation of these hypotheses.

CHAPTER FIVE - A Statement and discussion of the Results

The central focus of this research has been an investigation into the relationship between cognitive style, as represented by Witkin's analytic/global dimension and children's perceptions of their environment. This section attempts to co-ordinate and discuss the results of the study and to relate their significance to the previous research which was reviewed in chapters two and three. This chapter will be organised in the following way:

1. The overall results produced by the sample
2. An analysis of Intercorrelations between the various elements of the study
3. Feature Analysis of
   1) The Questionnaire
   2) The Maps
4. Additional Map Analysis
   1) Labelling
   2) Structure
5. The Follow up study

1. The overall results produced by the sample

The following five tables provide a detailed description of the overall characteristics of the sample on the measures of cognitive style, ability, mapping exercises and aspects of personality. Each table includes details of mean scores, standard deviations and the range of scores for the sub groups of the sample, ie

TABLE A The overall characterstics of the sample (including comparison by sex)

TABLE B Characteristics of the sample by Age and Sex (including sub divisions for 10 - 11, 11 - 12, and 12 - 13 year old boys and girls)

TABLE C Characteristics of the Sample by Residence (ie 'Urban' and 'Rural' groupings)

TABLE D Characteristics of the sample by residence and sex (ie Urban Boys, Rural Boys, Urban Girls, Rural Girls)

TABLE E Characteristics of the sample by Age, Sex and residence (ie 10 - 11 Urban boys, Rural Boys, Urban girls, Rural girls; 11 - 12 Urban boys, Rural boys, Urban girls, Rural girls; 12 - 13 Urban boys, Rural boys, Urban girls, Rural girls)

In the text which follows, Tables are labelled 5.I, 5.2 etc, indicating that they are to be found in Chapter 5. The discussion of results refers only to the Table number, and excludes the chapter reference, i.e. Table 5 indicates.....

TABLE 5 A The Overall Characteristics of the Sample

	VARIABLES	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	16.574	5.854	0-25	16.900	5.912	0-25	16.250	5.791	1-25
	RFT	43.003	55.818	3.5-223.0	38.295	51.509	3.5-223.5	47.731	59.567	5-222.5
	ABC	3.143	0.947	1-5	3.325	0.988	1-5	2.961	0.868	1-5
ABILITY	AH3	51.747	16.452	9-100	50.729	16.079	9-100	52.773	16.793	14-91
	VERBAL	17.632	6.446	1-34	16.949	6.187	1-33	18.321	6.639	3-34
	NUMERICAL	12.606	6.237	0-35	12.992	6.343	2-35	12.218	6.117	0-33
	PERCEPTUAL	21.541	6.232	1-35	20.862	6.115	5-35	22.228	6.287	1-35
	SPATIAL TEST 2	59.017	20.306	11-99	60.440	20.604	11-94	57.607	19.950	15-99
	DRAW-A-MAN	103.095	13.105	58-139	103.143	13.920	58-139	103.048	12.262	67-132
MAPPING EXERCISES	DRAW-A-PLAN	100.095	13.544	70-131	97.545	14.016	70-131	102.622	12.587	75-129
	ORIENTATION 1	7.028	1.819	0-9	6.893	1.885	1-9	7.163	1.744	0-9
	ORIENTATION 2	13.212	4.333	1-22	13.068	4.333	1-22	13.356	4.338	2-22
	ORIENTATION 3	7.053	3.316	1-12	7.685	3.325	1-12	6.416	3.190	1-12
	EXTENT	2.553	0.959	1-5	2.665	1.035	1-5	2.438	0.863	1-5
	ABSTRACTION 1	3.564	1.272	1-5	3.717	1.123	1-5	3.407	1.393	1-5
	PERSPECTIVE 1	4.116	1.207	1-5	4.287	1.064	1-5	3.942	1.317	1-5
	ACCURACY 1	2.390	0.902	1-5	2.404	0.956	1-5	2.376	0.846	1-5
	STYLE 1	2.711	0.600	1-4	2.709	0.632	1-5	2.712	0.567	1-5
	MAP 1 (COMPOSITE)	12.735	3.049	4-19	13.117	2.816	5-19	12.447	3.240	4-18
	ABSTRACTION 2	3.904	1.163	1-5	4.058	1.029	1-5	3.760	1.262	1-5
	PERSPECTIVE 2	4.361	1.003	1-5	4.577	0.795	1-5	4.158	1.131	1-5
	ACCURACY 2	2.349	0.977	1-5	2.426	1.012	1-5	2.276	0.939	1-5
	STYLE 2	2.601	0.801	1-4	2.529	0.792	1-5	2.670	0.806	1-5
	MAP 2 (COMPOSITE)	13.217	2.858	4-19	13.591	2.473	5-19	12.864	3.143	4-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.543	1.236	0-4	1.398	1.235	0-4	1.688	1.223	0-4
	SOLITARINESS	1.227	1.054	0-4	1.274	1.076	0-4	1.179	1.029	0-4
	INTROVERT	1.410	1.122	0-4	1.394	1.117	0-4	1.425	1.129	0-4
	INDIVIDUALISTIC	1.998	1.073	0-4	1.942	1.063	0-4	2.054	1.083	0-4
	PERSEVERES	2.252	1.021	0-4	2.079	1.003	0-4	2.425	1.012	0-4
	INDEPENDENT	2.056	1.074	0-4	1.938	1.080	0-4	2.175	1.056	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.478	3.495	0-21	10.025	3.622	0-21	10.933	3.308	1-17
	FOLLOWER	1.825	1.070	0-4	1.921	1.102	0-4	1.729	1.030	0-4
	GREGARIOUS	1.906	1.085	0-4	1.954	1.054	0-4	1.858	1.115	0-4
	EXTRAVERT	1.690	1.208	0-4	1.734	1.178	0-4	1.646	1.239	0-4
	CONFORMIST	2.089	0.930	0-4	2.033	0.894	0-4	2.146	0.964	0-4
	GIVES UP	1.428	1.097	0-4	1.585	1.100	0-4	1.271	1.073	0-4
	DEPENDENT	1.125	1.060	0-4	1.759	1.092	0-4	1.563	1.021	0-4
	COMPOSITE SCORE FOR FD CHARACTERISTICS	10.638	3.466	1-21	11.017	3.433	1-19	10.258	3.464	3-21

(Results of the Questionnaire Analysis and further Map Analysis will be outlined in a later section)

TABLE 5 BI Characteristics by Age - Boys

	VARIABLES	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	15.190	5.794	4-25	16.885	5.961	0-25	18.010	5.739	2-25
	RFT	58.587	68.578	5.5-223.5	33.526	46.101	6-212	29.230	38.349	3.5-214
	ABC	3.661	0.940	1-5	3.355	0.989	1-5	3.075	0.958	1-5
ABILITY	AH3	41.492	13.984	12-91	53.115	15.131	20-95	54.895	15.822	9-100
	VERBAL	13.444	5.432	3-30	18.244	5.825	7-32	18.211	6.100	1-33
	NUMERICAL	9.984	5.160	2-26	13.564	6.115	3-31	14.516	6.612	2-35
	PERCEPTUAL	18.095	6.337	5-35	21.179	5.709	9-35	22.374	5.733	6-34
	SPATIAL TEST 2	53.049	19.947	16-88	59.553	20.175	11-94	65.895	19.959	14-94
	DRAW-A-MAN TEST	101.952	15.518	58-139	102.829	13.150	79-137	104.194	13.477	74-135
MAPPING EXERCISES	DRAW-A-PLAN TEST	100.065	13.843	75-131	95.507	13.864	70-130	97.469	14.126	73-127
	ORIENTATION 1	6.444	1.830	1-9	6.895	2.004	1-9	7.189	1.282	2-9
	ORIENTATION 2	11.524	3.860	3-19	13.132	3.890	1-21	14.042	4.699	1-22
	ORIENTATION 3	7.063	3.068	2-12	6.987	3.657	1-12	8.646	2.991	2-12
	EXTENT	2.459	0.941	1-5	2.487	0.959	1-5	2.946	1.097	1-5
	ABSTRACTION 1	3.410	1.086	1-5	3.566	1.289	1-5	4.043	0.908	1-5
	PERSPECTIVE 1	4.082	1.053	1-5	4.105	1.260	1-5	4.570	0.813	1-5
	ACCURACY 1	2.279	0.819	1-4	2.224	0.961	1-5	2.634	0.998	1-5
	STYLE 1	2.656	0.544	2-4	2.579	0.548	1-4	2.849	0.722	1-4
	MAP 1 (COMPOSITE)	12.426	2.513	6-18	12.474	3.066	6-19	14.097	2.515	5-19
	ABSTRACTION 2	3.610	1.246	1-5	3.955	0.983	1-5	4.458	0.704	2-5
	PERSPECTIVE 2	4.424	0.969	1-5	4.470	0.881	2-5	4.771	0.502	3-5
	ACCURACY 2	2.119	0.930	1-4	2.343	0.962	1-5	2.711	1.042	1-5
	STYLE 2	2.407	0.833	1-4	2.515	0.769	1-4	2.627	0.776	1-4
	MAP 2 (COMPOSITE)	12.559	2.699	5-17	13.318	2.413	7-19	14.542	1.983	10-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.825	1.264	0-4	1.321	1.211	0-4	1.190	1.178	0-4
	SOLITARINESS	1.286	1.023	0-4	1.000	1.044	0-4	1.480	1.096	0-4
	INTROVERT	1.317	1.075	0-4	1.385	1.119	0-4	1.450	1.149	0-4
	INDIVIDUALISTIC	2.190	0.998	0-4	1.962	1.025	0-4	1.770	1.109	0-4
	PERSEVERES	1.905	1.043	0-4	2.321	0.987	1-4	2.000	0.964	0-4
	INDEPENDENT	2.143	1.162	0-4	2.179	0.977	0-4	1.620	1.033	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.667	3.137	4-17	10.167	3.645	1-21	9.510	3.842	0-20
	FOLLOWER	2.000	1.063	0-4	1.654	1.103	0-4	2.080	1.098	0-4
	GREGARIOUS	1.249	1.118	0-4	1.987	1.038	0-4	1.750	0.989	0-4
	EXTRAVERT	2.111	1.179	0-4	1.795	1.155	0-4	1.450	1.132	0-4
	CONFORMIST	2.000	0.861	0-3	2.000	0.926	0-4	2.080	0.895	0-4
	GIVES UP	1.857	1.090	0-4	1.295	1.070	0-3	1.640	1.087	0-4
	DEPENDENT	1.714	1.211	0-4	1.564	1.064	0-4	1.940	1.013	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	11.921	2.497	5-17	10.423	3.923	3-19	10.910	3.447	1-19

TABLE 5 B2 Characteristics by Age - Girls

	VARIABLES	10 - 11 Year Olds			11 - 12 Year Olds			12 - 13 Year Olds		
		Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	13.319	5.465	1-24	16.341	5.126	1-25	18.438	5.677	3-25
	RFT	50.659	59.520	7-218	51.762	61.160	7-222.5	41.747	58.294	5-222
	ABC	3.391	0.669	2-5	2.937	0.822	1-5	2.622	0.911	1-4
ABILITY	AH3	43.000	12.52	18-73	50.219	16.387	14-90	62.941	14.592	27-91
	VERBAL	14.254	5.136	3-27	18.049	6.132	7-33	21.788	6.313	6-34
	NUMERICAL	9.119	4.252	0-26	11.390	6.586	0-33	15.459	5.366	3-27
	PERCEPTUAL	19.627	6.159	1-30	20.756	6.195	1-35	25.580	4.908	12-35
	SPATIAL TEST 2	51.478	18.706	19-96	53.247	18.160	22-95	66.845	19.405	15-99
	DRAW-A-MAN TEST	102.435	12.025	75-132	102.582	13.206	67-129	104.012	11.587	73-126
MAPPING EXERCISES	DRAW-A-PLAN TEST	104.217	12.141	80-129	98.793	12.099	75-128	105.110	12.665	79-129
	ORIENTATION 1	6.159	1.746	3-9	7.481	1.678	1-9	7.682	1.457	0-9
	ORIENTATION 2	11.739	3.261	2-19	12.684	4.454	3-22	15.294	4.309	3-22
	ORIENTATION 3	6.188	3.074	1-12	5.911	2.927	2-12	7.071	3.432	1-12
	EXTENT	2.344	0.895	1-4	2.075	0.671	1-4	2.866	0.828	1-5
	ABSTRACTION 1	2.984	1.507	1-5	3.350	1.468	1-5	3.793	1.108	1-5
	PERSPECTIVE 1	3.484	1.425	1-5	3.837	1.326	1-5	4.402	1.064	1-5
	ACCURACY 1	2.266	0.802	1-3	2.087	0.830	1-3	2.744	0.767	1-5
	STYLE 1	2.594	0.526	2-4	2.688	0.518	1-4	2.829	0.625	1-4
	MAP 1 (COMPOSITE)	11.328	3.423	6-16	11.962	3.239	4-16	13.793	2.600	6-18
	ABSTRACTION 2	2.984	1.314	1-5	3.709	1.189	1-5	4.430	0.872	2-5
	PERSPECTIVE 2	3.429	1.341	1-5	4.291	0.922	1-5	4.680	0.823	1-5
	ACCURACY 2	1.984	0.793	1-3	1.962	0.854	1-5	2.823	0.888	1-5
	STYLE 2	2.381	0.750	1-4	2.506	0.732	1-4	3.063	0.774	1-4
	MAP 2 (COMPOSITE)	10.794	3.118	4-17	12.456	2.731	4-19	14.924	2.099	9-19
ASPECTS OF PERSONALITY	LEADERSHIP	2.087	1.160	0-4	1.463	1.249	0-4	1.584	1.185	0-4
	SOLITARINESS	1.159	1.066	0-4	0.963	0.922	0-4	1.393	1.062	0-4
	INTROVERT	1.536	1.119	0-4	1.402	1.142	0-4	1.360	1.131	0-4
	INDIVIDUALISTIC	2.406	0.960	0-4	1.963	1.071	0-4	1.865	1.130	0-4
	PERSEVERES	2.449	0.978	1-4	2.573	0.930	0-4	2.270	1.095	0-4
	INDEPENDENT	2.551	0.948	1-4	2.073	1.131	0-4	1.978	1.000	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	12.188	2.277	6-17	10.439	3.356	3-17	10.416	3.689	1-17
	FOLLOWER	1.870	1.028	0-4	1.780	1.031	0-3	1.573	1.021	0-4
	GREGARIOUS	1.928	1.155	0-4	1.793	1.141	0-4	1.865	1.068	0-4
	EXTRAVERT	1.855	1.240	0-4	1.805	1.309	0-4	1.337	1.117	0-4
	CONFORMIST	2.493	1.024	0-4	2.146	0.803	0-4	1.876	0.975	0-4
	GIVES UP	1.348	0.997	0-4	1.207	1.074	0-3	1.270	1.136	0-4
	DEPENDENT	1.623	1.099	0-4	1.451	1.044	0-3	1.618	0.935	0-4
	COMPOSITE SCORE FOR FD CHARACTERISTICS	11.261	2.501	5-16	10.195	3.808	3-17	9.539	3.618	3-21

TABLE C Characteristics of the Sample by Residential Location

	VARIABLES	RURAL			URBAN		
		Mean	S.D.	Range	Mean	S.D.	Range
COG-STYLE	EFT	15.228	5.970	0-25	17.996	5.388	1-25
	RFT	48.976	60.607	3.5-223.5	36.751	49.683	4-217
	ABC	3.208	0.937	1-5	3.069	0.955	1-5
ABILITY	AH3	49.047	14.631	14-93	54.633	17.802	9-100
	VERBAL	16.803	5.757	3-32	18.527	7.019	1-34
	NUMERICAL	11.795	5.642	2-31	13.482	6.725	0-35
	PERCEPTUAL	20.426	5.779	1-34	22.708	6.483	5-35
	SPATIAL TEST 2	56.988	18.902	11-96	61.210	21.549	14-99
	DRAW-A-MAN	101.445	12.751	67-132	104.968	13.277	58-139
MAPPING EXERCISES (MAP 1)	DRAW-A-PLAN	101.909	13.483	70-131	98.117	13.361	70-129
	ORIENTATION 1	6.927	1.735	1-9	7.140	1.906	0-9
	ORIENTATION 2	12.882	3.847	1-22	13.577	4.795	1-22
	ORIENTATION 3	7.061	3.401	1-12	7.045	3.228	1-12
	EXTENT	2.381	0.997	1-5	2.729	0.888	1-5
	ABSTRACTION 1	3.706	1.442	1-5	3.418	1.054	1-5
	PERSPECTIVE 1	3.926	1.328	1-5	4.311	1.036	1-5
	ACCURACY 1	2.134	0.953	1-5	2.653	0.765	1-5
	STYLE 1	2.749	0.602	1-4	2.671	0.596	1-4
	MAP 1 (COMPOSITE)	12.515	3.424	4-19	13.062	2.587	5-19
(MAP 2)	ABSTRACTION	3.694	1.169	1-5	4.117	1.120	1-5
	PERSPECTIVE 2	4.213	1.129	1-5	4.512	0.833	1-5
	ACCURACY 2	2.184	1.038	1-5	2.516	0.883	1-5
	STYLE 2	2.537	0.904	1-4	2.667	0.678	1-4
	MAP 2 (COMPOSITE)	12.634	3.136	4-19	13.808	2.414	5-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.703	1.131	0-4	1.374	1.319	0-4
	SOLITARINESS	1.220	1.042	0-4	1.234	1.066	0-4
	INTROVERT	1.500	1.102	0-4	1.315	1.137	0-4
	INDIVIDUALISTIC	2.004	1.020	0-4	1.991	1.128	0-4
	PERSEVERES	2.150	0.997	0-4	2.357	1.038	0-4
	INDEPENDENT	1.980	1.012	0-4	2.128	1.133	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.565	3.172	1-17	10.387	3.808	0-21
	FOLLOWER	2.049	1.064	0-4	1.591	1.027	0-4
	GREGARIOUS	2.163	0.972	0-4	1.638	1.133	0-4
	EXTRAVERT	1.825	1.221	0-4	1.549	1.181	0-4
	CONFORMIST	2.374	0.907	0-4	1.791	0.859	0-4
	GIVES UP	1.581	1.117	0-4	1.268	1.054	0-4
	DEPENDENT	1.890	1.092	0-4	1.421	0.972	0-4
	COMPOSITE SCORE FOR FD CHARACTERISTICS	11.915	2.927	3-21	9.302	3.487	1-16

TABLE D Characteristics of the Sample by Residential Location and Sex

	VARIABLES	Urban Boys			Rural Boys			Urban Girls			Rural Girls		
		Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG-STYLE	EFT	18.108	5.767	1-25	15.852	5.857	0-25	17.893	5.040	3-25	14.551	6.042	1-25
	RFT	37.345	52.061	4-208.5	39.133	51.207	3.5-223.5	36.201	47.584	6-217	59.653	68.003	5-222.5
	ABC	3.288	0.952	1-5	3.354	1.020	1-5	2.866	0.915	1-5	3.051	0.851	1-5
ABILITY	AH3	52.139	18.379	9-100	49.539	13.808	20-93	56.915	17.016	18-91	48.560	15.533	14-89
	VERBAL	17.056	6.944	1-33	16.859	5.494	3-31	19.873	6.842	3-34	16.741	6.058	4-32
	NUMERICAL	13.648	6.939	2-35	12.483	5.763	2-31	13.331	6.548	0-33	11.066	5.443	2.27
	PERCEPTUAL	21.661	6.944	5-35	20.164	5.212	6-33	23.678	5.888	7-35	20.716	6.357	1-34
	SPATIAL TEST 2	61.383	22.631	14-94	59.632	18.751	11-94	61.051	20.606	15-99	54.162	18.732	19-96
	DRAW-A-MAN	105.192	14.048	58-139	101.465	13.640	74-132	104.759	12.578	73-132	101.424	11.778	67-129
MAPPING EXERCISES	DRAW-A-PLAN	94.889	13.175	70-121	99.839	14.363	74-131	101.122	12.875	75-129	104.085	12.177	75-129
	ORIENTATION 1	6.963	1.976	1-9	6.835	1.812	1-9	7.304	1.831	0-9	7.025	1.651	1-9
	ORIENTATION 2	12.944	4.912	1-21	13.173	3.795	1-22	14.165	4.028	3-22	12.568	3.895	2-22
	ORIENTATION 3	7.972	3.161	2-12	7.441	3.452	1-12	6.174	3.056	1-12	6.653	3.311	1-12
	EXTENT	2.877	0.973	1-5	2.484	1.055	1-5	2.597	0.785	1-4	2.262	0.915	1-5
	ABSTRACTION 1	3.613	0.879	1-5	3.806	1.292	1-5	3.244	1.164	1-5	3.589	1.596	1-5
	PERSPECTIVE 1	4.519	0.875	1-5	4.089	1.169	1-5	4.126	1.132	1-5	3.738	1.475	1-5
	ACCURACY 1	2.632	0.832	1-5	2.210	1.014	1-5	2.672	0.702	1-5	2.047	0.873	1-4
	STYLE 1	2.660	0.631	1-4	2.750	0.633	1-4	2.681	0.566	1-4	2.748	0.568	1-4
	MAP 1 (COMPOSITE)	13.425	2.272	5-19	12.855	3.195	6-19	12.739	2.809	6-17	12.121	3.646	4-18
	ABSTRACTION 2	4.286	1.045	1-5	3.855	0.975	1-5	3.974	1.166	1-5	3.528	1.325	1-5
	PERSPECTIVE 2	4.612	0.820	1-5	4.545	0.774	2-5	4.426	0.838	2-5	3.868	1.324	1-5
	ACCURACY 2	2.571	0.942	1-5	2.297	1.058	0-5	2.470	0.831	1-5	2.066	1.007	1-5
	STYLE 2	2.633	0.632	1-4	2.436	0.904	1-4	2.696	0.715	1-4	2.642	0.896	1-4
	MAP 2 (COMPOSITE)	14.082	2.260	5-19	13.155	2.581	7-19	13.574	2.524	7-19	12.094	3.555	4-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.292	1.367	0-4	1.492	1.101	0-4	1.451	1.273	0-4	1.932	1.123	0-4
	SOLITARINESS	1.274	1.104	0-4	1.273	1.055	0-4	1.197	1.034	0-4	1.161	1.029	0-4
	INTROVERT	1.265	1.110	0-4	1.508	1.115	0-4	1.361	1.165	0-4	1.492	1.092	0-4
	INDIVIDUALISTIC	1.965	1.093	0-4	1.922	1.039	0-4	2.016	1.164	0-4	2.093	0.996	0-4
	PERSEVERES	2.230	1.027	0-4	1.945	0.966	0-4	2.475	1.038	0-4	2.373	0.985	0-4
	INDEPENDENT	2.035	1.149	0-4	1.852	1.012	0-4	2.213	1.115	0-4	2.136	0.995	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.062	4.014	0-21	9.992	3.252	2-17	10.689	3.598	3-17	11.186	2.973	1-17
	FOLLOWER	1.681	1.080	0-4	2.133	1.082	0-4	1.508	0.973	0-4	1.958	1.041	0-4
	GREGARIOUS	1.699	1.125	0-4	2.180	0.934	0-4	1.582	1.142	0-4	2.144	1.015	0-4
	EXTRAVERT	1.673	1.168	0-4	1.789	1.188	0-4	1.434	1.185	0-4	1.864	1.260	0-4
	CONFORMIST	1.805	0.766	0-4	2.234	0.951	0-4	1.779	0.940	0-4	2.525	0.834	0-4
	GIVES UP	1.398	1.065	0-4	1.750	1.108	0-4	1.148	1.034	0-4	1.398	1.103	0-4
	DEPENDENT	1.522	1.001	0-3	1.969	1.129	0-4	1.328	0.940	0-4	1.805	1.048	0-4
	COMPOSITE SCORES FOR FD CHARACTERISTICS	9.779	3.443	1-16	12.109	3.041	3-19	8.861	3.484	3-16	11.703	2.796	4-21

TABLE E Characteristics of the Sample by Age/Sex/Residential Location

(10 - 11 year olds)

	VARIABLES	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	15.469	5.702	5-25	16.520	3.980	8-22	14.903	5.969	4-25	11.500	5.389	1-24
	RFT	62.016	73.802	5.5-205.5	41.400	52.673	8-217	55.048	63.763	9-223.5	55.920	63.053	7-218
	ABC	3.531	0.983	1-5	3.320	0.748	2-5	3.800	0.887	2-5	3.432	0.625	2-5
ABILITY	AH3	42.031	15.568	12-91	46.400	13.360	18-73	40.935	12.372	23-65	40.976	11.688	19-71
	VERBAL	13.313	6.151	4-30	15.800	5.657	3-27	13.581	4.675	3-22	13.333	4.626	4-25
	NUMERICAL	10.219	5.517	2-26	9.520	5.292	0-26	9.742	4.844	2-20	8.881	3.542	3-17
	PERCEPTUAL	18.563	7.066	5-35	21.080	5.560	7-29	17.613	5.560	6-27	18.762	6.397	1-30
	SPATIAL TEST 2	50.438	21.626	16-88	55.120	19.934	22-87	55.931	17.844	21-82	49.409	17.875	19-96
	DRAW-A-MAN	103.438	15.854	58-139	106.200	11.822	85-132	100.367	15.258	74-132	100.295	11.737	75-129
MAPPING EXERCISES	DRAW-A-PLAN	96.188	12.805	75-121	105.240	11.945	80-129	104.200	13.912	81-131	103.636	12.350	80-125
	ORIENTATION 1	6.000	2.095	1-9	6.120	1.965	3-9	6.903	1.399	4-9	6.182	1.632	3-9
	ORIENTATION 2	10.750	4.579	3-19	12.960	3.323	3-19	12.323	2.797	7-18	11.045	3.050	2-19
	ORIENTATION 3	6.438	2.552	2-12	6.520	3.190	1-12	7.710	3.447	2-12	6.000	3.027	1-12
	EXTENT	2.833	0.950	1-5	2.840	0.800	1-4	2.097	0.790	1-4	2.026	0.811	1-4
	ABSTRACTION 1	3.167	0.874	1-5	3.080	1.077	1-5	3.645	1.226	1-4	2.923	1.738	1-5
	PERSPECTIVE 1	4.200	0.961	1-5	4.000	0.957	2-5	3.968	1.140	1-5	3.154	1.582	1-5
	ACCURACY 1	2.667	0.606	1-4	2.840	0.374	2-3	1.903	0.831	1-4	1.897	0.788	1-3
	STYLE 1	2.533	0.571	2-4	2.480	0.586	2-4	2.774	0.497	2-4	2.667	0.478	2-3
	COMPOSITE SCORE MAP 1	12.567	2.176	7-16	12.400	2.309	8-15	12.290	2.831	6-18	10.641	3.849	6-16
	ABSTRACTION 2	3.933	1.230	1-5	3.125	1.393	1-5	3.276	1.192	1-5	2.897	1.273	1-5
	PERSPECTIVE 2	4.267	1.112	1-5	3.875	1.035	2-5	4.586	0.780	2-5	3.154	1.443	1-5
	ACCURACY 2	2.633	0.765	1-4	2.542	0.509	2-3	1.586	0.780	1-3	1.641	0.743	1-3
	STYLE 2	2.733	0.583	2-4	2.708	0.550	2-4	2.069	0.923	1-3	2.179	0.790	1-4
	COMPOSITE SCORE MAP 2	13.567	2.622	5-17	12.292	2.493	7-15	11.517	2.400	7-16	9.872	3.246	4-17
ASPECTS OF PERSONALITY	LEADERSHIP	1.656	1.473	0-4	1.720	1.242	0-4	2.000	1.000	0-3	2.295	1.069	0-4
	SOLITARINESS	1.156	0.920	0-3	1.320	0.802	0-3	1.419	1.119	0-4	1.068	1.189	0-4
	INTROVERT	1.156	1.019	0-3	1.520	1.005	0-3	1.484	1.122	0-4	1.545	1.190	0-4
	INDIVIDUALISTIC	2.094	0.963	1-4	2.400	1.000	1-4	2.290	1.039	0-4	2.409	0.948	0-4
	PERSEVERES	1.969	0.999	1-4	2.640	0.907	1-4	1.839	1.098	0-3	2.341	1.010	1-4
	INDEPENDENT	2.250	1.218	0-4	2.680	0.945	1-4	2.032	1.110	0-4	2.477	0.952	1-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.281	3.612	4-17	12.280	2.685	6-17	11.065	2.555	5-16	12.136	2.041	7-15
	FOLLOWER	1.875	0.976	0-3	1.640	0.952	0-3	2.129	1.147	0-4	2.000	1.057	0-4
	GREGARIOUS	1.344	1.096	0-4	1.960	0.978	1-4	2.129	1.147	0-4	1.909	1.254	0-4
	EXTRAVERT	2.094	1.254	0-4	1.880	1.013	0-4	2.129	1.118	0-4	1.841	1.363	0-4
	CONFORMIST	1.844	0.574	1-3	2.120	0.881	0-3	2.161	1.068	0-3	2.705	1.047	0-4
	GIVES UP	1.750	1.016	0-3	1.280	0.843	0-3	1.968	1.169	0-4	1.386	1.083	0-4
	DEPENDENT	1.656	1.125	0-3	1.640	0.952	0-3	1.774	1.309	0-4	1.614	1.185	0-4
	COMPOSITE SCORE FOR FD CHARACTERISTS	11.563	2.488	6-16	10.920	2.482	6-15	12.290	2.493	5-17	11.455	2.519	5-16

TABLE E Characteristics of the Sample by Age/Sex/Residential Location

(11 - 12 year olds)

	VARIABLES	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	19.333	5.324	1-25	17.386	4.463	5-25	14.786	5.723	0-24	15.132	5.619	1-25
	RFT	27.986	43.136	6-208.5	32.705	37.402	7-162.5	38.274	49.253	6.5-212	73.829	75.029	7.5-222.5
	ABC	3.147	1.019	1-5	2.829	0.892	1-5	3.524	0.943	1-5	3.053	0.733	2-4
ABILITY	AH3	57.083	15.834	29-95	54.523	17.123	22-90	49.714	13.795	20-93	45.237	14.130	14-77
	VERBAL	19.278	6.327	8-32	19.159	6.523	8-33	17.357	5.272	7-31	16.763	5.450	7-28
	NUMERICAL	14.861	6.020	4-28	13.205	7.470	0-33	12.452	6.045	3-31	9.289	4.655	2-24
	PERCEPTUAL	22.944	6.150	12-35	22.159	5.851	10-35	19.667	4.882	9-33	19.132	6.261	1-34
	SPATIAL TEST 2	63.382	20.188	25-91	57.233	18.126	25-95	56.452	19.863	11-94	48.737	17.342	22-90
	DRAW-A-MAN	107.735	13.772	82-137	104.219	13.062	80-125	98.857	11.293	79-124	100.816	13.305	67-129
MAPPING EXERCISES	DRAW-A-PLAN	94.471	12.809	70-117	97.909	13.212	75-127	96.410	14.828	70-130	99.816	10.752	75-128
	ORIENTATION 1	7.529	1.911	3-9	7.829	1.564	1-9	6.381	1.950	1-9	7.105	1.737	1-9
	ORIENTATION 2	14.441	3.799	3-20	14.195	4.781	3-22	12.071	3.672	1-21	11.053	3.440	5-18
	ORIENTATION 3	7.647	3.634	2-12	5.317	2.514	2-12	6.452	3.631	1-12	6.553	3.227	2-12
	EXTENT	2.861	0.931	1-5	2.093	0.479	1-3	2.150	0.864	1-4	2.054	0.848	1-4
	ABSTRACTION 1	3.694	0.856	1-5	2.953	1.327	1-5	3.450	1.584	1-5	3.811	1.506	1-5
	PERSPECTIVE 1	4.528	0.845	2-5	3.860	1.320	1-5	3.725	1.450	1-5	3.811	1.351	1-5
	ACCURACY 1	2.639	0.899	1-5	2.372	0.757	1-3	1.850	0.844	1-4	1.757	0.796	1-3
	STYLE 1	2.667	0.586	1-4	2.674	0.522	2-4	2.500	0.506	2-3	2.703	0.520	1-3
	COMPOSITE SCORE MAP 1	13.528	2.063	8-19	11.860	3.197	6-16	11.525	3.508	6-17	12.081	3.328	4-16
	ABSTRACTION 2	4.194	1.078	1-5	3.881	1.087	2-5	3.743	0.852	2-5	3.514	1.283	1-5
	PERSPECTIVE 2	4.613	0.761	2-5	4.405	0.857	2-5	4.343	0.968	2-5	4.162	0.986	1-5
	ACCURACY 2	2.387	0.919	1-5	2.048	0.731	1-3	2.306	1.009	1-5	1.865	0.976	1-5
	STYLE 2	2.645	0.551	1-3	2.476	0.707	1-4	2.400	0.914	1-4	2.541	0.767	1-4
	COMPOSITE SCORE MAP 2	13.839	2.146	7-17	12.810	2.540	7-16	12.857	2.568	7-19	12.054	2.915	4-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.111	1.389	0-4	1.159	1.275	0-4	1.500	1.018	0-4	1.816	1.136	0-4
	SOLITARINESS	1.083	1.131	0-4	1.045	1.011	0-3	0.920	0.973	0-3	0.868	0.811	0-3
	INTROVERT	1.306	1.167	0-4	1.477	1.311	0-4	1.452	1.007	0-4	1.316	1.165	0-4
	INDIVIDUALISTIC	1.889	1.141	0-4	1.909	1.217	0-4	2.024	0.924	1-4	2.026	0.885	0-3
	PERSEVERES	2.639	1.018	1-4	2.864	0.905	1-4	2.048	0.862	1-4	2.237	0.852	1-3
	INDEPENDENT	2.222	1.098	0-4	2.159	1.238	0-4	2.143	0.872	0-4	1.974	1.000	0-4
	COMPOSITE SCORE FOR FI CHARACTERISTICS	10.250	4.265	1-21	10.614	3.743	3-17	10.095	3.067	2-16	10.237	2.880	3-15
	FOLLOWER	1.389	1.178	0-4	1.568	1.043	0-3	1.881	0.993	0-4	2.026	0.972	0-3
	GREGARIOUS	1.444	0.998	0-3	1.295	1.069	0-3	2.452	0.832	1-4	2.368	0.942	1-4
	EXTRAVERT	1.528	1.108	0-4	1.409	1.282	0-4	2.024	1.158	0-4	2.263	1.201	0-4
	CONFORMIST	1.889	0.854	0-4	1.955	0.834	0-4	2.095	0.983	0-4	2.368	0.714	1-3
	GIVES UP	0.972	1.000	0-3	0.841	1.010	0-3	1.571	1.063	0-3	1.632	0.998	0-3
	DEPENDENT	1.250	0.967	0-3	1.068	0.950	0-3	1.833	1.080	0-4	1.895	0.981	0-3
	COMPOSITE SCORE FOR FD CHARACTERISTICS	8.472	3.368	3-16	8.136	3.521	3-16	12.095	3.608	5-19	12.579	2.543	5-17

TABLE E Characteristics of the Sample by Age/Sex/Residential Location

(12 - 13 year olds)

	VARIABLES	Urban Boys			Urban Girls			Rural Boys			Rural Girls		
		Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
COG STYLE	EFT	19.047	5.657	2-25	18.962	5.743	3-25	17.200	5.723	4-25	17.667	5.560	4-25
	RFT	27.289	32.117	4-186.5	36.651	52.979	7.5-208	30.818	43.011	35-214	49.250	65.396	5-222
	ABC	3.211	0.843	1-5	2.632	0.948	1-4	2.982	1.027	1-5	2.583	0.874	1-4
ABILITY	AH3	55.775	19.727	9-100	64.429	15.278	27-91	54.255	12.398	32-79	60.917	13.551	29-89
	VERBAL	18.050	7.016	1-33	22.592	6.583	6-34	18.327	5.403	8-30	20.694	5.840	11-32
	NUMERICAL	15.300	7.849	2-35	15.388	5.350	3-25	13.945	5.552	4-29	15.556	5.464	6-27
	PERCEPTUAL	22.864	6.907	6-34	26.212	5.131	16-35	21.982	4.617	9-32	24.667	4.479	12-32
	SPATIAL TEST 2	68.268	22.600	14-94	67.429	21.611	15-99	64.093	17.703	29-94	66.029	16.083	33-94
	DRAW-A-MAN	104.395	12.665	74-135	104.457	12.748	73-126	104.055	14.124	80-130	103.444	10.058	74-125
MAPPING EXERCISES	DRAW-A-PLAN	94.219	13.985	73-121	101.957	12.524	79-127	99.891	13.863	75-127	109.139	11.823	86-129
	ORIENTATION 1	7.244	1.685	3-9	7.469	1.733	0-9	7.148	1.867	2-9	7.972	0.910	5-9
	ORIENTATION 2	13.415	5.459	1-21	14.755	5.019	3-22	14.519	4.018	4-22	16.028	3.009	9-22
	ORIENTATION 3	9.405	2.58	4-12	6.714	3.291	1-12	8.056	3.194	2-12	7.556	3.605	2-12
	EXTENT	2.925	1.047	1-5	2.902	0.781	1-4	2.962	1.143	1-5	2.806	0.910	1-5
	ABSTRACTION 1	3.875	0.791	1-5	3.569	0.985	1-5	4.170	0.975	2-5	4.161	1.214	1-5
	PERSPECTIVE 1	4.750	0.776	1-5	4.412	0.983	1-5	4.434	0.821	2-5	4.387	1.202	1-5
	ACCURACY 1	2.600	0.928	1-5	2.843	0.703	1-5	2.660	1.055	1-5	2.581	0.848	1-4
	STYLE 1	2.750	0.112	1-4	2.784	0.577	1-4	2.925	0.730	1-4	2.903	0.700	2-4
	COMPOSITE SCORE MAP 1	13.975	2.380	5-19	13.647	2.432	7-17	14.189	2.632	9-19	14.032	2.881	6-18
	ABSTRACTION 2	4.649	0.716	2-5	4.469	0.819	2-5	4.304	0.662	3-5	4.367	0.964	2-5
	PERSPECTIVE 2	4.892	0.393	3-5	4.714	0.540	3-5	4.674	0.560	3-5	4.433	1.135	1-5
	ACCURACY 2	2.676	1.082	1-5	2.796	0.889	1-5	2.739	1.021	1-5	2.867	0.900	1-5
	STYLE 2	2.541	0.730	1-4	2.878	0.754	1-4	2.696	0.813	1-4	3.367	0.718	1-4
	COMPOSITE SCORE MAP 2	14.703	1.927	10-19	14.857	1.904	11-19	14.413	2.039	10-19	15.033	2.414	9-19
ASPECTS OF PERSONALITY	LEADERSHIP	1.178	1.248	0-4	1.566	1.264	0-4	1.200	1.129	0-4	1.611	1.076	0-4
	SOLITARINESS	1.511	1.180	0-4	1.264	1.146	0-4	1.455	1.033	0-4	1.583	0.906	0-3
	INTROVERT	1.311	1.145	0-4	1.189	1.257	0-4	1.564	1.151	0-4	1.611	0.871	0-3
	INDIVIDUALISTIC	1.933	1.156	0-4	1.925	1.174	0-4	1.636	1.060	0-4	1.778	1.972	0-4
	PERSEVERES	2.089	0.973	0-4	2.075	1.071	0-4	1.927	0.959	0-4	2.556	1.081	0-4
	INDEPENDENT	1.733	1.095	0-4	2.038	1.037	0-4	1.527	0.979	0-4	1.889	0.950	0-3
	COMPOSITE SCORE FOR FI CHARACTERISTICS	9.756	4.146	0-20	10.000	3.674	3-17	9.309	3.600	2-17	11.028	3.676	1-17
	FOLLOWER	1.778	1.042	0-4	1.396	0.927	0-4	2.327	1.090	0-4	1.833	1.108	0-4
	GREGARIOUS	1.444	1.078	0-4	1.642	1.222	0-4	2.000	0.839	0-4	2.194	0.668	1-4
	EXTRAVERT	1.489	1.100	0-4	1.245	1.142	0-4	1.418	1.166	0-4	1.472	1.082	0-4
	CONFORMIST	1.711	0.815	0-3	1.472	0.973	0-4	2.382	0.850	0-4	2.472	0.609	1-3
	DEPENDENT	1.644	0.980	0-3	1.396	0.884	0-4	2.182	1.038	0-4	1.944	0.924	0-4
	GIVES UP	1.489	1.058	0-4	1.340	1.091	0-4	1.764	1.105	0-4	1.167	1.207	0-4
	SCORE FOR F D CHARACTERISTICS	9,556	3.609	1-16	8.491	3.539	3-16	12.018	2.896	3-19	11.083	3.193	4-21

It is not proposed to discuss differences which emerge from the analysis of the overall characteristics, for it is felt that any differences which exist will emerge as the next stage of the discussion continues.

2. The Intercorrelational Analysis

As was explained in the previous chapter, the inter-correlational analysis attempted to examine the inter-relationships between four main elements, ie

1. Measures of cognitive style
2. Measures of ability
3. Measures of environmental perception
4. Aspects of personality associated with Witkin's analytic/global dimension

The inter-relationships between these elements will now be discussed in terms of the hypotheses outlined in the last chapter, where the hypotheses were seen to be organised in to four main sub groups.

A Those which further investigate the analytic/global dimension and consider the correlations between the tests of cognitive style and other measures used in the study (Hypotheses 1 - 9 and 25)

B Those which consider the strength of relationships amongst the ability and various 'mapping' measures. (Hypotheses 10 - 16)

C Those which consider the inter-correlations with the scores on the children's cognitive maps. (Hypotheses 17 - 23)

D That which considers the relationship between cognitive style and aspects of personality. (Hypothesis 24)

A. Correlations with the measures of cognitive style

Hypothesis 1. Research suggests that there will be a positive and significant correlation between the three measures of cognitive style (ie Between scores on the Embedded Figures Test (EFT), the Rod and Frame Test (RFT) and the Articulation of Body Concept Scale (ABC)).

The first hypothesis is probably the most crucial of the research, for the existence of the analytic/global style described by Witkin is dependent upon a positive correlation between the three measures being demonstrated for the sample. As was discussed in Chapter 2, where previous research was reviewed, correlations between the measures of cognitive style vary in their levels of significance. For example, the review of research by Goldstein and Blackman (1978) demonstrated that correlations between EFT and RFT were significant and generally within the range of 0.30 - 0.65. Similarly Arbuthnot's (1972) more comprehensive study of relationships between EFT and RFT concluded that whilst the measures do share some variance, the amount of generality is often quite low. Correlations between the Articulation of Body Concept Scale and the other measures of cognitive style have been shown to be significant (Corah 1965, Karp, Silberman and Winters 1969, Witkin et al 1974) and generally in the range 0.4 - 0.5. Machover for example (Witkin et al 1962 p 117) is reported to have achieved a correlation of 0.41 ($p<0.05$) between figure drawings and the measures of field independence. The results of the inter-correlations between the measures of cognitive style for this study were as follows:

TABLE 5. 1	Full Sample (481)	Boys (241)	Girls (240)
EFT with RFT	0.4290 **	0.4956 **	0.3683 **
EFT with ABC	0.4392 **	0.4634 **	0.4529 **
RFT with ABC	0.2338 **	0.2975 **	0.2165 **

Levels of significance * $p < .05$
** $p < .01$

TABLE 5.1 Correlations between the measures of Cognitive Style (Sample, Boys, Girls)

As can be seen in these results, the EFT/RFT correlations fall within the limits described by Goldstein and Blackman. All of the results are significant at the 1% level and would probably be taken by Witkin to support his assertions. However, the low correlations between the Articulation of Body Concept Scale and the Rod and Frame Test raises questions about the ABC and RFT as reliable measures of cognitive style. Similar low correlations were identified by Vernon (1972) and this led Satterly (1976, 1979) to question the necessity of deriving a pooled index of field independence from such disparate measures and he preferred to rely solely on the results of the Embedded Figures Test as his measure of cognitive style, or more particularly field dependence/independence.

The results above also suggest slightly stronger associations between these measures for the boys of the sample. Analysis of the results in terms of the urban/rural distinction indicates that differences between the sexes for EFT/RFT correlations derive primarily from the high correlations of the urban boys and the lower correlations of the rural girls. The slightly higher correlations of EFT/ABC for the boys is a result of the lower correlations of the Urban Girls, although that of the rural girls was the highest.

TABLE 5. 2	Urban Boys (113)	Rural Boys (128)	Urban Girls (122)	Rural Girls (118)
EFT with RFT	0.6098 **	0.4097 **	0.4136 **	0.2841 **
EFT with ABC	0.4605 **	0.4689 **	0.3830 **	0.5074 **
RFT with ABC	0.2899 **	0.3045 **	0.1697	0.2330 *

(Levels of significance * $p < .05$, ** $p < .01$)

TABLE 5. 2. Correlations between the measures of Cognitive Style (By Residence/Sex)

The lower correlations between RFT/ABC are further demonstrated by the urban/rural categorisation with the results of the girls especially. The rural girls correlations were at the 5% level and those of the Urban girls proved <u>not</u> to be significant. Age differences in the correlations between these measures are discussed in a later section.

The results described here are similar to those reported by Brophy (1982, p.116) who concluded that the criterion measures of Field dependence/independence do not correlate at a significantly high enough level to meet even modest 'equivalence' conditions which Arbuthnot (1972) argued was necessary if they were to be regarded as measuring a similar capacity.

Hypotheses 2 and 3 were concerned with the relationships between the measures of cognitive style and intelligence.

Hypotheses 2. Since 'cognitive styles' purport to cut across general levels of ability, one would not necessarily expect high correlations between intelligence (as measured by AH3) and measures of cognitive style.

Hypotheses 3. 'There are likely to be higher correlations between perceptual reasoning and the measures of cognitive style than with verbal or numerical reasoning.'

The relationship of intelligence with the measurement of Witkin's analytic/global dimension has been a central issue in the literature reviewed in Chapter Two. Witkin et al (1962) have reported high positive correlations between RFT and EFT and intelligence and as was mentioned earlier Witkin et al (1971) argue that if separate factor IQ scores are computed for the three factors of the Weschler Intelligence Scale, EFT scores correlate at a high and significant level with the analytic factor, but only at a low and usually non-significant level with the verbal and comprehension factors. Goldstein and Blackman (1978) however, report consistent indications that the measures of cognitive-style are related to various measures of verbal and performance intelligence. The results of the analysis of this study seem to support these assertions.

TABLE 5.3	Sample	Boys	Girls
AH3 with EFT	0.5982	0.5353	0.6729
AH3 with RFT	0.2991	0.2822	0.3269
AH3 with ABC	0.3290	0.3623	0.3623

(All significant at the 1% level)

TABLE 5.3 Correlations between the measures of Cognitive Style and Intelligence (Sample, Boys, Girls)

Comparison of these correlations with those described in Table 1 reveal that EFT correlations are higher with intelligence than they are with the other measures of cognitive style, whereas RFT and ABC correlations are generally higher with EFT than they are with intelligence. This is a further indication of the differences that exist between these measures and seems to offer further support to the views of Satterly cited earlier of taking the Embedded Figures Test as the most appropriate measure of cognitive style. However, in terms of Hypothesis 2, the association between ABC and RFT and intelligence was as had been hypothesised, whereas this proves not to be the case for the Embedded Figures Test. As a result one might question whether RFT and ABC are therefore more appropriate indicators of the analytic/global dimension. (It is important to remember however that all of the inter-correlations with intelligence (as measured by full AH3 score), proved to be significant at the 1% level and that EFT correlations were much the strongest).*

When the inter-correlations between intelligence and cognitive style were considered in terms of the rural/urban distinction, limited differences emerged and in general the results confirm the comments already made.

TABLE 5.4 Correlations between the measures of Cognitive Style and Intelligence (By Residence/Sex)

TABLE 5.4	Urban Boys	Rural Boys	Urban Girls	Rural Girls
AH3 with EFT	0.6408	0.4230	0.6410	0.6671
AH3 with RFT	0.3390	0.2220*	0.3132	0.2896
AH3 with ABC	0.2913	0.3018	0.3021	0.4054

(All Results significant at the 1% level except * $p < 5\%$)

A further interesting point about the relationship of these measures to intelligence is the relatively low level correlations between ABC and AH3 for the sample (Table 3) although there are exceptions (see the rural girls in Table 4). It has been argued earlier that the analysis of the ABC raised some difficulty for the

*This was also confirmed in Brophy's (1982) study.

judges of this sample who felt that they were measuring increasing drawing sophistication which Goodenough-Harris (1972) argue is a demonstration of increasing intellectual maturity. The lower correlations described in Tables 3 and 4 do not support the association between intelligence and ABC particularly strongly. Witkin et al (1971) had earlier identified a clear relationship between the intellectual index of the Weschler Intelligence Scale and the level of Articulation of Body Concept (0.55 significant at the 1% level) and the fact that this correlation was higher than with that of the verbal index (0.33) was taken by Witkin to indicate that differences in the nature of drawings is primarily a reflection of the differences in mode of field approach rather than a reflection of general intelligence. It is interesting however that this was not considered merely as a reflection of drawing ability, although the Goodenough-Harris Draw-a-Man Test which is usually taken as an indicator of intellectual maturity, is also recognised as a measure of the level of drawing skill.

The third hypothesis, which has already been stated, derives directly from the factor analytic studies undertaken by Witkin and his colleagues (Karp 1965). The measure of intelligence employed in this study provided scores for verbal, numerical and perceptual reasoning and it was hypothesised that the Spatial bias of the measures of cognitive style (Vernon 1972, Satterly 1976) would be reflected in the correlations especially with perceptual reasoning. Similarly, the comments previously referred to about associations with verbal indices, would lead one to anticipate low and possibly non-significant correlations with verbal reasoning. As can be seen in Table 5 below, the association between EFT and perceptual reasoning confirms the hypothesis when the sample is taken as a whole and when the boys are considered separately, but the correlations with verbal reasoning are slightly higher for the girls.

TABLE 5.5	Sample	Boys	Girls
EFT with Verbal	0.5111	0.4199	0.6199
EFT with Numerical	0.4890	0.4359	0.5425
EFT with Perceptual	0.5616	0.5310	0.6128

(All results significant at the 1% level)

TABLE 5.5 Correlations between EFT results and aspects of intelligence (Sample, Boys/Girls)

When the results are considered for the urban/rural categorisation it becomes clear that the correlations of the rural girls influenced the association between EFT and verbal reasoning for the girls as a whole.

TABLE 5.6	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EFT with Verbal	0.5797	0.2678	0.5920	0.6081
Numerical	0.4843	0.3755	0.4825	0.5763
Perceptual	0.6275	0.4125	0.6260	0.5531

(All Results significant at the 1% level)

TABLE 5.6 Correlations between EFT Results and aspects of intelligence (By Residence/Sex)

It is important to recognise the high correlations which are demonstrated here between the three elements of ability and EFT. The only relatively low correlations are for those of the Rural Boys sub-group and in general these results appear to confirm the suggestions of Goldstein and Blackman about associations between EFT and other elements of intelligence and which in turn are contradictory to those reported by Witkin.

The correlations between RFT and ABC and the subdivisions of ability were not as high as those with the Embedded Figures Test but in general confirmed the hypothesised relationship with perceptual reasoning being stronger than with verbal or numerical reasoning. As can be seen in Table 7, RFT correlates most highly with perceptual reasoning in all cases described here and although correlations with the other elements of numerical and verbal reasoning are significant, the level of shared variance is extremely low and especially in the case of the association between RFT and Numerical Reasoning for the boys of the sample. The strength of the

TABLE 5.7	Sample	Boys	Girls
RFT with Verbal	0.2373	0.2222	0.2706
RFT with Numerical	0.2223	0.1864	0.2487
RFT with Perceptual	<u>0.3202</u>	<u>0.3224</u>	<u>0.3430</u>

(All correlations are significant at the 1% level)

TABLE 5.7 Correlations between RFT and aspects of intelligence (Sample, Boys, Girls)

relationship with perceptual reasoning was further demonstrated by the results of the analysis by urban and rural sub-grouping, as was the much lower associations with verbal and numerical reasoning.

TABLE 5.8	Urban Boys	Rural Boys	Urban Girls	Rural Girls
RFT with Verbal	0.3194 **	0.1173	0.2933 **	0.2005 *
RFT with Numerical	0.1984 *	0.1755	0.2254 *	0.2313 *
RFT with Perceptual	<u>0.3782</u> **	<u>0.2639</u> **	<u>0.3095</u> **	<u>0.3163</u> **

(Levels of significance: * $p < .05$, ** $p < .01$)

TABLE 5.8 Correlations between RFT and aspects of intelligence (By Residence/Sex)

The correlations for the Rural Boys were particularly low and those of RFT with verbal and numerical reasoning proved not to be significant for the rural boys.

The correlations between the Articulation of Body Concept Scale and verbal, numerical and perceptual reasoning were similar to those for the Rod and Frame Test, except that, as with the Embedded Figures Test, correlations for the girls were higher with Verbal than Perceptual Reasoning. As with the Embedded Figures Test, this was a result of the correlations achieved by the Rural Girls. (The difference in correlation between verbal and perceptual reasoning was extremely small, however: 0.0010).

TABLE 5.9	Sample	Boys	Girls	
ABC with Verbal	0.3127	0.2705	0.3372	(All significant at
ABC with Numerical	0.2151	0.1934	0.2797	the 1% level)
ABC with Perceptual	0.3308	0.3040	0.3362	

TABLE 5.9 Correlations between ABC and aspects of intelligence (Sample, Boys, Girls)

TABLE 5.10	Urban Boys	Rural Boys	Urban Girls	Rural Girls
ABC with Verbal	0.2918 **	0.2553 **	0.2770 **	0.3807 **
ABC with Numerical	0.1776 *	0.2080 *	0.2013 *	0.3508 **
ABC with Perceptual	0.3192 **	0.2951 **	0.3239 **	0.3240 **

(Levels of significance: * $p < .05$, ** $p < .01$)

TABLE 5.10 Correlations between ABC and aspects of intelligence (By Residence/Sex)

It seems thereforethat with the exception of the Rural girls of the sample, the association between perceptual reasoning and the measures of cognitive style is the strongest and that in general the association of all of the ability measures with ABC and RFT is much smaller than with the Embedded Figures Test. It is the case however that the results do confirm an association with intelligence and this is further investigated in the factor analysis of the results which will be discussed in a later section of this chapter.

Hypotheses 4 and 5 attempted to investigate the validity of the Articulation of Body Concept Scale as a measure of cognitive style by comparing the results of the Draw-a-Man analysis with intelligence and with those of the Articulation of Body Concept Scale.

Hypotheses 4. The Draw-a-Man Test will correlate positively and significantly with AH3 and in particular with perceptual reasoning.

Hypotheses 5. The correlation between the Draw-a-Man test and the Articulation of Body Concept Scale will prove to be both positive and significant.

The results of this analysis produced lower correlations than might have been anticipated for the relationship between Draw-a-Man and ability, especially since the test is supposed to be an indicator of increasing intellectual maturity (Goodenough-Harris 1963) but as anticipated in Hypothesis 4, the most positive relationship was with perceptual reasoning for all sub groups.

TABLE 5.11	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
DAM with:							
AH3	0.2587**	0.2349**	0.2874**	0.2595**	0.1925*	0.2377*	0.2928**
Ver.	0.2366**	0.2123**	0.2667**	0.2613**	0.1597	0.2055*	0.2882**
Num.	0.1509**	0.1226	0.1855**	0.1429	0.0812	0.1545	0.1756
Per.	0.2920**	0.2868**	0.3039**	0.3031**	0.2443**	0.2768**	0.2872**

(Levels of Significance: * $p < .05$, ** $p < .01$)

TABLE 5.11 Correlations between Draw-a-Man Test Results and intelligence

Again there appears to be a considerable degree of similarity between all sub groupings from these results. Low, but significant correlations between Draw-a-Man and AH3 and Verbal and Perceptual Reasoning, but much weaker correlations between Draw-a-Man and numerical reasoning. The results do however, raise questions about the Draw-a-Man test as a reliable indicator of intellectual maturity for this sub group.

When the results of the Draw-a-Man analysis were compared with those of the tests of Cognitive Style, as anticipated in Hypothesis 5, the correlations between ABC and D-a-Man proved to be highly significant for all sub groups. When this result is taken in conjunction with those reporting associations with intelligence and with cognitive style (ie Table 11 for Draw-a-Man and Tables 2, 4 and 9 for ABC), it appears that the high positive variance between these tests is something other than 'intellectual maturity' or the ability to 'disembed'. As was discussed earlier and in Chapter 4 the judges who scored the Articulation of Body Concept Scale found it difficult to decide whether they were in fact following the criteria for the ABC analysis and felt that they were more likely to have considered the drawings in terms of their quality, and even perhaps the level of drawing skill demonstrated, which is obviously an important element of the Goodenough-Harris analysis.

TABLE 5.12 Correlations between Draw-a-Man Test Results and the measures of Cognitive Style

TABLE 5.12	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
DAM with:							
EFT	0.4379**	0.4632**	0.4112**	0.4832**	0.4229**	0.3661**	0.4191**
RFT	0.2558**	0.2915**	0.2257**	0.3415**	0.2512	0.1705	0.2364*
ABC	0.7594**	0.8112**	0.7270**	0.8357*	0.8357**	0.7369**	0.7084**

(Levels of Significance, * $p < .05$, ** $p < .01$)

As with the results discussed so far, the correlations with EFT were positive and significant, the results here are probably associated with the perceptual skills required in solving EFT problems and drawing high scoring figures on the Draw-a-Man Test. The correlations with RFT scores are interesting in that they demonstrate slight sex differences, with the scores of the girls of the sample achieving lower levels of correlation than the boys. The different levels of correlation for the three measures of cognitive style raises further question about their inter-relationships.

Hypothesis 6 attempted to follow up the relationship between Spatial ability and the measures of cognitive style.

Hypothesis 6. Research suggests that correlations between tests of spatial ability and the measures of cognitive style will prove to be positive and significant. This will apply especially to the Embedded Figures Test. Positive correlations have been reported between aspects of spatial ability and the Witkin measures by Vernon (1972), Kogan (1973) Perera (1974) and Satterly (1976) and since the original basis of the analytic/global dimension identified by Witkin was of a strongly perceptual nature, this is not surprising. (It will be remembered that in Chapter Two it was commented that Witkin now sees Field dependence/Independence as the perceptual element of the analytic/global dimension).

Results of this study clearly confirm this relationship and again raises questions about the existence of the style as an independent definable characteristic, or merely as a representation of spatial ability as demonstrated by the results of Spatial Test 2 (ST2) which has a bias towards the mental manipulation of three dimensional shapes.

As can be seen in Table 13 all of the results reported here are highly significant, all at the 1% level and are the highest correlations reported so far. Again the correlations for the Embedded Figures Test are higher than those for RFT and ABC, yet the RFT/ABC correlations with Spatial Ability are amongst the strongest for these tests to be demonstrated in this study.

Brophy's (1982) study of 14 year olds confirm these findings for the EFT and ABC, but achieved lower correlations for the RFT (0.33), when scores on the criterion measures were compared with the results of N.F.E.R. Spatial Test I.

TABLE 5.13	Sample	Boys	Girls
EFT with ST2	0.7333	0.7354	0.7295
RFT with ST2	0.4179	0.4777	0.3611
ABC with ST2	0.4205	0.4349	0.4495

(All significant at the 1% level)

TABLE 5.13 Correlations between the measures of cognitive style and spatial ability. (Sample Boys, Girls)

These results were confirmed by the analysis of the urban and rural subgroups.

TABLE 5.14	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EFT with ST2	0.7747	0.7150	0.7667	0.6908
RFT with ST2	0.4828	0.4755	0.4287	0.2841
ABC with ST2	0.4555	0.4210	0.4317	0.4487

(All results significant at the 1% level)

TABLE 5.14 Correlations between the measures of cognitive style and spatial ability. (By Residence/Sex)

There appears to be very little difference between the subgroups or the sexes for this analysis, except perhaps for slightly stronger associations for EFT/ST2 for the Urban subgroup and the somewhat lower correlation between RFT/ST2 for the Rural Girls which has obviously influenced the lower 'girls' correlation described in Table 13.

Within the 'disembedding' ability isolated by Witkin is an element of orientational ability, positioning oneself appropriately to separate figure from field, or rod from the surrounding frame, or identification of self. The particular skills required to solve EFT and RFT problems especially, it was felt, contained obvious similarities to skills required to solve mapping problems, eg separate a shape from the complexity of an Ordnance survey map, orientation of a map with the ground. Thus, measures which explored some of these abilities were included in the study. Satterly (1979) had previously identified a positive correlation between EFT scores and the exercises used in this study as Orientation 1 (01.-0.368, $p < 1\%$ level) and Orientation 2 (02- 0.398, $p < 1\%$ level). These tests made use of small plans for 01* and a street map for 02* and presented the children with problems of left, right, orientation and of cardinal directions. The results of this study confirm the findings of Satterly and at an increased level of significance particularly in the case of Orientation Exercise Two, which required the children to solve directional problems on the fictitious street plan. (* 01/02 - shorthand for Orientation 1 and 2)

TABLES 5.15, 16, 17 Correlations between the measures of cognitive style and Orientation Exercises 1 and 2.

TABLE 5.15	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
01 with EFT	0.4333	0.4330	0.4371	0.5637	0.3479	0.3997	0.4733
02 with EFT	0.5242	0.5398	0.5148	0.6355	0.4889	0.5227	0.4740

TABLE 5.16	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
01 with RFT	0.2687	0.3447	0.2189	0.4077	0.2638	0.3889	0.0772 ns
02 with RFT	0.3334	0.3702	0.3125	0.4689	0.2605	0.4226	0.1913 ns

TABLE 5.17	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
01 with ABC	0.2806	0.2607	0.2875	0.3095	0.2202*	0.2570	0.3123
02 with ABC	0.3072	0.3105	0.3053	0.3867	0.2477	0.2323	0.3700

(Levels of Significance: All significant at 1% level except *$p < 5\%$, ns - not significant)

and thus to some extent confirmed Hypothesis 7 for this study.
Hypothesis 7. There will be a positive and significant correlation between the measures of orientational ability (01 and 02) and the measures of cognitive style. (This was felt to be more likely in the case of EFT and RFT because of the 'orientational' skills required in them).

As can be seen in Tables 15, 16 and 17 the strongest correlations between Orientation and cognitive style are with the Embedded Figures Test, producing fairly consistent results for all subgroups. Correlations with RFT and ABC were again much lower, but still significant (At the 1% level except for the Rural Girls with RFT, and at 5% level for the Rural Boys on the ABC). It was also the case that correlations with orientation 2 were higher than those of orientation 1 for the ABC/RFT and there appears to be a slightly higher correlation between RFT and orientation for the Urban children of the sample. Why this might be so can only be speculated upon. The much more 'angular' environment of the urban children may be an influence and this could be an avenue for further investigation.

As a further measure of orientational ability and its association with cognitive style a third measure, 0 3, had been included in the study. This exercise presented children with a variety of map extracts of increasing complexity and a series of pictures. The children's task was to match the map extract to its appropriate picture and it was hypothesised that this would require considerable 'disembedding' skills in Witkins terms since children would have to separate elements from the visual field of the pictures and the map extracts in order to compare them, and that with increased detail this would place greater demands on the disembedding ability that the measures of cognitive style are supposed to reveal.

Hypothesis 8. The disembedding skills required in orientation 3 will correlate positively and significantly with those demonstrated by the tests of cognitive style.

As can be seen in Table 18 below, the results do not confirm Hypothesis 8 with any real strength. The correlations with the Embedded Figures test are again the highest and all at the 1% level except for the Rural Girls, but the level of shared variance between EFT and 03 is quite low. It is also the case that as with previous results, the correlations with RFT and ABC are considerably lower, particularly in the case of RFT and 0 3, where all results of those other than the sample as a whole proved not to be significant and even then the shared variance is extremely low. When the results are considered in terms of the urban rural distinction, they again demonstrate stronger correlations for the urban children of the sample and reinforce the suggestions of the need for further research to examine this difference.

TABLE 5.18 Correlations between the measures of cognitive style and Orientation exercise 3

TABLE 5.18	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
03 with EFT	0.2849**	0.3234**	0.2340**	0.3476**	0.2931**	0.3489**	0.2087*
03 with RFT	0.1038*	0.0934	0.0836	0.1811	0.0271	0.1499	0.0687
03 with ABC	0.1642**	0.2205**	0.1892**	0.3197**	0.1486	0.3533**	0.0504

(Levels of Significance: * $p < .05$, ** $p < .01$)

The final analysis which further investigated the analytic/global continuum, considered the possible associations with map/plan drawing. The Draw-a-Plan Test was included as an additional measure for comparison with the cognitive map analysis. As with the hypotheses associated with orientation, it was felt that the disembedding skills described by Witkin might have a considerable influence on the drawing of maps and plans, thus it was hypothesised that,

Hypothesis 9. Scores on the Draw-a-Plan Test will correlate positively and significantly with the measures of cognitive style, especially the EFT and RFT.

The results set out in Table 19 again demonstrate stronger associations with the Embedded Figures Test and it appears that these tests do share a fairly high level of variance. Correlations with RFT are much lower than anticipated and although significant do not appear to support the hypothesis outlined above, in fact correlations with ABC are generally higher than those with RFT, perhaps relating the 'drawing' element of both exercises. Comparison of the results for the various sub-groupings do not appear to reveal any major differences, except that when the boys and girls are considered as total groups there appears to be a slightly increased correlation between Draw-a-Plan and all measures of cognitive style

TABLE 5.19 Correlations between the measures of Cognitive Style and the Draw-a-Plan Test.

TABLE 5.19	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
DAP with EFT	0.4381	0.4711	0.4425	0.5292	0.5131	0.4620	0.5440
DAP with RFT	0.2475	0.3308	0.2108	0.3936	0.2939	0.2692	0.2287*
DAP with ABC	0.3413	0.3225	0.3078	0.4324	0.2635	0.3245	0.3217

(All significant at 1% level except * $p < 5\%$)

in favour of the boys of the sample. When these results are considered for urban and rural sub-groups however, this distinction is not confirmed for the Embedded Figures Test where the Rural girls achieved the highest correlation, or the Articulation of Body Concept Scale where the Rural Boys was the lowest.

B. Inter-correlations Amongst the other Measures used in the Study

As an additional element of the analysis, it was thought important to investigate the strength of relationships between the other measures used in this study. This would then serve as a comparison for the results, just discussed, relating these measures to those of cognitive style. The following matrices 1 - 7 present the results of the intercorrelations and Hypotheses 10 - 16 focussed upon relationships within them which were regarded as pertinent to the study as a whole.

Hypothesis 10, anticipated that the association between Spatial Ability and Intelligence would be strongest for the perceptual element of AH3.

The results of the analysis confirmed this hypothesis with all correlations between Spatial Ability and AH3 and Verbal, Numerical and Perceptual Reasoning being significant at the 1% level. Correlations with perceptual reasoning proved to be the highest amongst the three sub-divisions of intelligence for all sub groups. Of particular interest within this analysis were the results of the girls of the sample, who have achieved the highest correlations between all elements of ability and Spatial Test 2. Previous research (Watts 1963) had revealed clear sex differences on correlations of

INTERCORRELATIONS AMONGST OTHER MEASURES USED IN THE STUDY

MATRIX 1 Correlations for the Sample as a whole

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.6521**							
PER	—	0.6588	0.6023**						
ST 2	0.6382**	0.5275**	0.5122**	0.6183**					
01	0.5220**	0.5088**	0.4142**	0.4485**	0.4410**				
02	0.6146**	0.5447**	0.5069**	0.5680**	0.5543**	0.5330**			
03	0.2368**	0.1608**	0.2235**	0.2313**	0.3096**	0.1515**	0.1927**		
DAM	0.2587**	0.2366**	0.1509**	0.2920**	0.4116**	0.2480**	0.2645**	0.2214**	
DAP	0.3241**	0.2599**	0.2436**	0.3464**	0.4804**	0.2413**	0.3441**	0.1390**	0.3624**

MATRIX 2 Correlations for the Boys of the Sample

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.6624**							
PER	—	0.6117**	0.6084**						
ST2	0.5751**	0.4452**	0.4412**	0.5897**					
01	0.5373**	0.4936**	0.4092**	0.5003**	0.4526**				
02	0.6070**	0.5276**	0.4700**	0.5858**	0.5295**	0.5672**			
03	0.2145**	0.1657*	0.1779*	0.2109**	0.2987**	0.1699*	0.1964**		
DAM	0.2349**	0.2123**	0.1226	0.2868**	0.4051**	0.2389**	0.3208**	0.2155**	
DAP	0.2900**	0.1974**	0.2415**	0.3267**	0.5322**	0.2795**	0.3693**	0.1655*	0.3516**

MATRIX 3 Correlations for the Girls of the Sample

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.6670**							
PER	—	0.6941**	0.6207**						
ST2	0.7144**	0.6295**	0.5829**	0.6706**					
01	0.5026**	0.5167**	0.4327**	0.3850**	0.4459**				
02	0.6201**	0.5592**	0.5359**	0.5501**	0.5913**	0.4953**			
03	0.2974**	0.2098**	0.2628**	0.3093**	0.3040**	0.1690*	0.2101**		
DAM	0.2374**	0.2667**	0.1855**	0.3039**	0.4218**	0.2620**	0.2026**	0.2350**	
DAP	0.3573**	0.3039**	0.2905**	0.3456**	0.4748**	0.1764**	0.3189**	0.2102**	0.3929**

Levels of Significance * $p < .05$

** $p < .01$

MATRIX 4 Correlations for the Urban Boys only

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.7333**							
PER	—	0.6941**	0.6402**						
ST2	0.6470**	0.5526**	0.5105**	0.6296**					
01	0.6294**	0.6544**	0.4239**	0.5856**	0.5201**				
02	0.6410**	0.5961**	0.4341**	0.6410**	0.5492**	0.7025**			
03	0.3199**	0.3296**	0.2615**	0.2457*	0.3419**	0.0801	0.2399*		
DAM	0.2595**	0.2613**	0.1429	0.3031**	0.4219**	0.2555*	0.4218**	0.2826**	
DAP	0.4711**	0.4183**	0.3729**	0.4890**	0.5751**	0.3594**	0.4459**	0.2139*	0.4609**

MATRIX 5 Correlations for the Rural Boys only

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.5755**							
PER	—	0.5010**	0.5573**						
ST2	0.4810**	0.3125**	0.3531**	0.5375**					
01	0.4342**	0.3158**	0.3939**	0.4045**	0.3780**				
02	0.5724**	0.4382**	0.4746**	0.5292**	0.5109**	0.4147**			
03	0.1092	0.0168	0.0958	0.1666	0.2596**	0.2377**	0.1650		
DAM	0.1925*	0.1597	0.0812	0.2445**	0.3885**	0.2187*	0.2340**	0.1489	
DAP	0.1650	0.0138	0.1722	0.2319**	0.5337**	0.2284**	0.3024**	0.1578	0.3234**

MATRIX 6 Correlations for the Urban Girls only

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.6729**							
PER	—	0.7233**	0.5861**						
ST2	0.6891**	0.6327**	0.5187**	0.6672**					
01	0.4526**	0.4834**	0.4003**	0.3218**	0.4608**				
02	0.5603**	0.5203**	0.4559**	0.5297**	0.5695**	0.5177**			
03	0.2812**	0.1666	0.2351**	0.3422**	0.2785**	0.1676	0.3285**		
DAM	0.2377*	0.2055*	0.1543	0.2768**	0.4179**	0.2607**	0.1684	0.4433**	
DAP	0.3515**	0.2882**	0.2592**	0.3884**	0.4398**	0.0943	0.2828**	0.3636**	0.4217**

MATRIX 7 Correlations for the Rural Girls only

	AH3	VER	NUM	PER	ST2	01	02	03	DAM
AH3	—								
VER	—	—							
NUM	—	0.6260**							
PER	—	0.6339**	0.6368**						
ST2	0.7241**	0.5973**	0.6389**	0.6518**					
01	0.5587**	0.5538**	0.4619**	0.4389**	0.4207**				
02	0.6547**	0.5627**	0.6145**	0.5413**	0.5827**	0.4563**			
03	0.3803**	0.3099**	0.3428**	0.3359**	0.3687**	0.1861	0.1254		
DAM	0.2929**	0.2881**	0.1756	0.2872**	0.3911**	0.2500*	0.1997*	0.0689	
DAP	0.4495**	0.3982**	0.3914**	0.3808**	0.5756**	0.2843**	0.4192**	0.0654	0.4087**

Levels of Significance: * $p < .05$

** $p < .01$

this test with intelligence in favour of the boys, although reference to Fig. 1 (The overall characteristics of the Sample) still confirms a higher mean score on this test for the boys. A further point of importance was that differences between the correlations of Spatial Test Two with Verbal, Numerical and Perceptual reasoning were comparatively small.

It was also anticipated that a similar relationship to that described for spatial ability would be demonstrated between intelligence and the measures of orientational ability. As Hypothesis 11 stated,

Hypothesis 11. Orientation scores will correlate positively and significantly with the measures of intelligence, especially perceptual reasoning.

Conner (1969) had established a positive and significant relationship between intelligence and orientation Exercise 3 (of 0.46 for boys and 0.39 for girls) with a sample of 9 - 14 year old children and Satterly found correlations of 0.481 and 0.457 between intelligence and orientation Exercises 1 and 2 respectively and in the range 0.33 - 0.37 with tests of English and 0.39 - 0.57 with tests of Mathematics. The findings of this study are somewhat contradictory however. Correlations of 01 and 02 with Intelligence (AH3) are generally higher than those established by Satterly for this sample, with much more positive relationships demonstrated by the Urban children. Similarly, higher correlations (0.50 and 0.544) are demonstrated in these results for correlations with verbal reasoning when compared with Satterly's 'English Test' results, whereas slightly lower correlations are demonstrated for numerical reasoning (0.41 for Orientation 1 and 0.51 for Orientation 2). The assumption that these orientation exercises would correlate most strongly with perceptual reasoning was not confirmed. The results of correlations with orientation Exercise 3 are not as positive as those reported by Conner and the somewhat lower correlations when compared with orientation 1 and 2, seem to be a direct influence of the non-significant results of the Rural Boys for all aspects of the intelligence measures. It is also the case that correlations between 03 and AH3, Verbal and Numerical reasoning are the most positive for the Urban Boys and Rural Girls sub-groups, whereas correlations with perceptual reasoning are strongest for the girls of the sample.

When the Orientation Exercises were compared with Spatial Ability, similar results to those for Intelligence were demonstrated, with Orientation 2 producing the most consistent and strongest positive correlations and Orientation 3 achieving generally much lower correlations than the other two tests and thus confirming Hypothesis 12.

Hypothesis 12. Orientation scores will correlate positively and significantly with the measure of Spatial Ability.

As can be seen in the matrices of results, correlations between 01 and 02 and Spatial Ability are slightly lower than those described for intelligence, whereas those for Orientation 3 are slightly higher.

It has already been explained that the Draw-a-Plan Exercise had been included in this study, because of anticipated associations with map drawing. Hypotheses 13 to 16 investigated correlations between scores achieved on this test and the elements discussed so far, ie

Hypothesis 13 with measures of intelligence
14 with measure of spatial ability
15 with the measures of orientational ability
16 with aspects of drawing (Draw-a-Man)

Hypothesis 13. Scores on the Draw-a-Plan Test will correlate positively and significantly with measures of ability and in particular with perceptual reasoning.

Correlations with intelligence proved to be rather lower than anticipated, especially since Thorstad (1974) sees this test as a good indicator of intellectual maturity, but with a strong Spatial bias. As was anticipated however, scores for perceptual reasoning were most strongly correlated in all cases, except the rural girls whose correlation with verbal reasoning was only slightly stronger (0.3982 for verbal and 0.3808 for perceptual). Although hypothesis 13 is confirmed the level of shared variance between the tests is quite low. One interesting factor to emerge from this analysis was the results of the Rural Boys, which as with the Orientation 3 scores just reported, proved not to be significant for all elements of the analysis of intelligence except perceptual reasoning. Relationships between this test and spatial ability were confirmed by the results of this study and in turn confirmed Hypothesis 14.

Hypothesis 14. Scores on the Draw-a-Plan Test will correlate positively and significantly with the results of Spatial Test 2.

Thorstad (1974) had previously reported positive correlations between the Draw-a-Plan and two spatial sub-tests drawn from the Weschler Intelligence Scale for Children (ie the Object Assembly Test produced correlations of 0.32 for girls and 0.39 for boys and the Block Design achieved a correlation of 0.54 for both sexes). The results of this analysis produced consistent results in the range 0.44 - 0.58, with limited intergroup differences. The only obvious difference was the somewhat lower correlation of the rural boys subgroup.

When the Draw-a-Plan results were compared with those of the Orientation Exercises, the correlations were rather varied and less consistent or positive than was anticipated. Orientation 1 and 2 were concerned with plans and the low correlations between them and Draw-a-Plan results are perhaps an indication of the differences between 'reading' and 'drawing' plans. The demands of drawing a plan of one's house requires mental transformations which it was felt demanded a high degree of orientational ability and thus it was hypothesised that,

Hypothesis 15. Scores on the Draw-a-Plan Test will correlate positively and significantly with scores on the Orientation Exercises.

As can be seen, the results do not consistently support this assertion. The correlations with Orientation 2 are the strongest and significant at the 1% level in all cases, with the most positive results achieved by the Urban Boys and Rural Girls. Orientation 2 involved the use of the street plan and there appears to be a relatively high degree of shared variance here. Orientation 1 demonstrated more positive results for the boys of the sample, but this is due to the very low and non significant correlation of the Urban Girls, who in turn were the only sub-group to achieve a positive correlation between D-a-Plan and Orientation 3.

Hypothesis 16 attempted to investigate a point made earlier about the differences between map/plan drawing and map/plan reading. The Draw-a-Man test is not only a useful indicator of intellectual maturity according to Goodenough-Harris (1963) but also demonstrates something of an individual's concern for detail in his drawing. The Draw-a-Plan Test also demands concern for detail. Thorstad (1974) has reported positive correlations (of 0.32 for girls and 0.28 for boys) between D.A.Man and Draw-a-Plan, and Thompson (1977) reported significant (at the 1% level) but unspecified correlations between Draw-a-Man and Draw-a-Plan; and Draw-a-Plan and a Map Drawing Exercise. The results of this study produced higher correlations than those reported by Thorstad and to some extent confirmed Hypothesis 16, that

Hypothesis 16. Scores on the Draw-a-Plan test will correlate positively and significantly with those of the Draw-a-Man test.

However, the level of shared variance is still low and it is open to question as to whether this is a direct result of general intelligence, since both tests purport to measure this.

This concludes the review of inter-test correlations, the next section goes on to consider the cognitive-map analyses.

C. Intercorrelations with the Cognitive Maps produced by the Children of the Sample

Hypotheses 17 to 21 considered the inter-relationships demonstrated by the results of this study when the two maps produced by the children were compared with the various measurement techniques. Strong and positive correlations were anticipated between the maps and the following elements.

Hypothesis 17, with the measures of Cognitive Style
" 18, with the measures of Intelligence
" 19, with the measure of Spatial Ability
" 20, with the measures of Orientational Ability
" 21, with the Draw-a-Plan Test

It will be remembered that the maps were analysed in a variety of ways, for The Extent of the Area Map and for the degree of Abstraction, Perspective adopted, Accuracy and Map Style, for both the Area Map and the Route Map. Hypothesis 17 anticipated that the results of the analysis of the maps in terms of these elements would correlate positively and significantly with the three measures of cognitive style and this had been a significant factor in the selection of these particular elements for analysis. (See Appendix 3 for a detailed explanation).

Hypothesis 17. Each of the elements for which the maps were analysed will correlate positively and significantly with the tests of cognitive style, with field independent subjects producing better maps.

If this hypothesis proved to be confirmed, this would support the major hypothesis of the study that there is an association between children's perceptions of their environment, (as demonstrated in their cognitive maps) and cognitive style (as demonstrated by Witkin's analytic/global dimentsion). The previous discussion about the inter-relationships between the measures of cognitive style would lead one to anticipate a varied inter-correlational matrix in terms of the three measures of cognitive style, which is the case as can be seen on Table 20.

The results demonstrate a reasonable degree of similarity in the correlations between the Extent of the Area revealed in Map 1 and the Embedded Figures Test, confirming the hypothesis anticipated in Appendix 3 of a positive relationship between these two elements. All results are significant at the 1% level, but not at as high a level as had been anticipated. Thus, although statistically it is possible to argue that field independent subjects are more likely to produce more 'extensive' maps than those produced by field dependent individuals the difference is smaller than expected. (This is followed up later in terms of the actual detail included on the maps). Comparison of the correlations between Extent and the RFT and ABC are less supportive however, and as has been demonstrated previously the correlations are much lower than with the Embedded Figures Test. Although correlations for the sample are significant at the 1% level, there are indications of lower and non-significant correlations for the sub-groups. This raises further questions about the comparability of the measures of field dependence/independence and their use as a reliable indicator of children's cognitive style for this study. If

TABLE 5.20 Map Elements and the Measures of Cognitive Style

Map 1 (Area)	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Extent with EFT	0.3419**	0.2966**	0.3959**	0.3018**	0.2480**	0.3443**	0.3745**
Abstraction with EFT	0.2942**	0.2546**	0.3265**	0.1454*	0.3546**	0.5351**	0.2827**
Perspective with EFT	0.3555**	0.2827**	0.4173**	0.1461*	0.3377**	0.4429**	0.3272**
Accuracy with EFT	0.4055**	0.3584**	0.4160**	0.3280**	0.3329**	0.3598**	0.4227**
Style with EFT	0.1411**	0.1711*	0.1082	0.2669**	0.1321	0.1921	0.0779
Extent with RFT	0.1951**	0.1874**	0.1960**	0.2441*	0.1409	0.2123*	0.1324
Abstraction with RFT	0.1091**	0.1143	0.0946	0.0726	0.1457	0.3067**	0.0223
Perspective with RFT	0.1611**	0.1191	0.1816**	0.1170	0.1183	0.3023**	0.0723
Accuracy with RFT	0.2423**	0.1837**	0.3057**	0.1695	0.1937**	0.2665**	0.2462*
Style with RFT	0.1622**	0.1163	0.2103**	0.1254	0.1161	0.1892	0.2638**
Extent with ABC	0.2060**	0.2617**	0.1972**	0.2120*	0.2957**	0.2153**	0.1410
Abstraction with ABC	0.1368**	0.1678*	0.1623*	0.0824	0.2187*	0.2375**	0.1352
Perspective with ABC	0.1632**	0.2094**	0.1860**	0.1506	0.2421**	0.1668	0.1789
Accuracy with ABC	0.1946**	0.1717*	0.2383**	0.1465	0.1848*	0.2601**	0.1682
Style with ABC	0.1742**	0.1379	0.2254**	0.2161*	0.0851	0.3600**	0.0888
Map 2 (Route)	**Sample**	**Boys**	**Girls**	**Urban Boys**	**Rural Boys**	**Urban Girls**	**Rural Girls**
Abstraction with EFT	0.2987**	0.2055**	0.3665**	0.1218	0.2381**	0.3307**	0.3551**
Perspective with EFT	0.3149**	0.2685**	0.3472**	0.0983	0.4194**	0.3555**	0.2624**
Accuracy with EFT	0.3597**	0.3606**	0.3541**	0.3870**	0.3195**	0.2961**	0.3195**
Style with EFT	0.1168*	0.0421	0.1973**	0.0649	0.0023	0.1271	0.2503*
Abstraction with RFT	0.1652**	0.2684**	0.0822	0.2447*	0.3072**	0.0615	0.0382
Perspective with RFT	0.1810**	0.2573**	0.1221	0.1773	0.3395**	0.0807	0.0710
Accuracy with RFT	0.1853**	0.1917**	0.1726**	0.1425	0.2401**	0.0561	0.1808
Style with RFT	0.0341	0.0103	0.0824	0.0663	0.0612	0.1284	0.0479
Abstraction with ABC	0.1497**	0.1707*	0.1856**	0.1281	0.2140*	0.1849	0.1507
Perspective with ABC	0.0901	0.1335	0.1428*	0.0077	0.2550**	0.0825	0.1543
Accuracy with ABC	0.2634**	0.3060**	0.2617**	0.3189**	0.3024**	0.2227*	0.2 68**
Style with ABC	0.1908**	0.0240	0.3457**	0.0367	0.0589	0.3470**	0.3535**

Significance Levels: * $p < .05$

** $p < .01$

the only measure used as an indicator of 'style' had been the EFT, as much of the previous research has done, the relationships are much more positive. This assertion is also demonstrated when the other elements of the map anlysis are considered in terms of their correlations with EFT, RFT and ABC. When the results for both maps are compared, the EFT achieves the greatest degree of consistency. Correlations with Abstraction, Perspective and Accuracy are at the 1% level for all groups except the Urban Boys and the only irregular results are the associations with Map Style which included non significant results for the Girls and the Rural Boys.

Thus, if the EFT is taken as the measure of cognitive style, the hypothesis relating the map analysis to cognitive style is also confirmed for the degree of abstraction, the perspective adopted and the accuracy of the maps. In each case field independent individuals are more likely to achieve higher scores for these elements. The association of a particular map style and field independence is not proved however and it must also be recognised that the correlations for the other elements are comparatively low and that the strongest association links Accuracy with the Embedded Figures Test. Witkin would probably have expected this to be the case, since as was discussed earlier, accuracy is an associated characteristic of field independent individuals. Similarly Satterly (1964) had suggested,

> "... that the best single predictor of mapwork skill was provided by performance in the test of the perception of embedded shapes." (p 262)

The results of this study seem to confirm Satterly's suggestion.

As with the analysis of the Extent of the Maps, when the Abstraction, Perspective, Accuracy and Style of the maps are considered in terms of their relationship with RFT and ABC, the results are less clear and contain a large number of non significant results.

When the results are compared for sex and residential group differences there are very few differences and there is a considerable degree of similarity between the results for the two maps, with only the Urban Boys achieving consistly low correlations for both of them.

The association of cognitive style and cognitive maps is also considered in a later section when the scores for Abstraction, Perspective, Accuracy and Style are combined to produce composite scores for each map and then compared with results of EFT, RFT and ABC.

When each of the elements for which the maps had been analysed were compared with intelligence, Hypothesis 18 anticipated that a higher correlation would emerge with perceptual reasoning.

Hypothesis 18. Each of the elements for which the maps were analysed will correlate positively and significantly with the measures of intelligence and with perceptual reasoning in particular.

Table 21 provides a breakdown of the analysis, where it can be seen that the expected dominant association with perceptual reasoning is not confirmed. It is the case however that for the sample as a whole perceptual reasoning is the strongest correlating element, but it is also true that there are clear associations for verbal and numerical reasoning. It is also the case that correlations with intelligence are about the same as for the Embedded Figures Test and higher than for Rod and Frame and ABC. Previous research has demonstrated a close relationship between cognitive maps and intelligence. Bycroft (1974) for example identified a general ability factor in his analysis, Satterly (1964) demonstrated an association between intelligence and Map drawing and interpretation and Thompson (1977) reported significant correlations between map drawing and ability (0.611).

In terms of the elements considered in this study, the most positive association appears to be between Accuracy and Intelligence for all groups and there is a positive relationship demonstrated between the Extent of Map 1 and Intelligence. The remaining categories are less clear however, except that the perspective adopted and the degree of abstraction demonstrated are more closely associated with perceptual reasoning. The Style element again has produced extremely varied correlations with distinct sex differences. The boys demonstrate negative associations (Rural Boys on Map 1 and Urban Boys on Map 2) between Style and Intelligence, whereas the girl's correlations are more positive, but still demonstrate non-significant results. In general however, the girls correlations are significantly higher than those of the boys. This is especially true of the Rural Girls, whose results correlate with AH3, verbal, numerical and perceptual reasoning at the 1% level in all instances except the Style element on Map 1.

TABLE 5.21 Map 1 and 2	Elements/Intelligence						
MAP 1 with Intelligence	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EXTENT with:							
Verbal	0.3489**	0.3724**	0.3618**	0.3739**	0.3849**	0.2572**	0.4126**
Numerical	0.3426**	0.3484**	0.3283**	0.3066**	0.3751**	0.1328	0.4996**
Perceptual	0.3560**	0.3000**	0.4629**	0.2675**	0.3068**	0.4749**	0.4031**
AH3	0.3975**	0.3890**	0.4343**	0.3524**	0.4218**	0.3162**	0.5012**
ABSTRACTION with:							
Verbal	0.3049**	0.2308**	0.3909**	0.2686**	0.2246**	0.4946**	0.4180**
Numerical	0.2436**	0.1768*	0.2933**	0.2629**	0.1465	0.2788**	0.3937**
Perspectual	0.3156**	0.1678*	0.4380**	0.1459	0.2256**	0.5675**	0.4862**
AH3	0.3343**	0.2255**	0.4377**	0.2544**	0.2403**	0.5095**	0.5005**
PERSPECTIVE with:							
Verbal	0.2935**	0.1607*	0.4299**	0.1570	0.1721	0.4025**	0.4365**
Numerical	0.2521**	0.1558*	0.3262**	0.1517	0.1413	0.2103*	0.4226**
Perceptual	0.3549**	0.2050**	0.5122**	0.1658	0.2111*	0.4787**	0.5150**
AH3	0.3456**	0.1996**	0.4824**	0.1745	0.2114*	0.4134**	0.5296**
ACCURACY with:							
Verbal	0.4163**	0.3947**	0.4544**	0.4772**	0.3540**	0.3533**	0.4579**
Numerical	0.3948**	0.3782**	0.4152**	0.3798**	0.3727**	0.2285*	0.5432**
Perceptual	0.4235**	0.3118**	0.5584**	0.2356**	0.3585**	0.5218**	0.5136**
AH3	0.4753**	0.4254**	0.5400**	0.4309**	0.4295**	0.4112**	0.5799**
STYLE with:							
Verbal	0.1407**	0.1078	0.1731*	0.2685**	-0.0434	0.2086*	0.1686
Numerical	0.0997*	0.1167	0.0841	0.1469**	0.1090	0.0735	0.1194
Perceptual	0.1332**	0.0982	0.1692*	0.2277**	-0.0141	0.2135*	0.1616
AH3	0.1497**	0.1317	0.1679*	0.2573**	0.0247	0.1957	0.1739
MAP 2 with Intelligence	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
ABSTRACTION with:							
Verbal	0.2966**	0.0909	0.4718**	-0.0244	0.2378**	0.4959**	0.4016**
Numerical	0.2671**	0.0998	0.3910**	-0.0734	0.2773**	0.3383**	0.4132**
Perceptual	0.3534**	0.2033**	0.4980**	-0.0708	0.3302**	0.4829**	0.4703**
AH3	0.3565**	0.1526*	0.5222**	-0.0075	0.3381**	0.5097**	0.4966**
PERSPECTIVE with:							
Verbal	0.2734**	0.1219	0.4214**	0.0871	0.1649	0.3408**	0.4454**
Numerical	0.2480**	0.1234	0.3228**	0.1021	0.1452	0.2273*	0.3693**
Perceptual	0.2794**	0.1276	0.4323**	0.0832	0.1755*	0.3425**	0.4366**
AH3	0.3072**	0.1432*	0.4473**	0.0984	0.1973*	0.3458**	0.4844**
ACCURACY with:							
Verbal	0.3692**	0.3388**	0.4200**	0.4055**	0.2954**	0.2906**	0.4953**
Numerical	0.3723**	0.3768**	0.3603**	0.3738**	0.3836**	0.1889	0.5023**
Perceptual	0.4029**	0.3142**	0.5141**	0.2528**	0.3676**	0.3840**	0.5725**
AH3	0.4386**	0.3986**	0.4894**	0.3868**	0.4232**	0.3193**	0.6072**
STYLE with:							
Verbal	0.1532**	0.0050	0.2660**	-0.0145	0.0235	0.2231*	0.3288**
Numerical	0.1576**	0.0928	0.2565	0.0679	0.1072	0.1099	0.3858**
Perceptual	0.1578**	0.0013	0.2828**	-0.0275	-0.0005	0.2999**	0.2763**
AH3	0.1772**	0.0356	0.2945**	0.0087	0.0505	0.2303*	0.3779**

Significance Levels: * $p < .05$

** $p < .01$

When the correlations between Maps 1 and 2 are compared there is a considerable degree of consistency demonstrated with a limited number of exceptions. (eg The Boys and especially the Urban Boys when Abstraction is compared for Maps 1 and 2 and the Style of Maps 1 and 2 for the Girls, Rural Girls especially and the Urban Boys). This offers some support to the argument that cognitive maps are a consistent and reliable technique.

Previous research has suggested that a fundamental relationship exists between spatial ability and the skills involved in using and producing maps, Rushdoony (1968), Satterly (1964), Bycroft (1974). This has been further demonstrated by the results of this study, confirming Hypothesis 19, that,

<u>Hypothesis 19</u>. There will be a positive and significant relationship between the elements for which the maps were analysed and those of spatial ability (ST 2)

TABLE 5. 22 Correlations between the map analyses and spatial ability

MAP 1 with ST 2	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Extent	0.3759**	0.3160**	0.4433**	0.3619**	0.2721**	0.4130**	0.4318**
Abstraction	0.3293**	0.2686**	0.3753**	0.2500**	0.3263**	0.5306**	0.3293**
Perspective	0.3691**	0.2845**	0.4537**	0.2821**	0.2902**	0.4659**	0.3894**
Accuracy	0.3962**	0.3078**	0.4996**	0.2791**	0.3323**	0.4579**	0.4823**
Style	0.1668**	0.2317**	0.0931	0.3391**	0.1387	0.1736	0.0356

MAP 2 with ST 2	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Abstraction	0.3398**	0.2345**	0.4158**	0.2546**	0.2697**	0.4065**	0.4341**
Perspective	0.3189**	0.2632**	0.3542**	0.2526**	0.3316**	0.3483**	0.3805**
Accuracy	0.3841**	0.3838**	0.3779**	0.4115**	0.3734**	0.3141**	0.3147**
Style	0.1724**	0.0708**	0.2791**	0.1246**	0.0379**	0.2688**	0.3815**

(Levels of significance * $p < .05$, ** $p < .01$)

As the results in Table 22 demonstrate, all elements are correlated significantly at the 1% level with Spatial Ability, except for the Style category, which again has produced inconclusive results. The levels of correlation are still comparatively low however. The Extent category seems to be most highly correlated with Spatial Ability for the girls of the sample and the correlations described here are higher than those between Extent and EFT, suggesting that Spatial Ability is of more influence in the 'extent' demonstrated on the maps of the sample. The other categories are not so consistent however. In the Abstraction analysis the correlations were higher with EFT for the Rural Boys and the Urban Girls and in the Accuracy analysis EFT correlations were also higher for the girls on Map 1 and the Rural girls only on Map 2. For the remaining correlations Spatial Ability correlated higher than EFT and questions the considerable influence of Spatial ability on the results produced by the sample. In general, the correlations for the girls between the map analysis and spatial ability are higher. One might conclude however, that Hypothesis 19 is confirmed, with all elements except the style category correlated significantly at the 1% level, but with the slight reservation that the levels of correlation are lower than expected, especially for the boys.

Hypothesis 20 anticipated a positive and significant correlation to be demonstrated between the map analysis and the measures of orientational ability.

Hypothesis 20. There will be a positive and significant correlation between the elements for which the maps were analysed and the measures of orientation. It is anticipated that Orientation 2 will correlate most highly.

The results of this analysis, which can be seen in Table 23, are similar to those for orientation already discussed, that is clear differences between the correlations of Orientation 1 and 2, and those of Orientation 3. The results described here do not confirm Hypothesis 20, except that correlations with Orientation 2 are higher than those for Orientation 1 and 3. Again, the style category produces the only consistently non-significant results, with the Rural Girls being the only positive correlation with Orientation 2

MAP 1 with 01	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EXTENT	0.2616**	0.2989**	0.2372**	0.3491**	0.2539**	0.1509	0.3054**
ABSTRACTION	0.2606**	0.2367**	0.3033**	0.2468**	0.2482**	0.3257**	0.3209**
PERSPECTIVE	0.2336**	0.2042**	0.2847**	0.2099**	0.1984**	0.2480**	0.3108**
ACCURACY	0.2469**	0.2557**	0.2272**	0.2002**	0.3129**	0.1167	0.3047**
STYLE	0.0713	0.0693	0.0726	0.0991	0.0497	0.0144	0.1457
MAP 2 with 01							
ABSTRACTION	0.1985**	0.1195	0.2811**	0.0726	0.1737	0.2319**	0.3139**
PERSPECTIVE	0.1317**	0.0998	0.1841**	0.0618	0.1387	0.1066	0.2206*
ACCURACY	0.1955**	0.2397**	0.1609*	0.2128*	0.2700**	-0.0272	0.3074**
STYLE	0.0119	-0.1081	0.1221	-0.2217*	-0.0385	-0.0318	0.2585**

MAP 1 with 02	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EXTENT	0.3507**	0.3321**	0.3897**	0.3674**	0.3225**	0.3494**	0.3843**
ABSTRACTION	0.3019**	0.2588**	0.3479**	0.2187*	0.3051**	0.4586**	0.3439**
PERSPECTIVE	0.3433**	0.2518**	0.4317**	0.2594*	0.2785**	0.4244**	0.4183**
ACCURACY	0.3561**	0.2962**	0.4300**	0.2656**	0.3539**	0.3615**	0.4204**
STYLE	0.1018*	0.1450*	0.0534	0.2053*	0.0851	0.0069	0.1361
MAP 2 with 02							
ABSTRACTION	0.3034**	0.1937**	0.3968**	0.1090	0.3300**	0.3055**	0.4482**
PERSPECTIVE	0.2378**	0.2032**	0.2810**	0.1368	0.2859**	0.2107*	0.2806**
ACCURACY	0.3648**	0.3398**	0.3975**	0.3630**	0.3581**	0.3005**	0.4467**
STYLE	0.1319**	0.0146	0.2396**	-0.1147	0.1277	0.1072	0.3776**

MAP 1 with 03	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EXTENT	0.1855**	0.0908	0.2632**	0.0971	0.0733	0.3565**	0.2170*
ABSTRACTION	0.1917**	0.1256	0.2177**	0.0807	0.1591	0.2275*	0.2061*
PERSPECTIVE	0.1788**	0.1292	0.1823**	0.0588	0.1589	0.1383	0.2369*
ACCURACY	0.1883**	0.1499*	0.2372**	0.1609	0.1314	0.3878**	0.2035*
STYLE	0.0272	-0.0545	0.1300	0.1151	0.1743	0.1572	0.0999
MAP 2 with 03							
ABSTRACTION	0.1709**	0.1186	0.1727*	0.0482	0.1681	0.0899	0.2652**
PERSPECTIVE	0.1072*	0.0301	0.0915	-0.0004	0.0545	-0.0032	0.1755
ACCURACY	0.2523**	0.2301**	0.2501**	0.2491*	0.2115*	0.3584**	0.2004*
STYLE	0.0758	0.0236	0.2132**	0.0347	-0.0636	0.2575**	0.1847

(Levels of Significance * p .05
** p .01)

(at the 1% level, which in turn influences the correlation for the girls and the sample as a whole). Factors of interest which emerge from this analysis are the generally more positive correlations of the girls and the rural girls in particular. The much lower correlations of the urban boys, especially on Orientation 1 and 3 and the somewhat inconsistent results when the two maps are compared. As was mentioned for Orientation 2, the Style category produced consistently non-correlating results, which perhaps raises questions about the validity of this particular measure as a means of analysing cognitive maps.* The differences between the urban and rural sub-groups demonstrated in other aspects of the orientational analysis were not demonstrated here however.

It has been explained earlier that map and plan drawing were felt to depend on similar skills and in order to measure this, the Draw-a-Plan Test had been included in the Study where it was hypothesised that,

Hypothesis 21. There will be a positive and significant correlation between the elements for which the maps were analysed, and the results of the Draw-a-Plan Test. Thompson (1977) had identified a positive correlation between map drawing and the Draw-a-Plan Test ($r = 0.429$ significant at the 1% level) for a sample of 125 11 - 12 year olds. She also identified sex differences in favour of the boys but did not report the differences in levels of significance. The results of this study are described below in Table 24, where it can be seen that there are distinctly different results demonstrated between the maps themselves, perhaps questioning the statement made earlier about cognitive maps as a consistent measure of environmental perception. The low correlations may however be because the Draw-a-Plan score is a composite score and inter-relationships between Map and Plan Drawing might be more clearly portrayed by the analysis when the map scores are combined to produce a similar composite score. This will be discussed in a later section. The correlations described here are generally lower than that reported by Thompson and contrary to her findings, the correlations for the girls are generally higher than for the boys. Although it was commented that there appears

* Bycroft reported similarly conflicting results for the analysis of map structure by his panel of judges.

TABLE 5.24 Correlations between the map analysis and the Draw-a-Plan exercise

MAP 1 with DAP	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Extent	0.2257**	0.1970**	0.3358**	0.3172**	0.1807*	0.3222**	0.4076**
Abstraction	0.2197**	0.1891**	0.3081**	-0.0115	0.2799**	0.3059**	0.2999**
Perspective	0.1780**	0.1639*	0.2575**	0.1393	0.2406**	0.2178*	0.3329**
Accuracy	0.2902**	0.2715**	0.3374**	0.3658**	0.2912**	0.3130**	0.4931**
Style	0.1871**	0.2095**	0.1644*	0.1006	0.2712**	0.2444*	0.0745

MAP 2 with DAP	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Abstraction	0.1106**	0.0241	0.2383**	0.0103	0.1287	0.2207*	0.2956**
Perspective	0.1214**	0.1391*	0.1925**	0.0715	0.2180*	0.2280*	0.2283*
Accuracy	0.2261**	0.2176*	0.2808**	0.4272**	0.1794*	0.3491**	0.2771**
Style	0.1167**	0.0148	0.2270**	0.1273	0.0604	0.3055**	0,1716

(Levels of significance: * $p < .05$, ** $p < .01$)

inconsistency between the maps themselves, it is the case that the correlations between Draw-a-Plan and the Accuracy of the Maps is at the 1% level in all cases (except the Rural Boys on Map 2 which is significant at the 5% level), which is not surprising since considerable weight is layed upon Accuracy of detail in the Draw-a-Plan Test.

This concludes the analysis of the maps in terms of the elements of extent, abstraction, perspective, accuracy and style, but before moving on it is possible to re-investigate a hypothesis referred to earlier. The analysis of Klett and Alpaugh (1976) had provided three of the categories used in this study, those of Extent (Scale in Klett's terms), Abstraction and Perspective. Derived from the work of Blaut and Stea, Klett and Alpaugh hypothesised that children's abilities for these three cognitive transformations will be approximately at the same level at any given point in a child's developmental sequence. As can be seen below the results of this study confirm those of Klett and Alpaugh at the 1% level when the sample is seen in terms of sex and residential groupings, but there are minor inconsistencies demonstrated when the results are considered in terms

TABLE 5.25 Comparison of the results of the Klett and Alpaugh analysis (1)

TABLE 5.25	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Extent/ Abstraction	0.5007	0.4670	0.5386	0.5119	0.4926	0.4889	0.6433
Extent/ Perspective	0.4911	0.4566	0.5266	0.3997	0.4593	0.4025	0.5826
Abstraction/ Perspective	0.8405	0.8069	0.8584	0.7459	0.8890	0.8335	0.8997

(Levels of significance $p < .01$)

of Age and Sex groupings. Although the results are still highly significant, there appears to be a reduction in the levels of correlation for the girls with age (Table 26) for all three inter-correlations and no real pattern emerges for the boys. It is also the case that correlations between perspective and abstraction are the most

TABLE 5.26 Comparison of the results of the Klett and Alpaugh analysis (2)

	TABLE 5.26	Extent/Abstn	Extent/Perspec	Abstn/Perspec
10 - 11 yr olds	Sample	0.4528**	0.5073**	0.8208**
	Boys	0.2042**	0.3144**	0.7131**
	Girls	0.6339**	0.6639**	0.8685**
11 - 12 yr olds	Sample	0.5365**	0.5367**	0.8529**
	Boys	0.5722**	0.5747**	0.8572**
	Girls	0.5258**	0.4977**	0.8491**
12 - 13 yr olds	Sample	0.4519**	0.3554**	0.8063**
	Boys	0.4825**	0.3882**	0.7765**
	Girls	0.4403**	0.3423**	0.8254**

(Level of Significance ** $p < .01$)

positive reported in the study. In terms of cognitive maps it is clear that the degree of abstraction demonstrated in cognitive maps is dependent upon the perspective adopted by the mapper.

Each of the categories for which the maps were analysed demonstrated a progressive improvement in that particular element in the map. (This is discussed in Appendix 3). It was therefore argued that by combining the scores for the degree of abstraction, perspective adopted, accuracy and style for each of the maps it was possible to produce composite scores which reflected the overall quality of the maps. Thus maps with higher composite scores for Map 1 and Map 2 were the 'better' maps. The results of these composite scores were then correlated with the other measures used in the study and the results can be seen in Table 27 where many of the assertions made for the analysis of the maps as separate elements are confirmed when the maps are considered in terms of their composite scores, ie

1. The Embedded Figures Test correlates more highly than RFT/ABC with the composite map scores and that the correlations for the girls are more positive than those of the boys. (This is primarily as a result of the Urban Girls on Map 1 and the Rural Girls for Map 2). There does appear to be some consistency between the maps for these correlations for all sub groups of the sample.

2. Comparison between composite map scores and intelligence (AH3) indicates, with the exception of the Urban Boys, a strong positive correlation. This is particularly true of the girl's results.

3. When the intelligence scores are separated out for Verbal, Numerical and Perceptual reasoning, perceptual reasoning is most highly correlated with the composite map scores in all cases except for the Urban Boys on Map 1 (where a high loading with verbal reasoning influences the result $\dot{-}$ 0.4124) and for the Boys as a whole on Map 2. (It is interesting to note that for the Urban Boys on Map 2 correlations are only significant for EFT and ST2 at the 1% level and RFT and O2 at the 5% level).

4. There is a strong positive association demonstrated between Spatial Ability as measured by Spatial Test 2 and the composite map scores, which is again consistent across both maps and with the girls of the sample achieving the higher correlations.

TABLE 5.27 Correlations between Maps 1 and 2 Composite Scores and other measures used in the study

TABLE 5.27	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Map 1 with:							
EFT	0.4103**	0.3686**	0.4772**	0.2956**	0.3938**	0.5418**	0.3694**
RFT	0.2135**	0.1795*	0.2323**	0.1700	0.1867*	0.3555**	0.1390
ABC	0.2135**	0.2354**	0.2465**	0.2038*	0.2526**	0.3032**	0.1856
AH3	0.4448**	0.3394**	0.5504**	0.3938**	0.3160**	0.5131**	0.5983**
VER	0.3929**	0.3111**	0.4880**	0.4124**	0.2576**	0.4912**	0.4986**
NUM	0.3367**	0.2839**	0.3788**	0.3400**	0.2509**	0.2687**	0.4912**
PER	0.4231**	0.2725**	0.5814**	0.2699**	0.2795**	0.5989**	0.5682**
ST2	0.4318**	0.3691**	0.4837**	0.3865**	0.3704**	0.5520**	0.4228**
DAM	0.2172**	0.2094**	0.2324**	0.2214*	0.1924*	0.2216*	0.2227*
01	0.2880**	0.2776**	0.3177**	0.2789**	0.2820**	0.2675**	0.3621**
02	0.3872**	0.3317**	0.4457**	0.3384**	0.3544**	0.4515**	0.4416**
03	0.2118**	0.1379	0.2514**	0.1449	0.1296	0.2742**	0.2503*
DAP	0.2837**	0.2745**	0.3531**	0.2114**	0.3458**	0.3394**	0.3955**

	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Map 2 with:							
EFT	0.3853**	0.3274**	0.4280**	0.2645**	0.3450**	0.3999**	0.5343**
RFT	0.2049**	0.2689**	0.1521*	0.2506*	0.2975**	0.1121	0.3757**
ABC	0.2343**	0.2441**	0.2916**	0.1790	0.2968**	0.2776**	0.1059
AH3	0.4510**	0.2806**	0.5915**	0.1873	0.3786**	0.5109**	0.6369**
VER	0.3862**	0.2153**	0.5362**	0.1788	0.2692**	0.4950**	0.5443**
NUM	0.3663**	0.2639**	0.4402**	0.1702	0.3469**	0.3170**	0.5346**
PER	0.4207**	0.2485**	0.5802**	0.1526	0.3252**	0.5385**	0.5714**
ST2	0.4246**	0.3539**	0.4761**	0.3644**	0.3656**	0.4744**	0.4416**
DAM	0.2116**	0.1923**	0.2348**	0.1955	0.1675	0.1782	0.2391*
01	0.1952**	0.1363	0.2622**	0.0731	0.1964*	0.1332	0.3551**
02	0.3693**	0.2887**	0.4428**	0.2093*	0.4084**	0.3475**	0.4926**
03	0.2090**	0.1338	0.2292**	0.1295	0.1302	0.2299*	0.2631**
DAP	0.2837**	0.1423	0.3096**	0.2281**	0.1505	0.3826**	0.3194**

(Levels of Significance * $p < 0.05$, ** $p < 0.01$)

5. Orientation 2 produced significantly more positive correlations with the composite map scores than orientation tests 1 and 3, and in general correlations are higher for the girls (The only exception to this is that of 02 for the Rural Boys on Map 2)

6. When the composite scores for Maps 1 and 2 are compared the results shown in Table 28 demonstrate that a considerable degree of consistency is represented for all subgroups of the sample and confirmed Hypothesis 22, that,

Hypothesis 22. There will be a positive and significant correlation between the composite scores for Maps 1 and 2. (Thus demonstrating consistency across the maps and offering evidence to support cognitive mapping as a consistent means of obtaining data).

TABLE 28 Correlations between Maps 1 and 2 (composite scores)

MAP 1 with Map 2	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
	0.5868	0.5287	0.6118	0.5730	0.5068	0.5563	0.6397

($p < .01$)

As can be seen, the correlations between Map 1 and Map 2 composite scores are highly significant confirming Hypothesis 22 at the 1% level and again the correlations for the girls are higher than those of the boys.

7. When the Draw-a-Plan scores are considered in terms of the composite map scores, the correlations are much lower than was expected. The results on Map 1 are more consistent, but correlations with Map 2 demonstrate non-significant correlations for the boys, particularly the Rural Boys. The correlations for the girls are again higher than the boys which is contrary to the findings of Thorstad (1974) and Thompson (1977) which were discussed earlier.

As a final comment about associations between the composite map scores and the other measures used in the study, it appears that AH3 and the Embedded Figures Test achieve the most positive relationships. In order to investigate this tri-partite relationship, correlations for the three scores were submitted to analysis by partial correlation which provides a single measure of association between two variables while adjusting or controlling for the effects of one or more variables.

When the effects of Intelligence were partialled out from the relationship between Map 1 and theEmbedded Figures Test the correlation reduced from 0.4103 to 0.2009 and that of Map 2 and the EFT from 0.3853 to 0.202 which suggests a strong influence of intelligence on the relationship between Map 1 and EFT (of 0.2094) and Map 2/EFT (0.1833). These results were also confirmed by the correlations between EFT and intelligence which were discussed earlier.

Although not part of the original study, it was possible to compare the map results with another form of map analysis. Following the collection of the empirical data the children of the Rural School undertook the Richmond Test of Basic Cognitive Skills as part of the Authority's monitoring of progress. Included in this battery of tests is a section testing map reading skills. The school concerned very kindly loaned the computer print out of these results which were then correlated with the results of this study and can be seen on Table 29 below, where associations for the Richmond Test are similar to those described for the analysis of Map 1 and Map 2 composite scores. Intelligence and Embedded Figures Test achieve high positive correlations, although verbal reasoning correlates more highly for the girls. The Draw-a-Plan produces slightly higher but similar results, with the Girls Draw-a-Plan results correlating more highly with the Richmond Scores than do the boys, which was the case for correlations with Map 1 and Map 2.

Throughout the analysis so far, no mention has been made of the effects of age on the results described. Much previous research into both environmental perception and cognitive style has demonstrated that age is an important variable in the development of the capacities associated with each of these, some of which was discussed in Chapters Two and Three. It was hypothesised that age would prove to be an important variable for the results of this study.

TABLE 5.29 Correlations with the results of the Richmond Test analysis (Rural Group only)

TABLE 5.29	Rural Sample	Rural Boys	Rural Girls
Richmond Test with EFT	0.4909	0.5015	0.4689
RFT	0.3196	0.3215	0.3059
ABC	0.2222	0.1895	0.3173
AH3	0.5416	0.5098	0.5753
VER	0.4717	0.3995	0.5499
NUM	0.4479	0.4489	0.4325
PER	0.4546	0.4159	0.5102
ST 2	0.4896	0.4968	0.4679
DAM	0.2547	0.2052	0.3215
01	0.3367	0.3486	0.3403
02	0.4482	0.4549	0.4323
03	0.1613	0.0953	0.2156
DAP	0.3552	0.3099	0.4629
Extent	0.2763	0.2322	0.3167
Abstraction	0.3224	0.2626	0.3735
Perspective 1	0.3220	0.2774	0.3498
Accuracy 1	0.3539	0.3144	0.3958
Style 1	0.0258	0.0757	-0.0404
Abstraction 2	0.3901	0.3444	0.4117
Perspective 2	0.3556	0.3398	0.3435
Accuracy 2	0.3470	0.2896	0.3883
Style 2	-0.0257	-0.0850	0.0720
Map 1	0.3637	0.3225	0.3934
Map 2	0.3837	0.3241	0.4110

Those underlined - not significant

(Results all significant at the 1% level except correlations with Style 1 and 2 and Orientation Exercise 3 for the Rural Boys which were not significant)

Hypothesis 23. The influence of age will be reflected across the results of the study and will be demonstrated in particular in the correlations of the tests of cognitive style and those of the map analysis.

Table 30 is taken from the 'overall characteristics of the sample' which were presented earlier as Tables A - E. In this tabulation it is possible to identify a general and progressive improvement on all of the exercises with age. If for example, scores

TABLE 5.30 Mean scores on EFT, RFT, ABC

TABLE 5.30	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Mean EFT							
10 - 11's	14.212	15.190	13.319	15.469	14.903	16.520	11.500
11 - 12's	16.606	16.855	16.341	19.333	14.786	17.386	15.132
12 - 13's	18.214	18.010	18.438	19.047	17.200	18.962	17.667
Mean RFT							
10 - 11's	54.443	58.587	50.659	62.016	55.048	41.400	55.920
11 - 12's	42.872	33.526	51.762	27.986	38.274	32.705	73.829
12 - 13's	35.124	29.230	41.747	27.289	30.818	36.651	49.250
Mean ABC							
10 - 11's	3.519	3.661	3.391	3.531	3.800	3.320	3.436
11 - 12's	3.142	3.355	2.937	3.147	3.524	2.829	3.053
12 - 13's	2.863	3.075	2.622	3.211	2.982	2.652	2.580

(1. Higher EFT scores indicate Field Independence)
2. Lower ABC/RFT scores indicate increasing Field independence)

for the sample, the Boys and the Girls are reviewed, Witkin's assertions are confirmed with the exception of the higher EFT score for 12 - 13 year old girls. Age certainly appears a dominant factor. Yet when the results are considered for urban and rural sub-groups, sex and age differences are less clearly progressive, which raises questions about the supposed age related characteristics of Witkin's analytic/global dimension. In order to compare the influence of age within the study, age was treated as an independent variable and scored in months, thus the older an individual, the higher his age score. The ages of the sample were then correlated with the measures employed to provide an indication of the effect of age on the results, a breakdown of which can be seen in the table below (Table 31).

The correlations between Age and the measures of cognitive style are varied, suggesting that something more than age is influencing success on these tests. In general, correlations between EFT and age are low with the exception of the Rural Girls, where age appears to be a dominant influence. Correlations with RFT and ABC suggest that age is more influential on the drawings produced by the children, yet when the Draw-a-Man scores are considered, correlations with age are extremely low. This contradicts comments made earlier about similarities between these tests (DAM/ABC) or at least points to one major difference between them, ie Age is more influential when drawings are scored for Articulation of Body Concept than for the Draw-a-Man Scale.

As might have been expected, correlations between age and the tests of intellectual ability are comparatively high, with that of the girls being higher on all counts. Correlations with Spatial ability are lower and age seems to be less influential, reinforcing spatial ability as a separate element of ability not an age related factor. The measures of orientation produced mixed results with Orientation Exercises 1 and 2 demonstrating a stronger influence of age than Orientation 3. In general however, the influence of age is comparatively small, but its effect is greater for the girls for all three exercises. This is particularly true on Orientation 1 and 2 for the Rural Girls.

The most interesting results of the analysis of the influence of age on the results are those associated with the composite scores for Map 1 (The Area where the children live) and Map 2 (The Route from Home to School). In all cases except the Urban Boys, the influence of age is considerably stronger on Map 2, the Route from Home to School. This suggests an important avenue for further study which has not been mentioned in the research literature that the appropriateness of a test to the particular age group undertaking that task needs to be more carefully considered in cognitive mapping studies.

TABLE 5.31 Correlations with Age

TABLE 5.31	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Age with							
EFT	0.2713**	0.1810**	0.3535**	0.2110*	0.1732	0.1809	0.4551**
RFT	0.1212*	0.1933**	0.0567	0.2239*	0.1634	0.0162	0.0289
ABC	0.2689**	0.2394**	0.3358**	0.1911	0.2908**	0.2376*	0.4276**
AH3	0.4131**	0.3535**	0.4738**	0.3381**	0.3900**	0.4182**	0.5010**
VER	0.3861**	0.3192**	0.4576**	0.3074**	0.3376**	0.4149**	0.4703**
NUM	0.3639**	0.3175**	0.4069**	0.3329**	0.3156**	0.3047**	0.5043**
PER	0.3339**	0.2950**	0.3838**	0.2738**	0.3397**	0.3795**	0.3427**
ST 2	0.2942**	0.2566**	0.3253**	0.3406**	0.1607	0.2755**	0.3442**
DAM	0.0365	0.0519	0.0200	0.0291	0.0933	0.0810	0.0877
0 1	0.2596**	0.1783*	0.3525**	0.2470*	0.1087	0.2497*	0.4599**
0 2	0.2734**	0.2373**	0.3115**	0.2336*	0.2409**	0.1436	0.4730**
0 3	0.1534**	0.1932**	0.1008	0.3605**	0.0503	0.0447	0.1835
DAP	-0.0327	-0.0479	0.0057	-0.0368	-0.0789	0.1213	0.1823
EXTENT	0.2236**	0.1961**	0.2518**	0.0448**	0.3573**	0.1293	0.3304**
ABSTRACT: 1	0.2439**	0.2431**	0.2414**	0.2929**	0.2168*	0.2170*	0.3229**
PERSPT: 1	0.2472**	0.1785*	0.2951**	0.1929	0.1955*	0.1999*	0.3566**
ACCURACY: 1	0.2062**	0.1714*	0.2445**	0.0087	0.3312**	0.0883	0.3108**
STYLE: 1	0.1384**	0.1265	0.1526*	0.1597	0.0902	0.1702	0.1594**
ABSTRACT: 2	0.4041**	0.3332**	0.4559**	0.2890**	0.4168**	0.4777**	0.4032**
PERSPT: 2	0.3068**	0.1836**	0.3887**	0.3020**	0.0567	0.3769**	0.3740**
ACCURACY: 2	0.2836**	0.2355**	0.3279**	0.0258	0.4484**	0.1722	0.4338**
STYLE: 2	0.2158**	0.1169	0.3093**	-0.0545	0.2589**	0.1243	0.4882**
MAP: 1	0.2897**	0.2502**	0.3178**	0.2352*	0.2822**	0.2334*	0.3848**
MAP: 2	0.4255**	0.3262**	0.4968**	0.2289*	0.4474**	0.4302**	0.5343**

(Levels of Significance * p <.05 ** p <.01)

When the effects of age are considered for the elements of the map analysis further interesting results emerge.

1. There is a closer association between the 'Extent' of the Area maps and age for the girls of the sample, which perhaps suggests that it is only as the girls get older that they are given greater freedom and hence acquire greater knowledge of their home area which is then reflected in their maps.

2. The degree of abstraction demonstrated and the perspective adopted demonstrate a stronger association with age in Map 2 for all groups except the Urban Boys.

3. The Accuracy of the maps seems to be more strongly associated with age for the Rural children of the sample.

4. Similarly, the Style of the maps, appears to improve with age for the Rural group on the second map, which again reinforces the suggestions made above about the influence of the task and its association with age.

Generally however, the influence of age on the results of the study are less significant than one might have expected and that we are concerned more with differences in capacity rather than with developmental changes. This conclusion seems to be supported when a partialling analysis (as undertaken with intelligence and discussed earlier) is performed to investigate the influence of Age on the association between Embedded Figures and the Composite Map Scores.

When this analysis was undertaken, correlations between EFT/Map 1 were reduced from 0.4103 to 0.3741, an influence of 0.0362 of age, and on EFT/Map 2 from 0.3853 to 0.3558 an influence of 0.0293. The limited influence of age on the results of the analysis were further confirmed when the major elements of the study were submitted to a Principal Components Analysis in order to determine the structure of their relationships.

Principal Components Analysis

(Several of the variables which were included in the principal components analysis have not been mentioned in the discussion so far. These will be discussed in more detail in later sections: SCORE 1 and SCORE 2 refer to composite scores for personality characteristics associated with Field dependence/independence and NOF 1, 2, 3 and

NODF refers to the Number of Features included on Map 1 (1) Map 2 (2), the Questionnaire (3) and the number of different features mentioned by individuals (NODF)).

In a principal components analysis, Badger (1978) cites Kaiser (Cooley and Lohnes 1971 p 104), who suggest that components with Eigen values larger than unity may be considered significant. In this study,four components satisfied this criterion and two fell slightly short of it, as can be seen in Table 32. The first, with an eigen value of 8.002, accounts for 53.5% of the variance and reflects the common intellectual component of the variables, but with a particularly strong bias towards the spatial/perceptual elements. (Spatial Test 2, EFT and the perceptual element of AH3 demonstrating the highest loadings). Loadings for the tests of cognitive style again reflect the differences demonstrated in the earlier part of the analysis, with EFT higher than RFT/ABC. Similarly,comparison with the scores for verbal, numerical and perceptual reasoning reinforce the comments made about the influence of intelligence. The various elements of the map analysis also demonstrate comparatively high loadings, suggesting the influence of spatial/perceptual/intellectual abilities in them. As has been shown in the earlier analysis however, the Style component is clearly differentiated from the other forms of map analysis when compared with this factor.

The second component has an eigen value of 2.15984 and accounts for a further 14.4% of the common variance. This component seems to be defined by the degree of abstraction and perspective adopted in the maps produced by the children of the sample. It is inversely related to a variety of other variables, but particularly the number of features referred to by the sample. This component seems to reflect important elements of environmental perception, ie The viewpoint adopted and the resulting perception in terms of the features felt to be significant. Of the measures of cognitive style, only the Articulation of Body Concept appears to demonstrate any association with this component.

The third component, with an eigen value of 1.5403 accounts for a further 10.3% of the variance and appears to represent a bi-polar

TABLE 5.32 The Principal Components Analysis

VARIABLES	i	ii	COMPONENTS iii	iv	v	vi	vii
AGE	0.461	0.049	0.217	0.196	0.388	0.095	0.108
EFT	0.74	-0.033	-0.303	-0.036	-0.035	0.026	0.103
RFT	0.43	-0.091	-0.247	-0.024	0.039	0.042	-0.100
ABC	0.53	-0.327	-0.150	-0.474	-0.200	-0.110	-0.031
VER	0.73	-0.083	-0.172	0.286	-0.057	-0.012	-0.014
NUM	0.65	-0.065	-0.078	0.355	-0.064	0.064	-0.035
PER	0.74	-0.048	-0.203	0.290	-0.324	0.057	0.049
ST 2	0.77	-0.058	-0.222	0.012	-0.025	0.006	0.154
D A Man	0.48	-0.243	-0.271	-0.595	-0.095	-0.077	-0.132
01	0.55	-0.139	-0.179	0.205	0.072	-0.214	0.076
02	0.69	-0.077	-0.158	0.194	0.056	-0.056	0.039
03	0.32	0.017	0.019	-0.062	-0.084	0.007	0.213
D A Plan	0.46	-0.114	-0.185	-0.209	0.195	0.075	0.013
Extent	0.59	0.209	0.225	-0.066	0.286	0.202	-0.080
Abst. 1	0.54	0.584	0.127	-0.133	0.267	-0.195	0.167
Pers. 1	0.57	0.593	0.076	-0.162	0.194	-0.181	0.125
Accuracy 1	0.66	0.139	0.152	-0.024	0.272	0.389	0.107
Style	0.23	-0.007	0.080	-0.118	-0.010	0.164	0.144
Abst. 2	0.52	0.520	0.117	-0.006	-0.295	-0.099	0.223
Pers. 2	0.46	0.569	0.042	-0.033	-0.223	-0.149	-0.207
Accuracy 2	0.59	0.048	0.242	-0.043	-0.163	0.311	-0.011
Style 2	0.26	-0.059	0.246	-0.114	-0.208	0.273	-0.001
NOF 1	0.47	-0.297	0.332	0.090	0.162	-0.058	0.101
NOF 2	0.39	-0.269	0.334	-0.079	-0.136	0.141	0.211
NOF 3	0.32	-0.370	0.300	0.004	0.157	-0.287	-0.290
NODF	0.56	-0.481	0.605	-0.011	0.071	-0.249	-0.032
SCORE 1	0.24	-0.156	-0.285	0.073	0.262	0.023	-0.162
SCORE 2	-0.44	0.109	0.176	-0.133	0.099	-0.021	0.203
EIGEN-VALUE	8.00186	2.15984	1.54033	1.10796	0.88940	0.75308	0.49617
PERCENTAGE OF VARIANCE	53.5%	14.4%	10.3%	7.4%	5.9%	5.0%	3.3%

component of Embedded Figures, Rod and Frame and the more spatially biased measures of intelligence against the Number of Features referred to by the sample. Again there is an inverse relationship demonstrated here, which is contrary to expectations, for as will be discussed later it was hypothesised that there would be a strong positive association demonstrated between cognitive style and perception of the environment as represented by the range of features referred to by individuals on their maps and in the questionnaire. This factor is the only one that demonstrates an influence of cognitive style and for the first time associations between EFT/RFT are demonstrated comparatively strongly, when compared with the other relationships associated with this factor.

Fourthly, a drawing component seems to have emerged as a significant factor, with an eigen value just above unity of 1.1079 and accounting for a further 7.4% of the variance. This factor associates the results of Draw-a-Man and the Articulation of Body Concept Scale and lends further support to Hypothesis 5 which argued for a close relationship between these tests.

Eighty-five point seven per cent of the variance of the measures is accounted for by these four components. A fifth component which almost reaches unity (0.889) accounts for a further 5.9% of the variance and appears to be defined by age. This further confirms the limited influence of age on the results of the study. A sixth factor which also almost approaches unity (0.75%) and accounts for a further 5% of the variance is defined by an Accuracy factor. In all, the factors discussed here account for 96.7% of the common variance, but it is clear that the most significant one is that reflecting the influence of spatial/perceptual/intellectual ability required in the solution of the measures used in the study.

Multiple Regression Analysis

In a final attempt to investigate this last assertion and in an attempt to interpret the results achieved so far, the major elements of the study were submitted to analysis by Stepwise Multiple Regression. As Nie et al (1974 p 321) explain, multiple regression is a general statistical technique through which one can analyse the relationships between a dependent or criterion variable and a set of independent or predictor variables. It can be used as a 'descriptive' or 'inferential' tool. In a stepwise multiple regression, independent variables are entered if they meet certain statistical criteria, thus the variable that explains the greatest amount of variance in the dependent variable is entered first and then the variable that explains the greatest amount of unexplained variance is entered next and so on, which produces a hierarchy of influences on the dependent variable.

Since the maps were regarded as an indicator of children's perceptions of their environments for this study, it was decided to investigate the influence of other factors on the production of the maps as represented by their composite scores. As argued earlier higher 'composite map scores' reflected maps of increasing quality and demonstrate significant differences in environmental perception. Composite scores on Maps 1 and Map 2 were submitted as the dependent or criterion variable and were regressed upon the variables achieving the highest correlations in the inter-correlational analysis. (ie Age, Verbal/ erical and Perceptual Reasoning, Embedded Figures, Spatial Test 2 and Orientation 1 and 2). As Badger (1978) comments, the independent variables are entered into the analysis in order of the size of their unique variance when compared with the other variables in the equation. The size of correlation with the dependent variable is not necessarily the important factor influencing the order in which variables are entered. A variable which is highly correlated with the dependent variable may not be selected because it is too highly correlated with a variable already in the equation and consequently contributes little unique variance.

When all of the variables had been entered in to the regression analysis, the resulting multiple regression coefficient for Map 1 was 0.51 accounting for only 26.5% of the variance. The order by which the variables emerged and the corresponding degree of variance was interesting and confirmed the findings of the factor analysis of a strong spatial/perceptual influence in the production of Map 1 but accounting for a relatively small proportion of the variance.

Order of Emergence of the variables with Map 1	Spatial Test 2	19.4% of variance
	Perceptual Reasoning	3.8% " "
	Embedded Figures	1.2% " "
	Age	0.99% " "
	Orientation 2	0.73% " "
	Verbal Reasoning	0.24% " "
	Orientation 1	0.084% "
	Numerical Reasoning	0.007% "
		26.457%

The regression equation which defined this relationship was:

$$y^1 = \underset{(ST2)}{4.21 + 0.214} + \underset{(PER)}{0.643} + \underset{(EFT)}{0.692} + \underset{(AGE)}{0.252} + \underset{(02)}{0.782} + \underset{(VER)}{0.404} - \underset{(01)}{0.608} - \underset{(NUM)}{0.563}$$

When Map 2 was regressed with the same variables the order of the emergence of the variables was altered and age was seen to increase in importance, as had been demonstrated in the Factor analysis and offers further evidence of the association of age to certain types of cognitive mapping task. Spatial and Perceptual influences were still of importance. However, as was demonstrated with Map 1, the variance accounted for is still quite low,

Order of the emergence of the variables with Map 2	Spatial Test 2	17.2% of variance
	Age	8.9% " "
	Perceptual Reasoning	1.8% " "
	Orientation 2	0.97% "
	Orientation 1	0.58% "
	EFT	0.5% " "
	Numerical Reasoning	0.3% " "
	Verbal Reasoning	0.057% "
		30.39%

at 30.39%, but slightly higher than for Map 1.

A further interesting factor was that Verbal Reasoning and Numerical Reasoning reverse their contributions in the two equations. The resulting multiple regression coefficient for Map 2 was 0.55 and was defined by the following regression equation.

$$y^1 = \underset{(ST2)}{0.137 + 0.189} + \underset{(AGE)}{0.706} + \underset{(PER)}{0.495} + \underset{(0.2)}{0.786} - \underset{(0.1)}{0.218} + \underset{(EFT)}{0.495} + \underset{(NUM)}{0.292} + \underset{(VER)}{0.169}$$

Since neither of these analyses explained a large enough percentage of the variance, further regression analyses were performed on the results. The strongest positive influences demonstrated in the correlation matrix were Intelligence as represented by AH3, Spatial Ability and the results of the Embedded Figures Test and although age has been shown to be of limited importance it was also included.

The results of this analysis, although confirming the influence of intelligence on the production of both maps and at an equivalent level, as well as the emergence of features in the same order, the amount of variance accounted for is still low. (25.4% for Map 1, and 28.7% for Map 2).

TABLE 5.33 Regression analysis

Regression of AH3, ST 2, EFT and AGE on Maps 1 and 2		
Order of Emergence	MAP 1 r = 0.504	MAP 2 r = 0.54
AH3	20.2% of variance	20.3% of variance
ST 2	3.6% " "	5.8% " "
EFT	0.9% " "	2.2% " "
AGE	0.6% " "	0.4% " "
Percentage of Variance	25.4%	28.7%

It seems therefore, that the low variance accounted for is attributable to the colinearity of the variables, a phenomenon in which some, or all of the independent variables are very highly correlated. As was explained earlier, one of the uses of multiple regression as an interpretive tool is to evaluate the relative importance of the independent variables and in order to do this certain levels of statistical significance are required. Nie et al (1974) p 340) comment,

> "The situation is somewhat parodoxical ... The more strongly correlated the independent variables are ... the greater the need for controlling the confounding effects."

A number of possible solutions are offered in the literature. Nie et al (1974) suggest that one alternative is to use only one of the variables in the highly correlated set to represent the underlying dimension, which in this case would appear to be the Spatial/intellectual ability identified in the principal components analysis. Alternatively, Cohen and Cohen (1975) suggest a Stepwise Regression with cross validation should be undertaken. A more appropriate solution argued for by Cohen and Cohen however, is to employ a hierarchical multiple regression analysis in which the order that the variables are entered into the equation is determined by the logic of the research. It may be for example that one or more of the Independent Variables are suppressing the resultant regression analysis. Cohen and Cohen are critical of the use of stepwise regression since this relieves the investigator of the responsibility of making decisions about the logical or causal priority of variables. They believe that advances in the behavioural sciences are more likely to occur when researchers provide a hierarchical ordering of the Independent variables which reflect causal hypotheses rather than when computers order independent variables, 'post and ad hoc for a given sample' (p 103)

To investigate these suggestions in relation to the current study a variety of further analyses were undertaken, none of which appeared to solve the problem of the multicolinearity of the variables involved. One final possibility lay in the reliability of the variables employed in the study.

Reliability and Disattenuation

An important factor in the interpretation of the conclusions of any research programme is the reliability of the measures upon which conclusions are based. Reliability theory originated in Spearman's desire to interpret correlations between operationally distinct variables, yet he realised that no matter how carefully one tries to assess an aspect of ability or particular trait of behaviour, assessments will never have the precision or accuracy that attends the measurement of physical characteristics such as weight or height. To help remedy this, Spearman (1904) recommended obtaining a measure of the reliability of the tests used and correcting for attenuation (unreliability) in their measurement. Cohen and Cohen (1975) (p 369) and Maxwell (1977) (p 79) argue that part of the reason for the weak relationship which characterises studies in the social and behavioural sciences lies in the attenuation phenomena. It is not surprising they suggest, that multiple regression coefficients of above 0.50 are rare, when perhaps as much as half of the variance can be accounted for by random error and by definition is inaccessible to correlation with the Independent variables.

Although there are no conditions under which perfect reliability can be expected, Anastasi (1969 p 106) suggests, that

> "... test reliability indicates the extent to which individual differences in test scores are attributable to chance errors of measurement and the extent to which they are attributable to true differences in the characteristics under consideration."

The reliability of a variable may be defined as the correlation between the variable as measuredand another equivalent measure of the same variable. In standard psychometric theory, the square root of the reliability coefficient may be interpreted as the correlation between the variable as measured by the test and the 'true' error-free score. (Maxwell 1977). Since 'true' scores are not themselves observable, a series of techniques have been developed to estimate the correlation between the obtained scores and these 'hypothetical' true scores. To estimate the correlation between two constructs from the correlations obtained between the 'imperfect' observed measures of these constructs, one corrects for attenuation by applying the following formula:

$$r\,x^*\;y^* = \frac{r\,x\,y}{\sqrt{(rxx)\;(ryy)}}$$

where $r\,x^*\,y^*$ = Corrected correlation

rxy = Uncorrected correlation

rxx, ryy = Reliabilities of the two tests involved

Thus, for example, if two variables, each with a reliability of 0.80 were found to correlate 0.44, the attenuated correlation would be calculated as follows:

$$r_{x^* y^*} = \frac{0.44}{\sqrt{0.80 \times 0.80}} = 0.55$$

Cronbach (1972, 1976), Maxwell (1977), Cohen and Cohen (1975) amongst others have long argued for the need for disattenuation and they offer evidence that correcting for error can at times change an ordinary partial correlation from negative to positive. For example a re-examination by Cronbach (cited in Cohen and Cohen 1975) of a study by Bloom revealed that Bloom's findings that IQ change from age to age had a slightly negative correlation with intial IQ (-0.05) was changed to a positive correlation when error in measurement was taken into account. Similarly Cohen and Cohen (1975) cite the conclusions of Campbell and Erlebacher (1970) that failure to correct for the falli bility of partial variables in the analysis of the 'Headstart' programme may have led to mistaken conclusions. (Further examples supporting disattenuation are given in Cronbach et al 1972, p 294 - 301).

One further advantage of disattenuation is that this technique makes it possible to consider the relative contribution of less easily measured variables, which despite the unreliability of their assessment may be of greater importance than those which can be measured more precisely. Similarly when such corrections are not made it is the more precisely measured variables which tend to explain the greatest proportion of variance in a prediction equation. Also, as Cronbach (1976) suggests, in a complex model aimed at ultimate prediction, neglect of the unreliability of measures may well lead to totally incorrect predictions. "An uncorrected model presumes a non-existent reliability."

Correction for attenuation is not without its critics however. As Cohen and Cohen (1975) comment (p 62) as for all <u>estimated</u> coefficients, extreme caution must be used in interpreting attenuation corrected coefficients, since each of the coefficients used in the equation is subject to sampling error. Indeed it is even possible to obtain attenuation corrected coefficients larger than 1, primarily when the reliability of variables is under-estimated. Similarly (Barker 1982) suggests, there may be an understandable hesitance about increasing a set of correlations on the basis of error in the measurement of the contributory variables when a natural but incorrect inclination to the effect of error would be to decrease correlations based on the 'error-contaminated' measures. It is also the case that the difficulty of obtaining reliability coefficients for all of the variables in a complex model may be a further obstacle to researchers electing to correct matrices.

On the basis of the previous discussion, it was decided that it would be appropriate to attempt a disattenuating analysis to complete the investigation of the factors associated with the production of the maps used in this study. In order to do this, it was therefore necessary to calculate levels of reliability of the measures used with this particular sample. (It will be remembered that previously reported levels of reliability for the tests were indicated in Chapter 3).

Thorndike and Hagan (1969) define reliability in terms of how accurately a test, or equivalent test, will produce the same results on an alternative occasion. In order that this might be achieved there are important factors which could influence results, namely variations in the individuals concerned, as well as various factors within the test instruments themselves. Thorndike and Hagan (1969) suggest that there are three main sources of variation in performance, each of which could effect reliability coefficients:

1. Variation in response to the test at a particular moment in time.
2. Variation in the individual from time to time
3. Variation arising out of the particular sample of tasks chosen to represent an area of behaviour.

Brown (1976) suggests that a major factor effecting the reliability of a measuring device is related to the range of scores which the test produces. As the variability of the scores decreases, reliability decreases. Thus a small score range tends to achieve a lower measure of reliability. The difficulty of a test for example, can either increase or decrease score range, which in turn effects the resultant coefficient.

It would appear important to consider reliability levels with such factors in mind. Some of the measures employed in this study encompassed limited ranges and were therefore subject to low levels of reliability, which need not imply that they were invalid test instruments for this particular undertaking but could certainly suppress their contribution to a final analysis.

Anastasi (1969) has tabulated the various types of reliability that are available to researchers, in the evaluation of their research techniques.

TABLE 5.34 Types of Reliability Coefficients

Procedure	Conventional Designation	Error Variance
1. Retest with same form on different occasion	Coefficient of Stability	Temporal Fluctuation
2. Retest with parallel form on different occasion	Coefficient of stability and Equivalence	Temporal Fluctuation and item specificity.
3. Retest with parallel form on same occasion	Coefficient of Equivalence	Item Specificity
4. Split-Half (Odd-Even or other parallel splits	Coefficient of Internal consistency	Item Specificity
5. Kuder-Richardson (and other measures of inter-item consistency	Coefficient of Internal Consistency	Item Specificity

(After Anastasi 1969 p 123)

The question of the most appropriate method of determining reliability seems of considerable importance and it is likely that more than one technique might need to be used as a result of variations in the testing techniques. The following table provides a breakdown of the particular reliability technique employed for each of the tests used in the study, with the resulting reliability coefficient.

Test	Procedure	Coefficient
EFT	Kuder-Richardson	0.87
RFT	Parallel Form (RFT 2 repetitions)	0.89
ABC	Inter Judge reliability	0.80
AH3	Kuder-Richardson	0.90
Verbal	Kuder-Richardson	0.77
Numerical	Kuder-Richardson	0.80
Perceptual	Kuder-Richardson	0.76
Spatial Test 2	Kuder-Richardson	0.95
Draw-a-Man	Kuder-Richardson	0.84
Draw-a-Plan	Kuder-Richardson	0.85
Orientation 1	Kuder-Richardson	0.60
Orientation 2	Kuder-Richardson	0.75
Orientation 3	Kuder-Richardson	0.80
Map 1	Parallel Form	0.59
Map 2	Parallel Form	0.59

TABLE 5.35 Reliability Coefficients

Once the measures of reliability had been calculated, it was possible to undertake the disattenuation analysis. The following two tables present the correlation matrix prior to disattenuation and when disattenuated, where it can be seen that accounting for error considerably influences the correlations obtained. It is also interesting to note the comparability of correlations with Maps 1 and 2.

TABLE 5.36 Correlation Matrix Before Attenuation (Corrected to 2 d.p)

	EFT	RFT	ABC	AH3	VER	NUM	PER	ST2	DAM	DAP	01	02	03	MAP 1	MAP 2
EFT															
RFT	0.43														
ABC	0.44	0.24													
AH3	0.60	0.30	0.33												
VER	0.51	0.24	0.31	-											
NUM	0.49	0.22	0.21	-	0.65										
PER	0.56	0.32	0.33	-	0.66	0.60									
ST2	0.73	0.42	0.42	0.64	0.53	0.51	0.62								
DAM	0.44	0.26	0.76	0.26	0.24	0.15	0.29	0.41							
DAP	0.44	0.25	0.34	0.32	0.26	0.24	0.35	0.48	0.36						
01	0.43	0.27	0.28	0.52	0.51	0.41	0.45	0.44	0.25	0.24					
02	0.52	0.33	0.31	0.62	0.55	0.51	0.57	0.55	0.27	0.34	0.53				
03	0.29	0.11	0.16	0.24	0.16	0.22	0.23	0.31	0.22	0.14	0.15	0.19			
MAP 1	0.41	0.21	0.21	0.45	0.39	0.34	0.42	0.43	0.22	0.28	0.29	0.39	0.21		
MAP 2	0.39	0.21	0.23	0.45	0.39	0.37	0.42	0.43	0.21	0.28	0.20	0.37	0.21	0.59	
AGE	0.27	0.12	0.27	0.41	0.39	0.36	0.33	0.29	0.04	-0.03	0.26	0.27	0.15	0.29	0.43

TABLE 5.37 Correlation Matrix after Attenuation (Corrected to 2 d.p)

	EFT	RFT	ABC	AH3	VER	NUM	PER	ST2	DAM	DAP	01	02	03	MAP 1	MAP 2
EFT															
RFT	0.49														
ABC	0.53	0.27													
AH3	0.68	0.33	0.39												
VER	0.63	0.29	0.40	-											
NUM	0.59	0.26	0.27	-	0.83										
PER	0.69	0.39	0.42	-	0.86	0.77									
ST2	0.81	0.46	0.48	0.69	0.62	0.59	0.73								
DAM	0.51	0.30	0.93	0.30	0.29	0.18	0.37	0.46							
DAP	0.51	0.29	0.41	0.37	0.32	0.29	0.43	0.53	0.43						
01	0.60	0.37	0.40	0.71	0.75	0.60	0.66	0.58	0.35	0.34					
02	0.64	0.41	0.40	0.75	0.72	0.66	0.75	0.66	0.33	0.43	0.79				
03	0.34	0.12	0.21	0.28	0.21	0.30	0.30	0.36	0.27	0.17	0.22	0.25			
MAP 1	0.57	0.29	0.31	0.62	0.58	0.50	0.63	0.57	0.31	0.40	0.49	0.59	0.31		
MAP 2	0.56	0.30	0.35	0.65	0.61	0.56	0.66	0.60	0.31	0.41	0.35	0.58	0.32	1.00	
Age	0.29	0.13	0.30	0.44	0.44	0.41	0.38	0.30	0.04	-0.04	0.34	0.32	0.17	0.38	0.55

MATRIX FOR SUBMISSION TO MULTIPLE REGRESSION ANALYSIS

	EFT	RFT	ABC	AH3	VER	NUM	PER	ST2	DAM	DAP	01	02	03	MAP 1	MAP 2	AGE
EFT	1.0000	0.4875	0.5265	0.6760	0.6245	0,5861	0.6907	0.8066	0.5122	0.5095	0.5997	0.6489	0.3415	0.5727	0.5378	0.2909
RFT	0.4875	1.0000	0.2771	0.3342	0.2867	0.2635	0.3893	0.4545	0.2958	0.2846	0.3677	0.4081	0.1230	0.2946	0.2827	0.1285
ABC	0.5265	0.2771	1.0000	0.3877	0.3984	0.2689	0.4242	0.4824	0.9264	0.4139	0.4050	0.3966	0.2053	0.3108	0.3410	0.3006
AH3	0,6760	0.3342	0.3877	1.0000	0.0000	0.0000	0.0000	0.6902	0.2975	0.3706	0.7104	0.7481	0.2779	0.6104	0.6193	0.4355
VER	0.6245	0.2867	0.3984	0.0000	1.0000	0.8309	0.8612	0.6168	0.2942	0.3213	0.7474	0.7168	0.2049	0.5829	0.5878	0.4400
NUM	0.5861	0.2635	0.2689	0.0000	0.8309	1.0000	0.7724	0.5875	0.1841	0.2954	0.5978	0.6544	0.2974	0.4901	0.5332	0.4069
PER	0.6907	0.3893	0.4242	0.0000	0.8612	0.7724	1.0000	0.7277	0.3655	0.4310	0.6642	0.7523	0.2966	0.6318	0.6283	0.3830
ST2	0.8066	0.4545	0.4824	0.6902	0.6168	0.5875	0.7277	1.0000	0.4608	0.5346	0.5841	0.65 8	0.3551	0.5768	0.5671	0.3018
DAM	0.5122	0.2958	0.9264	0.2975	0.2942	0.1841	0.3655	0.4608	1.0000	0.4289	0.3493	0.3332	0.2701	0.3085	0.3006	0.0396
DAP	0.5095	0.2846	0.4139	0.3706	0.3213	0.2954	0.4310	0.5346	0.4289	1.0000	0.3382	0.4310	0.1686	0.4006	0.4006	-0.0355
01	0.5997	0.3677	0.4050	0.7104	0.7474	0.5978	0.6642	0.5841	0.3493	0.3382	1.0000	0.7945	0.2187	0.4841	0.3281	0.3351
02	0.6489	0.4081	0.3966	0.7481	0.7168	0.6544	0.7523	0.6568	0.3332	0.4310	0.7945	1.0000	0.2488	0.5821	0.5552	0.3157
03	0.3415	0.1230	0.2053	0.2779	0.2049	0.2974	0.2966	0.3551	0.2701	0.1686	0.2187	0.2483	1.0000	0.3083	0.3042	0.1715
MAP 1	0.5727	0.2946	0.3108	0.6104	0.5829	0.4901	0.6318	0.5768	0.3085	0.4006	0.4841	0.5821	0.3083	1.0000	1.0000	0.3772
MAP 2	0.5378	0.2827	0.3410	0.6193	0.5878	0.5332	0.6283	0.5671	0.3006	0.4006	0.3281	0.5552	0.3042	1.0000	1.0000	0.5539
AGE	0.2909	0.1285	0.3006	0.4355	0.4400	0.4069	0.3830	0.3018	0.0396	-0.0355	0.3351	0.3157	0.1715	0.3772	0.5539	1.0000

(The correction for age was only made on the test with which it was correlated)

The disattenuated matrix was then submitted to multiple regression analysis and the results revealed a variety of factors, in particular a considerable increase in the percentage of explained variance. These results of course have to be considered in terms of the comments of Cohen and Cohen cited earlier, of the problems of interpreting attenuation corrected matrices. However, it appears that Spatial Test 2 was acting as a suppressing variable and that in the disattenuated matrix the influence of ST 2 is not so strong and that Perceptual Ability becomes the dominant factor in the production of both Maps 1 and 2.

The resulting multiple regression coefficient for Map 1 was increased from 0.51 to 0.69 and the explained variance increased from 26.5% to 48%. The order in which the variables emerged was altered slightly once the influence of Spatial Test 2 was reduced, Perceptual Ability then becomes the most important factor, followed by the Embedded Figures Test, Age and Orientation 2, as had emerged prior to disattenuation. Spatial Test 2 then assumes a much reduced influence and the order of the remaining variables, Verbal Ability, Numerical Ability and Orientation 1 are reversed.

Order of emergence of the variables with Map 1 after disattenuation	Perceptual Ability	39.9%	of	variance
	Embedded Figures	3.5%	"	"
	Age	1.9%	"	"
	Orientation 2	1.2%	"	"
	Numerical Reasoning	0.4%	"	"
	Spatial Test 2	0.3%	"	"
	Verbal Reasoning	0.3%	"	"
	Orientation 1	0.5%	"	"
		48.0%		

The regression equation defining the relationship was:

$$y' = \underset{(Per)}{0.23} + \underset{(EFT)}{0.17} + \underset{(Age)}{0.15} + \underset{(02)}{0.25} - \underset{(Num)}{0.17} + \underset{(ST2)}{0.12} + \underset{(Ver)}{0.21} - \underset{(01)}{0.14}$$

When Map 2 was regressed with the same variables, the multiple regression coefficient increased from 0.55 to 0.80 and the explained variance from 30.39% to 64.9%. As with Map 1 the order of emergence of the variables was altered and Perceptual ability is again seen as the dominant influence, accounting for 39.5% of the variance in maps of the route from Home to School. Age is still seen to be considerably more influential on the production of these maps than of those of the home area and apart from the influence of Spatial Ability and the order of Verbal and Numerical Ability the results are similar to those achieved prior to disattenuation. The regression equation defining the relationships was:

$$y' = \underset{(Per)}{0.09} + \underset{(Age)}{0.37} - \underset{(01)}{0.63} + \underset{(02)}{0.47} + \underset{(EFT)}{0.13} + \underset{(Ver)}{0.40} + \underset{(ST2)}{0.17} - \underset{(Num)}{0.13}$$

Order of emergence of the variables with Map 2 after disattenuation	Perceptual Ability	39.5%	of	variance
	Age	11.5%	"	"
	01	2.6%	"	"
	02	6.6%	"	"
	Embedded Figures	1.9%	"	"
	Verbal Reasoning	1.6%	"	"
	Spatial Test 2	0.7%	"	"
	Numerical Reasoning	0.5%	"	"
		64.9%		

When the results for Maps 1 and 2 are compared the dominance of Perceptual reasoning becomes most apparent and demonstrates the significance of Perceptual reasoning skills for map production. As had already been suggested, Age was more influential on the production of the Route maps and as might have been anticipated, greater demands are made on orientational abilities in the production of Route as opposed to Area maps. (When explained variance percentages are combined for orientation exercises 1 and 2 for each of the maps 9.2% of variance of the Route Maps is explained, whereas only 1.7% is explained for the Area Maps). Finally, as was suggested earlier, the influence of verbal and numerical reasoning remains reversed for the two maps, although the differences in explained variance are comparatively quite small.

This concludes the detailed statistical analysis of the maps produced for the study. A later section considers the maps in terms of their content and detail. The next section considers the association of personality characteristics and cognitive style for the children of the sample.

D. Correlations between the measures of Cognitive Style and Aspects of Personality

As was explained in Chapter 4, it was proposed to consider the relationship of personality characteristics supposedly associated with field dependence/independence with the three measures of cognitive style derived from this study. It was anticipated that,

Hypothesis 24. Composite scores for personality characteristics associated with Field independence will correlate positively and significantly with the measures of cognitive style and conversely there will be a significant negative correlation with the composite scores for personality characteristics associated with Field dependence.

The results of the analysis confirm these expectations particularly for the negative correlations with personality characteristics associated with Field dependence. (Table 38). The only major exception is that of the Rural Boys when Score 1* is not significantly correlated with EFT/RFT/ABC

TABLE 5.38 Correlations between the measures of cognitive style and the composite scores for personality

SCORE 1* Field Independent	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
with EFT	0.1882**	0.1864**	0.1979**	0.3520**	0.0148	0.2479*	0.2198*
RFT	0.2080**	0.1993**	0.2460**	0.2551*	0.1392	0.2557**	0.2956**
ABC	0.1310**	0.1711*	0.0956	0.2249*	0.0158	0.0514	0.1662

SCORE 2* Field Dependent	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
with EFT	-0.3395**	-0.3551**	-0.3411**	-0.3672**	-0.2643**	-0.3106**	-0.2053*
RFT	-0.2485**	-0.2514**	-0.2690**	-0.2030*	-0.3208**	-0.1387	-0.2915**
ABC	-0.2680**	-0.1840**	-0.3183**	-0.2309*	-0.1438*	-0.3205**	-0.2805**

(Levels of significance * $p < .05$, ** $p < .01$)

* SCORE I : Composite score for characteristics associated with Field Independence

SCORE 2 : " " " " " " Field Dependence

When the personality characteristics are considered as individual elements, rather than as part of a composite score, several emerge as more dominant. As can be seen in Table 39 there are considerable variations which lead one to question the supposed association of personality and style for the children of this sample, despite the reservations discussed in Chapter 4 about the technique used to investigate personality. As far as characteristics associated with field independence are concerned, the two with the strongest and most positive association are Perseverance and Independence, which appears to support Catell's belief in a possible association between 'field independence' and the independence factor of his 16 PF.

Similarly of the personality characteristics supposedly associated with Field dependence, two emerge as the most positively associated, those at the opposite poles of the two already mentioned, ie Gives Up Easily, and is Dependent on Others, and Follower for the Urban boys and Rural Girls.

For both sets of characteristics, associations are more clearly and consistently demonstrated in correlations with the Embedded Figures Test. In general therefore this study seems to suggest that cognitive style and personality can be linked particularly in terms of the continua: Gives up Easily - Perseveres, Dependent on Others - Independent, and for the category 'Follower' of the characteristics associated with Field dependence.

How far this might also be seen as representative of the behaviour of more intelligent as opposed to less intelligent individuals is obviously an important factor. Analysis of the correlations between composite scores for personality and Intelligence suggests that it may well be the case, as (Table 40) reveals. This appears to be especially true for the Urban boys on both and for the Rural Boys for correlations between intelligence and characteristics associated with Field dependence.

The results described here are similar to those reported by Brophy (1982, p. 130), who in addition to rejecting the claims of Catell, as was mentioned earlier, reported few significant correlations between the personality measures used in his study and the criterion measures of the Field dependence-independence continuum.

TABLE 5.39 Correlations between the measures of cognitive style and individual personality characteristics

FIELD INDEPENDENT CHARACTERISTICS	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
LEADERSHIP with EFT	0.0753	0.1091	0.0548	0.2517*	-0.0057*	0.1768	0.0635
RFT	0.0890	0.1534*	0.0536	0.2626*	0.0376*	0.0180	0.1656
ABC	0.0960	0.1586*	0.0227	0.2532*	0.0753	0.0269	-0.0412
SOLITARINESS with EFT	-0.0262	-0.0899	0.0360	-0.0291	-0.1501	0.0834	-0.0116
RFT	0.0440	0.0038	0.0740	-0.0193	-0.0254	0.1829	-0.0067
ABC	0.0651	-0.1072	0.0024	-0.0378	-0.1587	0.0631	0.0608
INTROVERT with EFT	-0.0919	-0.0835	-0.0995	-0.0104	-0.1125	-0.0553	-0.1165
RFT	0.0002	0.0194	-0.0142	-0.0560	0.0905	0.0983	-0.0809
ABC	-0.0816	-0.1019	-0.0665	-0.1007	-0.0972	-0.0864	-0.0293
INDIVIDUALISTIC with:							
EFT	0.1198*	0.1266	0.1193	0.2642**	-0.0019	0.1116	0.1633
RFT	0.1039*	0.0860	0.1288	0.1645	0.0114	0.1998*	0.0953
ABC	0.0658	0.0791	0.0299	0.2306*	-0.0442	0.0371	0.0270
PERSEVERES with EFT	0.3135**	0.3271**	0.3281**	0.4415**	0.1664*	0.3067*	0.3514**
RFT	0.2118**	0.1954**	0.2613**	0.2330*	0.1589	0.1426	0.3530**
ABC	0.2991**	0.2281**	0.3278**	0.2516*	0.2057*	0.3001**	0.3432**
INDEPENDENT with EFT	0.2188**	0.2490**	0.2090**	0.3050**	0.1583	0.2055*	0.2135*
RFT	0.2282**	0.2029**	0.2742**	0.2869**	0.1167	0.1972*	0.3471**
ABC	0.1264*	0.1351	0.0775	0.1784	0.0939	0.0110	0.1456

FIELD DEPENDENT CHARACTERISTICS	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
FOLLOWER with EFT	-0.2831**	-0.2650**	-0.3163**	-0.3628**	-0.1261	-0.2468*	-0.2911**
RFT	-0.2171**	-0.2128**	-0.2417**	-0.2785**	-0.1559	-0.0617	-0.3097**
ABC	0.1748**	-0.1454*	-0.1641**	-0.2687**	-0.0455	-0.1285	-0.2041*
GREGARIOUS with EFT	-0.0683	-0.0747	-0.0677	-0.1022	0.0380	-0.1400	0.1472
RFT	-0.0880	-0.0431	-0.1326	0.0102	-0.0949	-0.0753	-0.1015
ABC	-0.0548	-0.0054	-0.0883	0.0134	-0.0100	-0.1734	0.0709
EXTRAVERT with EFT	-0.0440	-0.0748	-0.0185	-0.0001	-0.1233	-0.0973	0.1401
RFT	0.0014	-0.0080	0.0035	0.1629	-0.1570	-0.0629	0.1093
ABC	-0.0826	-0.0252	-0.1382	0.0215	-0.0257	-0.1991*	-0.0484
CONFORMIST with EFT	-0.1111*	-0.0597	-0.1543*	0.0415	-0.0559	-0.0695	-0.0274
RFT	-0.0807	-0.0701	-0.0807	-0.0255	-0.0992	-0.0301	0.0160
ABC	-0.0309	-0.0295	-0.1171	-0.0125	-0.0695	-0.0597	-0.1112
GIVES UP EASILY with							
EFT	-0.3345**	-0.3603**	-0.03313**	-0.4537**	-0.2459**	-0.3046**	-0.3206**
RFT	-0.2706**	-0.1839**	-0.2589**	-0.2202*	-0.1521	-0.1433	-0.3136**
ABC	-0.2556**	-0.1737*	-0.3055**	-0.2898**	-0.0822	-0.2906**	-0.3006**
DEPENDENT with EFT	-0.2765**	-0.2999**	-0.2652**	-0.3175**	-0.2365**	-0.2002*	-0.2218*
RFT	-0.2308**	-0.2949**	-0.1926**	-0.3454**	-0.2611**	-0.1291	-0.1715
ABC	-0.2031**	-0.1720*	-0.2116**	-0.1939	-0.1519	-0.2288*	-0.1618

(Levels of significance * $p < .05$, ** $p < .01$)

TABLE 5.40 Correlations between intelligence and personality

AH3/ Personality	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
AH3 with SCORE 1	0.3118	0.3502	0.2621	0.4123	0.2658	0.2743	0.3044
AH3 with SCORE 2	-0.4232	-0.4621	-0.3792	-0.4273	-0.5122	-0.2901	-0.3486

(All significant at the 1% level)

In an attempt to follow up Sonnenfeld's suggestions about an 'environmental personality' the correlations between personality characteristics and cognitive maps were computed and as can be seen, very little of significance emerged. This was also the case when Maps 1 and 2 were compared with the individual personality elements.

TABLE 5.41 Correlations between composite map scores and personality

TABLE 5.41	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Map 1 with: Score 1	0.0796	0.0535	0.1414	0.0435	0.0634	0.1854	0.1195
Score 2	-0.1876**	-0.2239**	-0.1872**	-0.2370**	-0.1883*	-0.1562	-0.1800
Map 2 with: Score 1	-0.0152	-0.0226	0.0237	0.0157	0.0601	0.0363	0.0465
Score 2	-0.2246**	-0.2163**	-0.2634**	-0.0796	-0.2540**	-0.1927	-0.2024*

(Levels of significance * $p < .05$, ** $p < .01$)

The main differences demonstrated here are the stronger negative associations with factors associated with field dependence, but even then some of the correlations are non-significant.

3. <u>The Feature Analysis</u>

Earlier in the discussion it was hypothesised that Field Independent/analytic subjects would demonstrate a more detailed perception of their environment and that this would be reflected in their response to measures of environmental perception. This has been investigated so far by comparing the 'extent' of the 'area' maps produced by the children in the sample with their scores on the measures of cognitive style. As an additional attempt to follow this association, it was further hypothesised that a more extensive perception would be reflected in the detail referred to about their environment. In particular this refers to the detail demonstrated on Maps 1 and 2, and for this purpose each map was considered for the elements included and given a Score for the Number of Features (NOF 1 for Map 1, NOF 2 for Map 2). In the course of this analysis a considerable amount of information pertinent to environmental perception research was accumulated and this has been placed in Appendix 2, where the results are discussed.

It was also suggested earlier in the discussion that it was proposed to include a questionnaire to attempt to reveal more detail of the sample's knowledge of their environment. By concentrating on elements referred to in previous environmental perception research it was possible to obtain considerable detail about the children's perceptions in terms of:

1. Favourite Places and Reasons for Liking
2. Disliked Places and Reasons for Disliking
3. Comfortable/Uncomfortable Places
4. Dangerous Places
5. Beautiful Places
6. Noises/Smells associated with their environment
7. Two tasks 1) Choose a series of Guide photographs of their area
   2) Distinguish between features shown to a child, a relation, and a stranger, who you have been asked to show round

The results of the children's responses were analysed and compared across the questions to produce a score for the number of Features referred to in the questionnaire (NOF 3). Again this culminated in a considerable body of information pertinent to environmental perception research. This is included with a copy of the Questionnaire, in Appendix 2, where it is discussed. (Differences in terms of the Features referred to by more Field Dependent/Field Independent subjects are discussed in the section which considers the Follow Up Study).

The features referred to in Maps 1 and 2 and the Questionnaire were then compared for each individual to produce a final category for the number of different features referred to by the sample (NODF).

Having undertaken this elemental analysis, it was possible to investigate Hypothesis 25, with the scores for NOF1, NOF2, NOF3, and NODF.

Hypothesis 25. There will be a positive and significant relationship between the measures of cognitive style and the features referred to by the children of the sample on their maps (NOF 1, 2) in the questionnaire (NOF 3) and as a total number of different features (NODF). This will demonstrate that Field Independent individuals possess a more 'detailed' knowledge of their environment.

As can be seen in Table 42, the results of correlations between scores for the number of features and the measures of cognitive style are varied and provide no conclusive evidence to support hypothesis 25. Correlations with the three measures of cognitive style again demonstrate non-comparable results, with the RFT achieving the weakest and consistently non-significant correlations. Contrary to expectations the Articulation of Body Concept Scale achieves more consistently positive associations than does the Embedded Figures Test. When the various sub-divisions of the Number of Features analysis are considered there are considerable variations demonstrated between Map 1 and Map 2 for the three measures of cognitive style, which raises another question about consistency across cognitive maps. The most reliable measure, producing the most positive correlations with the EFT and ABC, but not the Rod and Frame Test, is that which is derived from an analysis of the maps and the questionnaire (NODF). This is the most comprehensive of the Number of Features measures used, since it is based upon both the maps and the questionnaire, and thus allowed children more opportunity to reveal their perceptions of the environment.

TABLE 5.42 Correlations between the measures of cognitive style and the feature analysis

TABLE 5.42	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
EFT with:							
NOF 1	0.2222**	0.1813*	0.2698**	0.3430**	0.1687	0.2319*	0.3315**
NOF 2	0.2130**	0.1891**	0.2407**	0.2443*	0.1097	0.1883	0.1839
NOF 3	0.1094*	0.1313	0.0890	0.1263	0.1748	0.1422	0.0904
NODF	0.2529**	0.2566**	0.2538**	0.3064**	0.2656**	0.2411*	0.2843**

RFT with:							
NOF 1	0.1403**	0.2008**	0.0889**	0.1957	0.2275**	0.2295*	0.0028
NOF 2	0.1067*	0.0313	0.1764*	0.0007	0.0630	0.1841	0.1040
NOF 3	0.0670	0.0167	0.1168	0.0285	0.0099	0.1665	0.1182
NODF	0.1481**	0.1483*	0.1553*	0.1136	0.1658	0.1879	0.1369

ABC with:							
NOF 1	0.1971**	0.1986**	0.1861*	0.1847	0.2293**	0.1287	0.2545*
NOF 2	0.2628**	0.2167**	0.3090*	0.2945**	0.1588	0.3168**	0.2548*
NOF 3	0.2539**	0.2627**	0.2472**	0.2587**	0.2717**	0.3470**	0.1458
NODF	0.3607**	0.3495**	0.3718**	0.3059**	0.3926**	0.4092**	0.3260**

(Levels of significance * $p < .05$, ** $p < .01$)

Since results discussed so far have demonstrated an association with intelligence it was proposed to consider the number of features referred to in terms of intelligence. The results of this analysis are below (Table 5.43) where it can be seen that the associations

TABLE 5.43 Correlations between Intelligence and the feature analysis

TABLE 5.43	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
AH3 with:							
NOF 1	0.3311**	0.4053**	0.2566**	0.5522**	0.3476**	0.1517	0.4041**
NOF 2	0.2585**	0.2179**	0.2908**	0.1609	0.2786**	0.1592	0.3458**
NOF 3	0.2022**	0.1630*	0.2361**	0.0855	0.2667**	0.2970**	0.2157*
NODF	0.3247**	0.2996**	0.3438**	0.3048**	0.3269**	0.2905**	0.4289**

(* $p < .05$, ** $p < .01$)

between AH3 and NODF are as strong as those reported between EFT and NODF, but not quite as strong as those between NODF and ABC. The correlations for the Urban Boys and the Rural Girls between NOF1 and AH3 and between NODF and AH3 for the rural girls are the most positive and there appears to be a stronger association between intelligence and the number of features included for the rural children of the sample. In general however, the correlations are comparatively low when one considers associations with intelligence discussed earlier, so it was felt that age might be an influential factor effecting the number of features referred to. The analysis described in Table 44 suggests that this probably is not the case. If anything, the most positive association between age and the number

TABLE 5.44 Correlations between Age and the feature analysis

TABLE 5.44	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Age with:							
NOF 1	0.2725**	0.2814**	0.2689**	0.2614**	0.3031**	0.2396*	0.3157**
NOF 2	0.2417**	0.1996**	0.2820**	0.1058	0.3150**	0.2006*	0.3205**
NOF 3	0.0824	-0.0447	0.2043**	-0.0978	-0.0036	0.2839**	0.1328
NODF	0.2714**	0.1765*	0.3671**	0.1201	0.2257**	0.3998**	0.3294**

(Levels of significance * p .05, ** p .01)

of features is demonstrated by the girls of the sample, especially for the maps and total number of different features. The reverse appears to be the case for the boys on the questionnaire, however, where there is a slightly negative correlation suggesting perhaps, that the younger boys are likely to provide more detail in response to the questionnaire.

4. Additional Map Analysis

Whilst analysing the maps in the terms described for this study, it was felt that it would be an opportunity to repeat types of analysis used in previous environmental perception research. Mathews (1980) for example found a close association between the amount of labelling included on the maps of his sample and the 'quality' of the maps. He also found that the amount of labelling increased with age within his sample of 11 - 17 year olds. For this study three categories of labelling were described, those of None, where nothing was actually written on the map, Incidental, where labelling was incidentally written over the map and Detailed, where the labelling was clearly seen as an important element of the map. On such maps, features would be named, as would roads and directions might also be included. As can be seen on Table 45, confirming the findings of Mathews, there is a progressive increase with age of the numbers of this sample including detailed labelling and that this progression seems to be true for both sexes and is demonstrated on both of the maps drawn for this study.

TABLE 5.45 Labelling of maps

TABLE 5.45		Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
MAP 1 (AREA)								
10 - 11's	None	8	3	5	-	3	-	5
	Incidental	106	50	56	25	25	21	35
	Detailed	16	7	9	6	1	4	5
MAP 2 (ROUTE)								
	None	3	3	-	-	3	-	-
	Incidental	104	50	54	25	25	19	35
	Detailed	16	7	9	6	1	6	3
MAP 1 (AREA)								
11 - 12's	None	8	4	4	3	1	-	4
	Incidental	122	58	64	26	32	36	28
	Detailed	30	18	12	13	5	8	4
MAP 2 (ROUTE)								
	None	7	4	3	3	1	-	3
	Incidental	112	53	59	28	25	35	24
	Detailed	24	12	12	5	7	7	5

continued.....

MAP 1 (AREA)

TABLE 5.45 (cont)		Sample	Boys	Girls	Urban Boys	Urban Boys	Rural Girls	Rural Girls
12 - 13's	None	3	3	-	1	2	-	-
	Incidental	105	55	50	23	32	27	23
	Detailed	58	28	30	9	19	22	8

MAP 2 (ROUTE)

	None	4	4	-	3	1	-	-
	Incidental	111	57	54	19	38	34	20
	Detailed	41	18	23	9	9	14	9

When the labelling analysis was compared with composite scores for Maps 1 and 2 to consider the association of increased labelling with higher 'quality' maps the results of Mathews were further confirmed, with all correlations significant at the 1% level as can be seen in Table 46. This was particularly true of the Rural Girls on

TABLE 5.46 Comparison of labelling for maps 1 and 2

TABLE 5.46	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Labelling with MAP 1	0.3592**	0.3466**	0.3759**	0.3979**	0.3200*	0.3107*	0.4124**
Labelling with MAP 2	0.3585**	0.4327**	0.3334**	0.3867**	0.4687**	0.3062**	0.3320**

TABLE 5.47 Correlation between degree of labelling and intellegence

TABLE 5.47	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
AH3 with labelling							
Map 1	0.3368**	0.3192**	0.3564**	0.3909**	0.2431**	0.2220*	0.4184**
Map 2	0.2450**	0.2372**	0.2478**	0.1690**	0.3181**	0.2280*	0.2119*

(Levels of significance * p <.05, ** p <.01)

Map 1 and the Rural Boys on Map 2. The association of Intelligence with these results, however, suggests that ability may be a definite influence for the Rural Girls on Map 1 and similarly the Rural Boys correlation with intelligence was the highest on Map 2. In general, however, correlations between intelligence and the amount of labelling demonstrated is quite low. (Table 47)

In order to compare the extent to which the maps of the more 'analytic' individuals included more labelling, the results of the labelling analysis were correlated with the measures of cognitive style. As can be seen below in Table 5.48 no real picture emerges

TABLE 5.48 Correlations between labelling on Maps 1 and 2 and EFT scores

TABLE 5.48	Sample	Boys	Girls	Urban Boys	Rural Boys	Urban Girls	Rural Girls
Labelling on:							
EFT Map 1	0.2326**	0.1498*	0.3196**	0.2457*	0.0660	0.1954	0.3376**
Map 2	0.1896**	0.1901**	0.2007**	0.2418*	0.1269	0.2331*	0.1193
RFT Map 1	0.1057*	0.0629	0.1465*	0.0909	0.0370	0.2114*	0.0321
Map 2	0.0779	0.0953	0.0730	0.0685	0.1253	0.1238	0.0047
ABC Map 1	0.1772**	0.1491*	0.2237**	0.1705	0.1315	0.1999*	0.2073*
Map 2	0.1982**	0.1627*	0.2215**	0.1762	0.1540	0.2408*	0.1705

(Levels of significance * $p < .05$, ** $p < .01$)

and the most positive correlations are for the Rural Girls and EFT which as was pointed out in the previous analysis is probably strongly associated with intelligence.

As a final element of the map analysis, each of the maps were considered for the structural elements described by Lynch, ie Paths, Landmarks, Nodes, Edges and Districts. As can be seen in Table 49 below, younger children's maps tended to consist primarily of Paths, Nodes and Landmarks and stressed individual elements rather than the connections between them. There was increased reference to Edges in the maps of children aged between 12 and 13, as well as the beginnings of a recognition of the composition of an area into

TABLE 5.49 Comparison of Maps 1 and 2 for 'Lynch' Type elements

TABLE 5.49	Sample					Boys					Girls					Urban Boys					Rural Boys					Urban Girls					Rural Girls				
AGE GROUPS (MAP 1)	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D
10-11 yr olds	125	94	114	41	3	60	42	55	20	1	65	52	59	21	2	31	27	30	13	1	29	15	25	7	0	25	24	24	16	2	40	28	35	5	0
11-12 yr olds	160	136	149	55	15	80	65	78	29	9	80	71	71	26	6	42	37	41	21	8	38	28	37	8	1	44	41	41	20	6	36	30	30	6	0
12-13 yr olds	165	144	159	99	26	86	68	86	45	10	79	76	73	44	16	33	27	33	19	7	53	41	53	26	3	49	49	46	30	12	30	27	27	14	4

MAP 2 (Route Map)	Sample					Boys					Girls					Urban Boys					Rural Boys					Urban Girls					Rural Girls				
AGE GROUPS	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D	P	L	N	E	D
10-11 yr olds	122	97	107	29	0	59	47	54	13	0	63	50	53	16	0	31	31	30	13	0	28	16	24	0	0	25	25	24	16	0	38	35	29	0	0
11-12 yr olds	133	128	140	20	2	69	62	71	12	2	64	66	69	8	0	36	34	36	7	0	33	28	35	5	2	42	39	40	6	0	32	27	29	2	0
12-13 yr olds	148	143	153	50	8	78	71	77	24	4	77	72	76	26	4	31	30	31	13	2	47	41	46	11	2	48	47	47	17	2	29	25	29	9	2

(P = Paths, L = Landmarks, N = Nodes, E = Edges, D = Districts) specific districts. There were also clear differences demonstrated within this sample between the Urban and Rural sub-groups for reference to Edges and Districts. This was definitely to the advantage of the Urban group, which is not surprising since the analysis devised by Lynch is primarily intended to describe the structural organisation of the city, i.e. a more Urban environmental setting, and goes some way to supporting the suggestions of Bishop (1973) who argues that some environments are more 'imageable' to children, using Lynch's terminology. Interestingly however, it was still possible to identify Edges and some Districts in the Rural maps. As with other studies however (Spencer and Lloyd 1974, Pocock 1975, Gold 1980) some difficulty was experienced in differentiating between the elements described by Lynch. It is also the case that the nature of the task is often ignored when analyses of this kind are applied. How far do exercises such as those used in this study, and others, allow an individual to demonstrate a knowledge of Districts and Edges? For example, the way in which the request for 'the map of an area' is interpreted influences the opportunity for inclusion of such features. Similarly, how far you live away from school, on a map which depicts a route from home to school, can certainly influence whether you actually pass through any districts and therefore include them on a map. In general, however, the results described here support the findings of Matthews (1980) and Calland (1973) which were discussed earlier.

When the results of this analysis were compared with the measures of cognitive style and that of intelligence by a point-biserial analysis, no clear associations emerged. The most positive associations demonstrated were between the Embedded Figures Test and the Edges included on Area Maps of the sample, but in all cases associations with AH 3 were higher, suggesting that if anything, it would be the more intelligent individuals who would include reference to the Edges and Boundaries of the area where they lived. In general the correlations were very low and few significant relationships are demonstrated (Table 50).

TABLE 5.50	Sample	Boys	Girls	Rural Boys	Urban Boys	Urban Girls	Rural Girls
MAP 1							
LANDMARKS with:							
EFT	0.1412**	0.0491	0.2919**	0.0817	0.1733	0.1509	0.2800**
RFT	0.1702**	0.1418*	0.2404**	0.1054	0.1935	0.2335*	0.1904
ABC	0.0908	0.0310	0.1181	0.0799	0.2066*	0.0222	0.1679
AH3	0.1998**	0.1879**	0.2063**	0.1438	0.2288*	0.0394	0.2243*
NODES with:							
EFT	0.1183*	0.0564	0.1577*	0.1056	0.0277	0.1235	0.1310
RFT	0.1082*	0.0597	0.1294	0.0267	0.1044	0.1608	0.0789
ABC	0.0392	0.0065	0.1097	0.0888	0.1231	0.1782	0.0381
AH3	0.2046**	0.1674*	0.2473**	0.2177*	0.1163	0.1770	0.2656**
EDGES with:							
EFT	0.3031**	0.2321**	0.3774**	0.1863	0.2330*	0.2545*	0.3765**
RFT	0.1905**	0.1616*	0.2191**	0.1521	0.1686	0.2629**	0.0878
ABC	0.1584**	0.1239	0.1957**	0.1714	0.0518	0.1047	0.2404*
AH3	0.3299**	0.2395**	0.4157**	0.1823	0.2741**	0.2757**	0.4666**
DISTRICTS with:							
EFT	0.2301**	0.1840**	0.2769**	0.1837	0.1486	0.2700**	0.2252*
RFT	0.1417**	0.1166	0.1669*	0.0849	0.1414	0.1707	0.1206
ABC	0.1017*	0.0839	0.1143	0.1578	0.0345	0.1037	0.0788
AH3	0.2808**	0.2240**	0.3292**	0.1391	0.2553*	0.3309**	0.2493*
	(Levels of significance * p .05 ** p .01)						

TABLE 5.50	Sample	Boys	Girls	Rural Boys	Urban Boys	Rural Girls	Urban Girls
MAP 2							
LANDMARKS with:							
EFT	0.0973	0.0702	0.1242	0.0226	0.0791	0.1145	0.1269
RFT	-0.0010	0.0222	0.0178	0.0791	0.0948	0.0675	0.0260
ABC	0.0087	0.0616	0.1180	0.0301	0.1557	0.0216	0.1629
AH3	0.1499**	0.1259	0.1717*	0.2106*	0.0051	0.0202	0.1715
Nodes with:							
EFT	0.1220*	0.1517*	0.0996	0.1129	0.2301*	0.0485	0.0715
RFT	0.0397	0.1238	0.0179	0.0828	0.2617*	0.0831	0.0299
ABC	0.1163*	0.1523*	0.1378	0.1914	0.0766	0.1399	0.1205
AH3	0.2229**	0.1807*	0.2629**	0.2545**	0.0956	0.1711	0.3129**
EDGES with:							
EFT	0.1810**	0.1991**	0.1620*	0.1187	0.2233*	0.0036	0.2247*
RFT	0.0966	0.0920	0.0993	0.0481	0.1340	0.0223	0.0867
ABC	0.1712	0.1327	0.2296	0.1278	0.1501	0.1389	0.3216**
AH3	0.1325**	0.1064	0.1565*	0.2034*	0.0286	0.1711	0.2787**
DISTRICTS with:							
EFT	0.1414**	0.1657*	0.1137	0.1456	0.1784	0.1705	0.0798
RFT	0.0290	0.0442	0.0119	0.0402	0.0482	0.0739	0.0283
ABC	0.1254*	0.1136	0.1535*	0.0407	0.1872	0.2037*	0.0991
AH3	0.1570**	0.1705*	0.1472*	0.0460	0.2510*	0.1230	0.1937
	(Levels of significance * $p < .05$ ** $p < .01$)						

TABLE 5.50 Correlation between Lynch classification and the Measures of Cognitive Style

This concludes the statement and discussion of the results of the main part of the empirical research. The next section goes on to consider the results of the Follow up study on two small sub-groups representing the extremes of the analytic/global cognitive style.

5. The Follow Up Study

The follow up study was an attempt to investigate further a possible relationship between cognitive style and environmental perception and to consider some of the factors that had emerged from the previous discussion in terms of sub-groups representing the extremes of the analytic/global dimension identified by Witkin. In order to achieve this, the criteria adopted for selection of the follow up study groups was $1\frac{1}{2}$ standard deviations from the mean for the children's age groups, across all three measures of cognitive-style. This was easily satisfied for the Embedded Figures Test and the Articulation of Body Concept Scale, but as can be seen in Figure 1 presented earlier in this chapter, Rod and Frame Test standard deviations were larger than the mean score. In order to achieve a standardised score on the Rod and Frame Test for selection purposes for those at the Analytic/field independent extreme an average of the numbers achieving this standard for EFT/ABC was taken and that number was assumed to have achieved the standard for the RFT. The eventual standard for all three tests can be seen in Table 51. As was explained in the previous chapter this produced an eventual follow up sample of 17 extreme field independent/analytic individuals (8 boys, 9 girls) and 17 extreme field dependent/global individuals, although only 16 of the Field dependent individuals participated in the field exercise. The group was drawn from children right across the sample and from all schools used in the study (as was shown in Table 4.3) in the previous chapter).

TABLE 5.51 The follow up sample. Scores on the measures of cognitive style used to identify the follow up sub-groups

TABLE 5.51	FIELD INDEPENDENT'S			FIELD DEPENDENTS		
	EFT	RFT	ABC	EFT	RFT	ABC
Boys 10+	24	11.5	2	6	153.0	5
Girls 10+	22	12.5	2	5	140.5	4/5
Boys 11+	25	8	1/2	8	65.5	4/5
Girls 11+	24	15	1/2	9	141.0	5
Boys 12+	25	6.5	1/2	9	65.5	4/5
Girls 12+	25	9.0	1/2	10	40.5	4

(EFT Scores 0 - 25, RFT represents degrees of deviation over 8 trials, ABC Grades 1 - 5 with higher scores representing more analytic individuals (ie 1/2) whereas lower scores (4/5) represent more global individuals)

It is proposed to discuss the analysis of the Follow-Up Study as follows:

1. Comparative analysis of Part I Results
2. Individual Interview
3. Field Exercise

1. Comparative Analysis of Part I Results

(1) Table 5.52 provides a breakdown of the mean scores for each of the sub-groups and the sample on all of the exercises included in the empirical study. It can be seen that the mean scores for the Field Independent group are higher than the mean score for all results (except the composite score for personality characteristics associated with field dependence) and that mean scores for the Field dependent sub-group are lower than mean scores on all exercises (except for the composite scores for personality characteristics associated with Field dependence). Reference to the scores for the various measures of ability used in the study

TABLE 5.52 Comparative mean scores (The sample and the two sub-groups)

TABLE 5.52	Sample	Field Independent	Field Dependent
EFT	16.574	24.18	5.12
RFT	43.003	9.74	172.97
ABC	3.143	1.8	4.53
VER	17.632	22.06	13
NUM	12.606	16.71	8.06
PER	21.541	27.3	14.9
AH3	51.747	66.06	36.9
ST 2	59.017	79.94	31.2
D-a-Man	103.095	118.29	92.2
D-a-Plan	100.095	108.76	84.2
0 1	7.028	8.26	5.24
0 2	13.212	16.5	9.88
0 3	7.053	9.9	5.71
EXTENT 1	2.553	3.26	1.88
ABSTN	3.564	4.12	2.53
PERSPECTIVE 1	4.116	4.41	3.12
ACCURACY 1	2.390	3.0	1.59
STYLE 1	2.711	2.77	2.59
ABSTRACTION 2	3.904	4.19	3.0
PROSPECTIVE 2	4.361	4.625	3.2
ACCURACY 2	2.349	3.0	1.6
STYLE 2	2.601	2.81	2.27
MAP 1	12.785	14.29	9.8
MAP 2	13.217	14.625	10.6
NOF 1	7.534	10.41	6
NOF 2	6.914	8.38	6.6
NOF 3	10.122	11.76	9.65
NODF	17.028	20.3	15.24
SCORE 1	10.478	11.65	9.53
SCORE 2	10.638	9.59	12.12

leads one to believe that it is ability that is the over-riding influence on these results and reinforces comments made earlier negating Witkins assertions about the influence of intelligence on cognitive style. When the results are inspected for individuals however, there are definite exceptions, as can be seen by reference to Table 53. Consider, for example, Case number 110, an extremely field independent individual aged 13 years, with an AH3 score of 53, just above the mean for his age group. Similarly case number 86, an extremely field dependent 13 year old with an AH 3 score of 68, which is well above the mean for his age group. Generally, however, the analysis of the comparative scores in these terms indicates better performance for the field independent individuals and strongly reinforces the conclusion of the factor analysis, referred to earlier, of an underlying intellectual/spatial/perceptual ability of which performance on the tests of cognitive style is one part. This suggests that intelligence is inextricably linked with the ability to cope with exercises such as the EFT, RFT, and ABC and therefore further questions the notion of a cognitive style dominated by the ability to 'disembed'. However it is important to recognise that at an individual level it is possible to find individuals that clearly substantiate the claims of Witkin and his colleagues. The extent to which this is generalisable, however, is open to considerable question.

(2) When the results of the map analysis are abstracted from Table 5.3 , definite differences are demonstrated in them for the two sub-groups. The maps produced by the field independent sub-group are generally more extensive, more abstract, more accurate, and adopt the most conventional perspectives. (See Tables 54 (a) and (b)). There appears to be little difference demonstrated in the map style adopted however. To this extent the results certainly confirm hypotheses anticipating differences for these various categories, yet the extent to which they derive from differences in cognitive style as opposed to differences in ability is questionable. Similarly, when the two sub-groups are compared for composite map scores, the field independent scores demonstrate that their maps are generally 'better' than those produced by the field dependent sub-group.

TABLE 5.53 . Follow Up Sample: Comparison of results

FIELD INDE-PENDENT CASE NUMBER	EFT	RFT	ABC	VER	NUM	PER	AH3	ST2	DAM	DAP	01	02	03	EXTENT	ABS 1	PERSPEC 1	ACY 1	STY 1	ABS 2	PERSPEC 2	ACY 2	STY 2	MAP 1	MAP 2	NOP 1	NOF 2	NOF 3	NODF	SCORE 1	SCORE 2
110	25	6.5	2	11	16	26	53	85	118	117	7	19	12	4	5	5	3	3	5	5	4	3	16	17	18	7	11	29	2	17
093	25	6.5	2	25	24	25	74	94	108	86	9	20	12	1	4	3	2	2	5	5	4	3	11	17	8	7	13	22	11	9
470	25	6	2	25	17	32	74	95	126	108	9	19	12	4	5	5	4	3	5	5	4	4	17	18	16	12	13	24	8	6
481	24	9	1	17	12	25	54	87	116	125	7	18	12	4	4	5	4	4	5	5	4	3	17	17	14	18	10	34	9	4
466	25	7.5	2	27	16	32	75	99	109	92	9	22	12	3	4	5	3	2	5	5	4	4	14	13	18	15	19	34	10	5
292	24	8	2	29	15	26	70	85	118	90	9	15	7	4	5	5	5	4	5	5	4	4	19	18	8	6	6	10	10	11
298	24	7	1	27	18	30	75	85	129	95	7	20	12	4	3	4	3	3	2	3	3	3	13	11	15	11	15	24	13	8
427	25	9	2	28	23	33	84	88	121	125	8	17	4	2	4	5	2	3	5	5	1	3	14	14	3	4	9	12	16	5
195	25	15	2	26	22	29	77	65	100	106	8	9	12	3	4	3	2	3	3	4	1	2	12	10	11	5	10	16	14	13
201	24	8.5	2	22	24	29	75	84	106	110	9	16	12	3	5	5	3	3	5	5	4	3	16	17	4	7	13	18	8	11
019	25	11	2	18	15	25	58	71	132	116	8	15	4	3	4	4	3	3	3	5	1	1	14	10	16	5	14	24	16	10
021	25	11.5	2	16	17	27	60	75	112	109	9	16	12	3	4	4	2	2	4	5	3	2	12	14	6	2	14	17	15	9
254	25	5.5	2	16	10	23	49	79	125	116	9	16	12	4	3	4	3	3	3	4	4	4	13	15	8	11	10	18	10	12
267	25	7.5	2	19	15	23	57	48	111	108	7	11	5	3	4	5	3	2	5	5	2	3	14	15	5	6	8	10	13	11
374	23	11.5	2	27	10	27	64	81	130	106	9	16	4	3	5	5	3	2	5	5	3	2	15	15	10	10	9	15	16	11
383	23	12.5	2	23	18	27	68	80	118	109	9	16	12	3	4	5	3	2	5	5	3	2	14	15	5	6	12	15	12	9
379	23	12.5	1	19	12	25	56	58	132	129	7	15	12	4	3	3	3	3	2	3	3	3	12	11	12	8	14	23	15	12

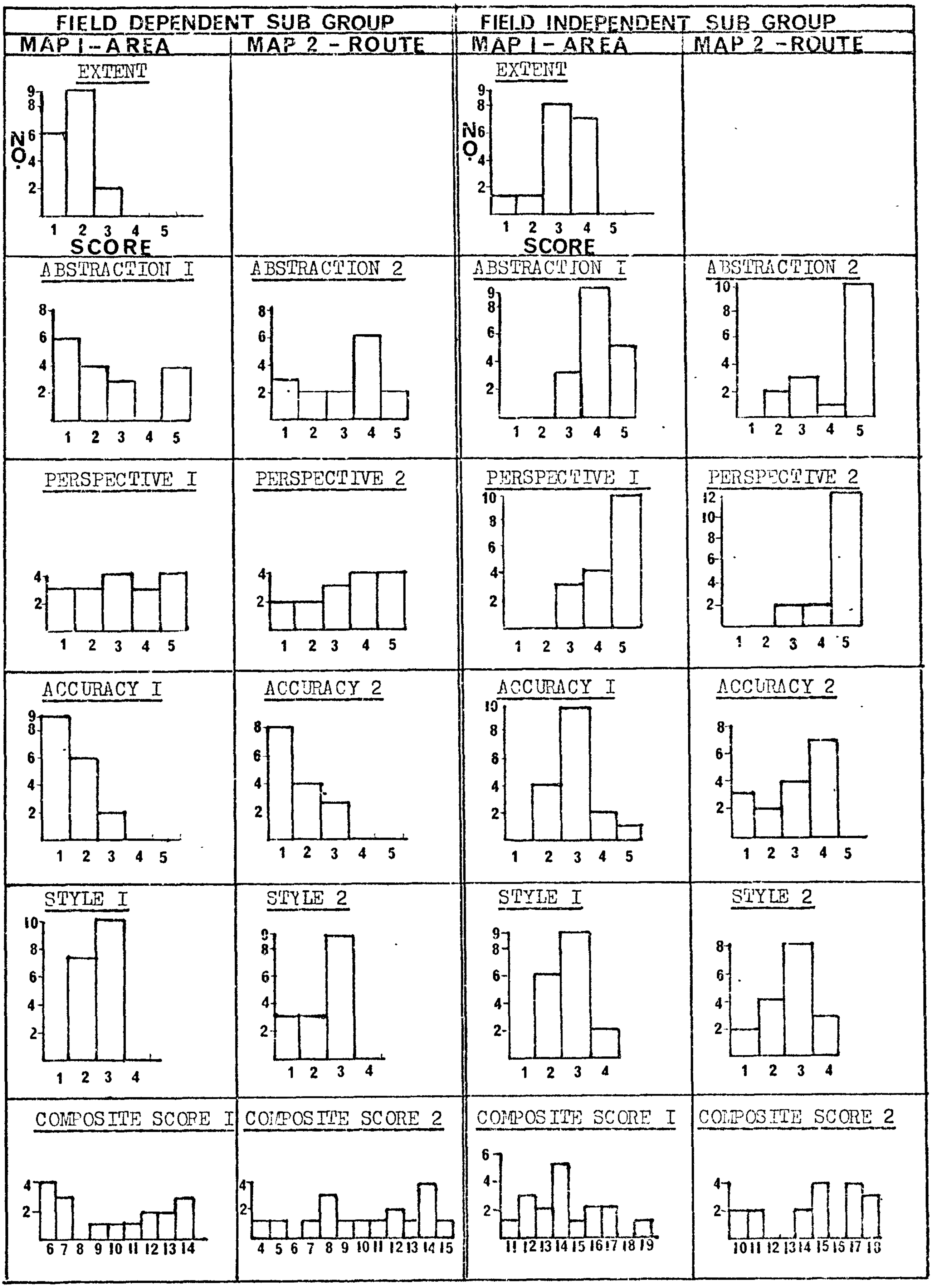
FIELD DE-PENDENT CASE NUMBER	EFT	RFT	ABC	VER	NUM	PER	AH3	ST 2	DAM	DAP	01	02	03	EXTENT	ABS 1	PERSPEC 1	ACY 1	STY 1	ABS 2	PERSPEC 2	ACY 2	STY 2	MAP 1	MAP 2	NOF 1	NOF 2	NOF 3	NODF	SCORE 1	SCORE 2
100	8	168.5	4	9	9	14	32	42	100	78	3	10	10	2	2	3	2	3	4	5	1	1	10	11	8	3	12	17	8	6
086	6	110.5	5	30	14	24	68	40	87	73	3	9	4	2	2	3	2	2	4	4	2	2	9	12	5	6	6	10	9	14
228	9	178	4	11	6	12	29	38	88	89	5	11	6	3	5	5	2	2	5	5	2	3	14	15	5	6	9	13	10	14
438	3	208	5	7	9	20	36	15	93	98	0	6	4	2	1	3	1	2	2	3	1	2	7	8	6	6	10	16	5	14
453	9	143	5	7	4	20	31	39	96	97	8	12	6	3	3	4	3	3	4	5	2	3	13	14	8	9	9	19	13	13
053	0	164	4	20	13	27	60	57	101	92	6	15	3	2	5	5	1	3	2	2	1	3	14	8	11	13	7	17	11	16
317	5	208	5	21	12	19	52	34	102	74	4	9	7	2	3	4	3	3	4	4	3	3	13	14	9	15	13	24	9	9
187	6	222	4	18	4	20	42	25	108	88	7	9	4	1	5	3	1	3	4	4	3	3	12	14	9	7	7	12	12	12
192	1	111	4	11	2	1	14	28	87	86	6	5	5	1	1	1	1	3	1	3	1	3	6	8	3	2	5	7	10	12
206	9	199	5	11	3	16	30	26	94	104	8	11	4	3	5	4	2	3	4	4	3	3	14	14	8	7	10	21	4	15
251	5	175.5	5	13	7	15	35	23	85	89	7	9	12	2	1	2	2	2	1	1	1	2	7	5	6	6	10	17	8	12
023	4	141	5	17	15	25	57	25	87	91	6	11	6	2	2	2	1	2	2	2	1	2	7	7	6	5	11	13	14	11
026	5	137.5	5	10	7	18	35	38	79	88	7	9	12	1	2	5	1	3	5	5	2	1	11	13	3	5	9	14	9	10
275	7	167.5	4	6	8	8	22	20	104	75	3	6	6	2	3	5	2	2	4	4	2	2	12	12	1	5	8	9	8	9
155	2	210	4	9	8	4	21	20	91	105	3	9	1	2	1	2	1	2	3	3	1	3	6	10	4	3	10	13	9	11
159	1	186	4	13	16	19	38	31	75	88	6	15	1	1	1	1	1	3	1	1	1	1	6	4	6	6	15	20	12	5
153	7	208	4	8	10	19	27	32	90	97	7	12	6	1	1	1	1	3	3	2	1	3	6	9	4	4	13	17	11	13

TABLE 54 (a) NUMBERS ACHIEVING EACH SCORE ON THE MAP ANALYSIS

TABLE 54 a	EXTENT					ABS^n I					PERSPTC					ACY I				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F.I. SUB GROUP	1	1	8	7	-	-	-	3	9	5	-	-	3	4	10	-	4	10	2	1
F.D. SUB GROUP	6	9	2	-	-	6	4	3	-	4	3	3	4	3	4	9	6	2	-	-

TABLE 54 a	STY I				ABS^n 2					PERSPEC2					ACY 2					STY 2			
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4
F.I. SUB GROUP	-	6	9	2	-	2	3	1	10	-	-	2	2	12	3	2	4	7	-	1	4	8	3
F.D. SUB GROUP	-	7	10	-	3	2	2	6	2	2	2	3	4	4	8	4	3	-	-	3	3	9	-

TABLE 54 (b) COMPARATIVE ANALYSIS OF THE MAP SCORES BY HISTOGRAM.



The analysis of the questionnaire and the maps for the features mentioned by each of the sub groups revealed further information about differences between field dependent and field independent individuals. (The detailed results of this analysis, which considered the items listed in Table 55 can be seen in Appendix 4). When the various elements listed in Table 55 were analysed, previous suggestions about the seemingly more extensive knowledge of their environment was confirmed for the Field Independent sub groups. On nearly every section, Field independent individuals included reference to more features (with the exception of Disliked, Dangerous and Comfortable places) when the overall total number of different references are considered the Field independent sub group mentioned significantly more features. A further interesting factor to emerge was that girls in both sub groups mentioned more features than the boys. When the analysis is considered for differences in type of features perceived it is difficult to discern any trends, yet when the overall responses are considered for features mentioned by the field dependent sub group alone and those referred to only by the field independent individuals it is possible to identify characteristic differences. As can be seen in Table 56 Field dependent subjects demonstrate a concern for incidental environmental features, with a positive influence of more social situations (eg Leisure Centre, Youth Clubs, Tennis Courts etc) there also appears greater specificity including personalised detail and often seemingly unimportant environmental elements, (eg Traffic bollards, Park benches, Chip shops and 'my old primary school'). Field Independent individuals on the other hand appear to consider more landmark type elements, the key features by which they move around their area and demonstrate a concern for the functional elements of the landscape. They also appear to be able to generalise better when it comes to a specific task. For example, in response to the request for features they might show to a cousin, a relation or a stranger, Field independent individuals said they would 'ask them', 'show them a map', 'take them on a general tour' and similarly when asked to select five features to be photographed for inclusion in a guide book of their area, Field

TABLE 5.55 An analysis of the number of features included on the area map, the route map and the various sections of the questionnaire

	FI BOYS	FI GIRLS	FI TOTAL	FD BOYS	FD GIRLS	FD TOTAL	SAMPLE TOTAL
Features noted on Maps	48	59	73	35	43	43	83
Favourate places	14	17	24	14	12	22	34
Disliked places	4	9	12	6	10	14	21
Features to Cousin	10	22	28	13	12	18	37
Features to Adult relation	10	21	25	10	11	16	31
Features to visitor	11	25	27	8	14	17	35
Dangerous places	3	8	8	5	9	12	16
Beautiful places	9	9	16	4	6	8	21
Uncomfortable places	2	8	9	5	7	7	13
Comfortable places	4	2	4	4	6	7	7
Associated with their environment - Noises	8	7	13	6	8	13	19
Associated with their environment - smells	7	5	10	4	4	7	14
Guide photographs selected to represent their area	24	26	36	16	22	30	48
TOTAL NO. OF DIFFERENT FEATURES INCLUDED	64	86	98	41	57	64	106

TABLE 5.56 Features referred to by Sub groups only on Maps and in Questionnaire

FD sub group only		FI Sub group only	
Personalised detail	Level Crossing	Post Box	Museums
		Telephone Box	Colleges
My Toys	Electricity Sub Station	Telephone Exchange	Kings Chapel
	Traffic Islands	Subway	Monument
			Mill
Leisure Centre	Road Signs		
Tennis Courts	Park Bench	Shopping Centre	Church/ Village Hall
Youth Club		Community Centre	Church
Jockey Club	Chip Shop		Churchyard/ Cemetry
Football Ground	Hairdresser		
Sand Pit	Restaurant	Playground	Factory
	Old Primary School	Rec	Offices
		Sports Ground	Tech
Woods	Railway		Police Station
Farms/Sheds	Doctors	Pond	Maternity Hosp.
Grass	Health Centre	Loch	Flats
		Lake	
		River/Brook	Bus Station
			Car Park
		Nursery	Garages
		Old People's Home	
			Waste Area
			Council Yard
			Allotments
			Animals
			Paddock
			Orchard
			Riverside Facilities

independent individuals generalised by suggesting 'general' or 'aeriel' views be taken. One might conclude that such responses suggest that Field independent subjects demonstrate a greater ability to analyse the situation and reflect on more appropriate solutions to tasks, as Witkin argues of field independence. It needs to be remembered however, that differences described here still tend to be reflective of the responses of individuals rather than typical of the sub groups as a whole.

2. Individual Interview

The character of the study described so far is very much of an objective scientific nature with the researcher distanced from the subjects of study. It was criticism of this approach that led Hart (1979) to opt for a more naturalistic approach, which he accepted as more subjective in interpretation, but which he believed was likely to reveal pertinent information. In attempting to produce a balanced study it was intended to include an interview with the children in the follow-up study, in which their responses to the maps and questionnaire could be reviewed with them and where other questions associated with research into Field Dependence/Independence and children's perceptions of their environment could be considered. It was intended that the interview should be as relaxed as possible, with key questions to provide a basic structure, but adopting Piagets 'Method Clinique' where anything of interest was pursued with the individual concerned. As can be seen from the copy the Interview Schedule in Appendix 4, the following areas were considered.

1. Children's Interests
2. School subject preferences and reasons
3. School subject dislikes and reasons
4. Preferences for Gregarious/Solitary activities
5. Freedom of Movement in the Environment
6. Changes noted in their own area
7. Changes desired in their own area
8. Follow up questions on the maps and questionnaire

Of these topics, the first four were attempting to consider suggestions made by Witkin (1976) and discussed in Chapter 2, that there are differences between analytic/global individuals for their interest and study preferences and for solitary or gregarious activities. The following tabulated results (Tables 57 - 59) do not support Witkin's suggestions that more analytic/field independent individuals demonstrate a preference for more analytic subjects, although specific comments by Field Independent children were more supportive. For example, comments of the following type were made by 7 of the children in the Field Independent Sub group.

I like such and such a subject because ...

"... It makes me think."

"... I like it when you've got a problem and you can figure it out ..."

"... I try to work things out for myself rather than ask the teacher..."

When preferences for more solitary or more gregarious activities were raised, the results presented in Table 59 do not demonstrate as positive an association between Field Independence and solitary activities as Witkin would expect. There is however, a clear preference demonstrated for gregarious activities by the field dependent sub group. It is also the case that field independent subjects indicate some interest in more solitary activities (eg Dog Walking, modelling, stamp collecting, reading) and the comments of one Field independent girl (Case Number 466) seemed to sum up the views of a number of them.

"... I like being with other people, but don't mind being on my own. If I get involved in something I don't like being disturbed though ..."

An important point to emerge from the interviews was the importance of the teacher and comments of the sort (Case Number 470)

"... the teacher influences my liking it a lot ..."

were common.

Question 5 in the interview considered the freedom of movement allowed to the children in the sub group. It was felt that this might be a factor closely associated with the analytic/global dimension and environmental perception. Witkin's assertions of parental influence on the development of field dependence were

TABLE 5.57 Interests of the Follow Up Sample

TABLE 5.57 - Interests	F.I Boys	F.I Girls	F.I Total	F.D Boys	F.D Girls	F.D. Total
Sporting Activities	2	1	3	2		2
Rounders					1	1
Football	4		4	6		6
Cricket	2		2	1		1
Golf	1		1			
Swimming		2	2	1	3	4
Horse Riding					2	2
Cycling	1		1		2	2
Playing	1	2	3	1	1	2
Fishing				2		2
Drawing/Painting	1	5	6	1	1	2
Modelling	3		3			
Speedway					1	1
Motor Bikes				1		1
Watching TV		2	2	2		2
School Club	1		1	1		1
Music		3	3			
Reading		2	2			
Cinema					1	1
Chess	1		1			
Space Invaders						
Ballet		1	1			
Stamp Collecting		1	1			
Drama Club		1	1			
Guides		1	1			
Walking		1	1			
Dog Walking		1	1			

TABLE 5.58 School Subject Prefered/Disliked by the Follow up sample

TABLE 5.58 LIKES	Boys	Girls	Total	Boys	Girls	Total
English	2		2	4	5	9
Maths	5	1	6	2	3	5
Science	1	2	3	1	1	2
French					1	1
History	1	2	3	1		1
Geography				2	4	6
R.E.					1	1
Classics					1	1
Biology		1	1			
Games	4		4	3	1	4
Writing		1	1		1	1
Design	1	1	2	1	1	2
Gym/P.E	1	1	2	2	1	3
Drama		1	1	1	1	2
Wood/Metalwork	2	1	3			
Art/Craft	1	1	2	2		2
Reading		1	1			
Most Things		2	2			

DISLIKES	F.I Boys	F.I Girls	F.I Total	F.D Boys	F.D Girls	F.D Total
English	1		1			
Maths	1	2	3	2	2	4
Science				3		3
French		2	2	2	1	3
History	1	2	3		1	1
Geography		1	1	2		2
R.E	1		1	1		1
Classics					1	1
Biology				1		1
Games	1		1			
Writing		1	1			
Music				1		1
Spelling		1	1			
Table Tests		1	1			
None	1	1	2		2	2

TABLE 5.59 Preferences for Solitary/Gregarious Activities

TABLE 5.59 Solitary/Gregarious	F.I Boys	F.I Girls	F.I Total	F.D Boys	F.D Girls	F.D Total
Gregarious		1	1	7	6	13
Solitary		3	3		1	1
Both	8	5	13	1	1	2
TOTALS	8	9	17	8	8	16

TABLE 5.60 Freedom of Movement of the Children in the Follow up sample

TABLE 5.60 Freedom of Movement		FI Boys	FI Girls	FI Total	FD Boys	FD Girls	FD Total
Total Freedom (no restrictions)		1		1	1		1
Total Freedom (only time restriction)		1		1		1	1
Total Freedom (if parents informed		2	3	5	5	3	8
Freedom within defined Geographical Limits (ie The Estate, My Area, The Village)		4	3	7	1		1
Limited Freedom (with permission)						2	2
Definite Restrictions						3	3
Preference for them to be with others		2	5	7	2	4	6
No difference if alone, or with others		3		3	2		2
Increased freedom if with others (old children, adults)		1	1	2			
Increased freedom if with others (friends)		1	2	3	1		1
Time restriction (stated hour)		1		1	1	1	2
Time restriction (Time of year)		1		1		1	1
Source of Permission:	Mother	3	7	10	7	7	14
	Father		1	1			
	Both	5	1	6		2	2
Noted Restrictions:							
None ("Places they wouldn't want me to go to, I probably wouldn't want to go to anyway" (Case No 110)		3	2	5			
Cafe (to play Space Invaders)					3		3
Main Roads		1	1	2	1	2	3
Building Site			1	1		1	1
River		1		1		1	1
Specific Areas						1	1
Cinema			1	1			
Park at Night					1	1	2
Out Alone						3	3

discussed earlier and the effect of parental control on children's 'environmental range' has been a subject of study in previous environmental perception research. (Hart 1979, Moore and Young 1978).

The results of the analysis of the responses to this question demonstrate that differences, rather than being the result of an analytic or global style, tends to be dependent upon age, especially for the girls. The older girls were given considerably more freedom than younger girls and the boys appear to be granted greater freedom earlier than the girls. These results are supported by the findings of previous research, (as reviewed by Moore and Young 1978) (pp 91 - 106). It would have been interesting to have followed up questions of this kind with the parents of the children in the sub groups, however this proved impossible. The kind of restrictions imposed upon the children's freedom are demonstrated in Table 60, where it can be seen that generally parents are happy for children in this age group to decide for themselves where they go and what they do, provided their parents are informed. There is some preference for them to be with others and the usual source of permission is the children's mother.

When the children were asked to comment on the changes noted and the changes they would like to see in the area where they lived, the differences between the sub groups were minor, yet the detail of the changes noted and the vehemence with which desired changes were argued demonstrated considerable differences. The field independent children were more thoughtful, more reflective and more analytic in their responses and several of them spoke at considerable length about changes that had taken place, or that they wished to see. This difference in linguistic skill is probably a direct result of ability as can be seen by reference to the comparative scores for verbal reasoning on Table 52. The types of features that were commented upon in response to these questions are tabulated below, where it can be seen that most of the changes noted were associated with building and that most of the changes desired associated with improving leisure activity facilities.

TABLE 5.61 Changes noted and desired in their home area by Children in the follow up sample

Changes Noted	FI Boys	FI Girls	FI Total	FD Boys	FD Girls	FD Total
No obvious changes	2	4	6	3	1	4
Limited Building	3	3	6		1	1
Building Sites	1		1	3	1	4
Demolition	1	1	2	1	1	2
Factory Extension		1	1			
Shopping Precinct		1	1		1	1
Change of shop type				1		1
Infilling	1		1			
Increased Noise					1	1
Increased Violence					2	2
Changes Desired						
None	3	2	5	1	3	4
Improved play facilities	1		1	3	1	4
More play spaces	1	2	3			
Sports Centre		1	1	1		1
Adv. Playground	1		1	1		1
Ice Skating Rink	1		1			
Swimming Pool				1		1
Cinema					2	2
More Clubs and Activities		2	2	1	1	2
As Under 18's Bar		1	1			
Improved Shopping facilities		1	1	1		1
Change area into Pedestrian Precinct		1	1	1		1
Stop Alterations to Named Area		1	1			

The final questions in the interview were concerned with clarifying individual responses to the maps and the questionnaire, primarily for the purpose of analysis. However, when the sub groups were asked to look again at their maps the Field Independent individuals were more readily prepared to suggest amendments or additions to ther maps. They were also prepared to constructively criticise their efforts and were quick to see any limitations or omissions in them. When asked how they went about the task of drawing maps such as those undertaken for the study, the field independent individuals were much clearer about the process they would adopt. For example,

> "... I would plan it out in my rough book first .... I would start from where I'm going from and think out things in stages .. I like to plan it out first ..." (Case number 019)

whereas the Field dependent individuals seemed to be less clear about the process involved,

> "... I start where I live and put things on as I think of them like the school and then the round-about (and then referring to his own map) ... and then thats a shop and thats the youth club..." (Case number 317)

or "... I'd put the church on and then a few roads and then I might put my house on and then the river I suppose ..." (Case number 228)

The lack of process in the drawing of maps between the two groups was clearly demonstrated in the next stage of the Follow up study which involved the children in a practical exercise.

3. <u>The Field Exercise</u>

It was felt that the exercises used in the study and discussed so far were somewhat static and since the focus of attention was the environment there ought to be the opportunity to investigate the ways in which children perceive the environment in a more direct way. To have undertaken this with the full sample would have been extremely difficult so it was proposed that it be undertaken with the children in the two sub groups representing the extremes of the analytic/global dimension.

As groups of 10 - 12, the children were taken by mini bus to an area unknown to them where they then went on a short walk. Whilst on the walk they were asked to imagine that they were exploring the area for the first time and to note down a list of any features they thought would help them to find their way back to the mini bus. (Paper and Clip-boards were provided and the Standardised Instructions used for the introduction can be seen in Appendix 4) Once back at the minibus the children were taken to a room in a local college and asked to draw a map of the route that they had just walked and to estimate how far they had walked. The list of features they had noted down were available to them for reference and the children had been asked to undertake the whole exercise without discussing it with the other members of the group. Whilst the various groups were drawing their maps, it was possible to focus on one or two individuals to monitor the process employed in drawing the maps.

- This exercise produced four further elements for analysis,

1. The mapping process
2. The features noted
3. The Maps (analysed as for the full study and compared with results of their earlier maps)
4. The estimation of distance

1. The Mapping Process

It was suggested earlier that distinct differences were demonstrated in the interview in the way in which field dependent and independent individuals said they would set about the task of drawing maps. To see how far this was true in practice, it was decided to monitor the process of mapping employed by some of the children in the follow up sample. Six children were selected for this purpose, two from each of the field exercise excursions, representing the extremes of field dependence and independence. Although highly subjective in interpretation, definite differences were demonstrated by these children. In all cases monitored, the field dependent children hesitated before commencing the task and were very tentative in the drawing which tended to be rather sketchy (as can be seen by the examples in Appendix 4). They made very little reference to their notes, although it had been suggested that it might help. Comparison between notes and completed maps demonstrated that the three field dependent children ignored features that they had noted when it came to drawing their maps. The field independent children on the other hand, appeared to tackle the task more confidently. One of them had actually kept a rough map-type record of the walk, perhaps anticipating the proposed exercise. The maps produced were more carefully organised, and included more detail and as a result the comparison between features noted and features represented on the maps were much closer. One final point of interest was concerned with the accuracy of the maps. Two of the field dependent children's maps contained orientational errors, in fact, one of these was 180° out, producing virtually a mirror image of the actual route walked. Although speculative and subjective it is felt that the findings described here suggest further avenues for research. It may of course be that the differences noted here are again representative of differences in general ability rather than style.

2. <u>Features noted on the field exercise</u>

As with the results of the full study and the sub group analysis discussed earlier, there were clear differences in the number of features noted by the two sub groups. Field independent children generally noted many more features when compared by age, sex and as full groups (Table 62). There were also definite differences

TABLE 5.62 Number of features noted on the field exercise by children in the follow up study

TABLE 5.62	FI Boys	FI Girls	FI Total	FD Boys	FD Girls	FD Total
10 - 11 yr olds	12.25	18.3	14	9	14.6	12
11 - 12 yr olds	24.5	22.6	23.4	15.5	20.3	14.75
12 - 13 yr olds	17	27.3	23.1	10	16.6	16.2
TOTAL	16.4	22.1	21.3	11.3	16.6	14.1

(Average Number of Features noted)

between the sexes, with the girls again tending to note more features than the boys.

When the features themselves were analysed for difference of inclusion, similar differences to those described earlier were revealed. Field dependent individuals tended to include very specific incidental and even ephemeral features (eg Log Piles, Bicycles, Ducks), whereas Field Independent individuals recorded more specific landmark type elements with a very detailed catalogue of street names by FI girls especially. As can be seen in Section 4 of Appendix 4 it was also the case that 13 out of the 17 field independent children recorded directional details, (left, right, straight on etc) whereas only 2 of the field dependent group included any such information.

When the maps were analysed for features noted, as has been suggested for the individuals monitored for the mapping process, field independent subjects made more reference to their notes. Thus there is greater correspondence between the number of features noted and the number of features mapped for the field independent group. One minor point about this analysis was that two field dependent children included details on their maps, which they hadn't noted and which were not in the area that they had walked. (See Section 4 Appendix 4). There was also evidence of each of the sub groups referring to their own memory of the walk, as well as to their notes, since features appeared on maps that had not been noted, but that they had certainly seen whilst on the walk.

3. Map Analysis

Analysis of the maps in terms of the elemental characteristics of Abstraction, Perspective, Accuracy and Style produced probably the most interesting results, with the Field Independent sub group producing the most detailed and accurate maps of the route with scores which reflect this, as can be seen on Table 63. In general field independent scores are much higher, but there are exceptions to the lower scores for the field dependent group. See Case number 453 for example, similarly not all field independent individuals achieve high scores. See Case number 427 as an example of this. When average scores for each of the sub groups are considered however, there are obvious and definite differences demonstrated between the

TABLE 5.63 An analysis of Individual's maps from the field exercise in the terms used to analyse the Route and Area Maps.

MAP ANALYSIS

BOYS									GIRLS							
Age Group	Case No.	Abstn.	Perspec.	Acy.	Style	Score	Av. Score	Age Group	Case No.	Abstn.	Perspec.	Acy.	Style	Score	Av. Score
						FIELD DEPENDENT SUB GROUP									
10-11	251	1	2	1	2	6		10-11	155	2	3	1	2	8	
	023	1	1	1	1	4	5.75		159	2	2	1	1	6	7
	026	2	2	1	2	7			153	2	3	1	1	7	
	275	1	2	1	2	6									
11-12	053	2	3	1	2	8	10	11-12	187	3	3	1	2	9	9
	317	4	3	2	3	12			206	3	3	1	2	9	
12-13	086	3	3	2	2	10	9	12-13	228	4	3	2	2	11	
	100	3	3	1	1	8			438	2	2	2	2	8	11.6
									453	5	5	3	3	16	

Average Scores - FD Boys 7.6 FD Girls 9.25 FD TOTALS 8.4

Age Group	Case No.	Abstn.	Perspec.	Acy.	Style	Score	Av. Score	Age Group	Case No.	Abstn.	Perspec.	Acy.	Style	Score	Av. Score
						FIELD INDEPENDENT SUB GROUP									
10-11	267	5	5	2	2	14		10-11	379	5	5	5	4	19	
	254	5	5	3	3	16	15.5		383	5	5	4	3	17	17.6
	019	5	5	3	3	16			379	4	4	5	4	17	
	021	5	5	3	3	16									
11-12	292	5	5	4	4	18		11-12	195	5	5	3	3	16	
	298	4	4	4	4	16	17.0		201	5	5	3	3	16	14.3
									427	3	3	2	3	11	
12-13	093	5	5	4	3	17		12-13	466	4	4	4	4	16	
	110	5	5	4	3	17	17.0		481	5	5	4	4	18	17.0
									470	4	5	4	4	17	

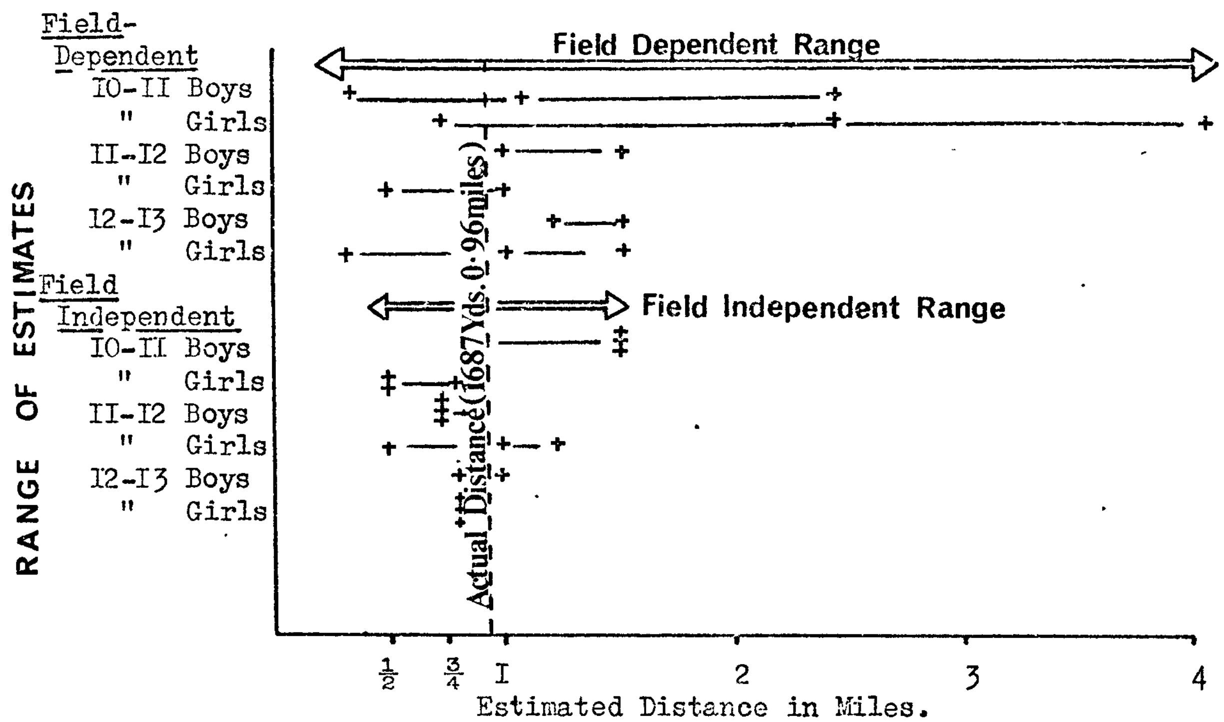
Average Scores - FI Boys 16.5 FI Girls 16.3 FI TOTAL 16.3

groups. (Table 62) Examples of the maps produced for this exercise can be seen in Appendix 4.

4. The Estimation of Distance

There have been an increasing number of studies which focus on the estimation of distance as a part of environmental perception research, (Pocock and Hudson 1978 pps 52 - 59, Canter 1975, 1976; Canter and Tagg 1975) which suggests an association exists between experience and accurate distance perception. Since accuracy had been a feature focussed upon in the analysis of the maps for this study it was decided that it would be interesting to see if the differences between field dependent and field independent subjects tendency towards greater or lesser accuracy was reflected in their ability to estimate how far they had walked whilst on the Field Exercise. They were told that reference to their maps might help. The results which can be seen on the diagram below suggests that Field independent subjects generally estimate distances more accurately and that there is a progressive improvement with age for both subgroups and for both sexes. Again, how far these differences are a reflection of general ability, as opposed to cognitive style, is highly questionnable. It is also the case that such an area deserves much more detailed investigation.

TABLE 5.64. DISTANCE ESTIMATION FOR THE FIELD EXERCISE.



This concludes the discussion of the follow up study and the statement and discussion of the overall results. The next chapter presents a summary of the conclusions reached.

CHAPTER SIX Summary of Conclusions

The following points present a résumé of the conclusions discussed in the previous chapter.

1. The irregularity of correlations between the three measures of cognitive style used in the study (EFT, RFT, ABC) raise questions about their consistency and reliability as true indicators of style. If the Embedded Figures Test is used as the indicator of cognitive style, as is the case in many previous studies, a much clearer and more regular series of results emerges than when all three measures are used. It also questions the existence of the cognitive style described by Witkin, if the level of consistency between the three measures are as low as those described in this investigation.

2. When the measures of cognitive style are considered in relation to intelligence, there is a very positive association between EFT and intelligence, whereas RFT and ABC correlations are generally higher with EFT than they are with intelligence. It is suggested that in terms of a cognitive style which cuts across levels of intelligence, the RFT and ABC may be better indicators of style than the Embedded Figures Test, which clearly requires an intellectual ability in its solution.

3. When considered for the sub divisions of intelligence (ie Verbal, numerical and perceptual reasoning) the most positive association with EFT is with perceptual reasoning as was anticipated, although contrary to Witkin's findings and in accordance with the suggestions of Goldstein and Blackman (1978) positive correlations were found with both verbal and numerical reasoning. RFT and ABC also demonstrated more positive relationships with perceptual reasoning, but in general correlations with verbal, numerical and perceptual reasoning were low when compared with those of the Embedded Figures Test.

4. When the measures of cognitive style were compared with the results of the Draw-a-Man analysis, as expected, correlations between ABC and Draw-a-Man were particularly strong, whereas both had demonstrated relatively low correlations with intelligence. It is suggested that the high positive variance demonstrated between these tests is based upon something other than the ability to disembed (in the case

of the ABC) or intellectual maturity (as is the case in the D-a-M) but represents the 'quality' of the drawings analysed in terms of the children's level of drawing skill.

5. A clear and positive association was demonstrated between all measures of cognitive style and spatial ability and when taken in conjunction with the results describing correlations with intelligence, again questions the analytic/global dimension as an independent definable characteristic. The correlations between EFT, RFT and ABC and Spatial ability again demonstrated stronger associations for EFT, yet correlations for RFT/ABC and Spatial Test 2 are amongst the strongest reported for these two tests. These results provide further evidence of the Embedded Figures Test in particular as a measure of something other than cognitive style and since many investigations have relied upon results of this test as their indicator of style it must raise questions about the reliability of their conclusions.

6. When aspects of orientational ability were compared with the measures of cognitive style and with intelligence, previous findings were confirmed (Satterly 1979) and generally at increased levels of significance. One factor of interest which emerged from this analysis was that the Urban children of the sample demonstrated a stronger association between RFT and orientation and it is hypothesised that this might be due to their greater experience of a more 'angular' and regular environment. It was suggested that this might be an interesting avenue for further research.

7. A relationship was demonstrated between Plan drawing and EFT and ABC. It was suggested that ABC/Draw-a-Plan correlations may be highlighting the drawing component of both exercises and that the EFT/Draw-a-Plan results demonstrating the 'disembedding' skills required to solve them both.

8. The analysis of the cognitive maps produced by the children of the sample demonstrated that those individuals achieving higher Embedded Figures Test scores produced maps which were more <u>extensive</u>, more <u>abstract</u>, were more likely to adopt an <u>overhead perspective</u> and were more <u>accurate</u>. Comparisons with ABC and RFT were less clear however and the results contained a number of non-significant results.

The lack of consistency amongst the correlations of the measures of cognitive style questions the hypothesised association between cognitive style and environmental perception as measured by cognitive maps, although the Embedded Figures Test is revealed as a reliable indicator of potential cognitive mapping ability.

9. When the results of the cognitive map analysis were compared with the measures of intellectual ability (AH3, verbal, numerical and perceptual reasoning) correlations were similar to those achieved with the Embedded Figures Test, but more positive with intelligence than they were with RFT and ABC. The most positive associations demonstrated were between the Extent of Map 1 (The Area where the children lived) and Intelligence and the accuracy element of both maps (The Area where the children lived and their Route from home to school) and intelligence. This suggests that the association described in point 8 above, may in fact be more a result of intelligence than they are of cognitive style.

Correlations between intelligence, verbal, numerical and perceptual reasoning with the map analysis were stronger for the girls in all cases.

10. Comparison of the analysis of the two maps produced by the children in the sample in terms of the degree of abstraction demonstrated, perspective adopted, accuracy and style of the maps revealed a considerable degree of consistency in the scores which offers some support to the argument that cognitive maps are a reliable and consistent technique.

11. Previous research had identified a positive relationship between spatial ability and the skills involved in using and producing maps. The results of this study confirmed these findings, although correlations were lower than anticipated. The '<u>Extent</u>' of the area map was the element that correlated most highly with spatial ability and at a higher level than it had correlated with the Embedded Figures Test, suggesting that spatial ability is a greater influence than 'cognitive style' on the extent of an area depicted in a cognitive map of an individual's locality.

12. The findings of Klett and Alpaugh (1976) of a developmental association between the three cognitive transformations of cognitive mapping of Extent (Scale in their terms), Abstraction and Perspective were confirmed by the results of this study. The correlations between the perspective adopted and the degree of abstraction were the most positive reported in the analysis and in terms of cognitive maps, it is clear that the degree of abstraction demonstrated is dependent upon the mental perspective adopted by the mapper.

13. The expectation of a positive correlation between map and plan drawing were not confirmed when the maps were considered in terms of the constituent elements of extent, abstraction, perspective, accuracy and style, although when Draw-a-Plan scores were compared with composite map scores (combination of scores for abstraction, perspective, accuracy and style) a more positive relationship was revealed, although this was still lower than expected.

14. Composite map scores, which reflected the overal 'quality' of the maps as a whole also produced the following results,

(i) EFT scores correlated most positively of the tests of cognitive style.

(ii) Correlations with intelligence and Spatial ability were highly positive, especially for the girls of the sample.

(iii) Correlations with verbal, numerical and perceptual reasoning were strongest with perceptual reasoning in all cases except the Urban boys.

(iv) Consistency was clearly demonstrated between composite map scores, further reinforcing the belief in cognitive maps as a reliable measure.

15. A partialing analysis between the elements most highly correlated with the composite map scores revealed that intelligence was a significant influence on the relationship between EFT and the production of both Maps 1 and 2 which confirms suggestions made earlier of the underlying influence of intelligence rather than cognitive style on the results of the study.

16. A similar analysis to assess the effects of age on the relationship between EFT and Intelligence on the production of the Maps suggests that the children's age did not appear to be a significant influence. In terms of the inter correlational analysis however,

(i) Correlations between age and EFT are generally low, except for Rural girls of the sample, where age appears to be a dominant influence. Correlations with RFT/ABC suggest that age is more influential on the drawings produced by the children, yet when Draw-a-Man scores are considered correlations are extremely low. (This contradicts comments made earlier about similarities between the ABC and Draw-a-Man exercises, or at least points to one major difference between them, ie Age is more influential when drawings are scored for articulation of body concept than in the terms provided by the Draw-a-Man analysis. This might be an interesting area for further study). When the mean scores for the tests of cognitive style were considered, as Witkin suggests, there is a progressive movement towards an analytic/field independent mode demonstrated with age, although contrary to the findings of Witkin, the 12 - 13 year old girls mean score was higher than that of the boys, and when more specific sub group analysis is undertaken association with age is not so clearly demonstrated.

(ii) Correlations between intelligence and age were, as one might expect, comparatively high, with those of the girls being the highest for all sub groups of the study. (ie Age and Residence).

(iii) Success on the test of spatial ability used in the study (Spatial Test 2) does not appear to be significantly influenced by age.

(iv) In all cases except the Urban Boys (and in particular the 12 - 13 year old Urban Boys) age was a considerably stronger influence on the production of the second map the children were asked to produce, (The Route from Home to School) and it is suggested that more attention needs to

(iv) contd. be directed in cognitive mapping studies towards the relationship between age and activity. This is another avenue for potential research. The association of age and differences between the two map tasks were also confirmed when the effects of age were considered for the elements of the map analysis.

(1) The degree of abstraction demonstrated and the perspective adopted demonstrated a more positive association with age on Map 2 for all groups except the Urban Boys.

(2) The accuracy of the maps seems to be more dependent upon age for the Rural Children of the sample.

(3) The style of Map 2 appears to improve with age for the Rural children of the sample.

(4) A closer association was identified between the Extent of the Area maps and Age for the girls of the sample, suggesting perhaps that it is only as girls get older that they are given greater freedom and hence acquire greater knowledge of their home area which is then reflected in their cognitive maps. This might also be worthy of further research.

17. A principal components analysis identified four significant components which accounted for 85.7% of the variance of the measures used in the study. The most significant of these reflected the common intellectual/spatial/perceptual bias of the exercises and accounted for 53.5% of the variance. A second component, accounting for a further 14.4% of the variance was based upon the perspective/abstraction demonstrated in the cognitive maps of the sample and appears to reflect important elements of environmental perception. Thirdly, a cognitive style factor emerged and was identified by EFT and RFT associations and accounted for a further 10.3% of the variance. Finally, a drawing component emerged, linking the Draw-a-Man and Articulation of Body Concept Scale and accounting for a further 7.4% of variance.

18. A stepwise multiple regression analysis confirmed the underlying intellectual/spatial bias of the investigation and demonstrated the multi colinearity of the variables involved. A variety of analyses were undertaken to overcome the problems of multicolinearity. Eventually, when the inter-correlation matrix was disattenuated to account for error in the variables themselves, Perceptual Reasoning emerged as the most dominant influence on the production of both maps. The effect of age on the production of the Route Map was also confirmed.

19. A relationship was established between personality and cognitive style. Personality characteristics associated with an analytic/field independent style correlated positively with the measures of cognitive style and much stronger negative correlations were established between the measures of cognitive style and personality characteristics associated with a more global/field dependent style. In particular the bi-polar dimensions of 'Gives up Easily - Perseveres' and 'Dependent - Independent' were identified by this study as being closely associated with the analytic/global extremes. As with other results reported, correlations with the Embedded Figures Test were the most consistent of the three measures of cognitive style. How far the results merely demonstrate personality characteristics associated with more or less able children was considered and comparison of individual and composite personality scores with intelligence suggests that this may be true.

20. Analysis of the maps and the questionnaire for the number of features referred to by individuals in the sample revealed little of significance, which was particularly disconcerting considering the length of time taken to score this analysis. The number of features mentioned by an individual does not appear to be influenced in any dramatic way by Age, Intelligence or Cognitive Style, although the girls of the sample generally made reference to more features than the boys in all activities, supporting the findings of Bishop (1973).

21. The additional analysis of the maps for the level of labelling included and the structure of the maps in the terms described by Lynch (1960) confirmed the findings of previous research. Older

children tended to include more detailed labelling on their maps, and only in the case of the Rural children was the influence of intelligence seen to be particularly important. No clear association emerged between cognitive style and the amount of labelling included on the cognitive maps however.

Analysis of the maps for map structure demonstrated that younger children's maps tended to consist primarily of Paths, Nodes and Landmarks and there was an increased reference to Edges and Districts in the maps of children aged 12 - 13. There were clear differences between the Urban and Rural sub groups on this analysis, as might be expected, since Lynch's original investigation reflected structural organisation of Urban Environments, thus there were more Urban children making reference to Edges and Districts. It was commented that the nature of the task set is an important consideration in analyses of this kind. Some tasks may not allow an individual the opportunity to demonstrate a knowledge of districts or boundaries in particular. Comparison of the results with intelligence and cognitive style revealed that it is the more intellectually able children who are more likely to include reference to Edges or Districts in their cognitive maps. In general however, correlations were low.

22. The follow up study of two sub groups representing extremely analytic/field independent individuals and extremely field dependent/global individuals revealed the following information.

1. Analysis of mean scores on all of the exercises demonstrated the superiority of the Field Independent subjects, which appeared to reflect the extremes of intelligence in the sample, i.e. the analytic field independent individuals were also the most intelligent and the global/field dependent sub group consisted of the less able children in the sample. Comparison of the sub groups at an individual level however, revealed that there were individuals within each of the sub groups for whom cognitive style was not a reflection of general intellectual ability.
2. Comparison of the map analysis for the two sub groups revealed consistent differences. As had been stated for the full sample, the more analytic/field independent individuals produced maps which scored higher for the Extent, Abstraction, Perspective and

Accuracy categories, whereas the Style of the maps demonstrated results similar to the sample as a whole, with no significant differences emerging between the sub groups.

3. When the map scores were combined to produce composite map scores, Field Independent/analytic subjects' maps achieved markedly higher scores reflecting the superior quality of their maps as a whole.
4. Comparative analysis of the two sub groups for the number of features they made reference to in the cognitive mapping tasks and in their responses to the questionnaire revealed that analytic/field independent subjects mentioned more features and therefore a wider range of features, for all activities, which it is suggested is representative of a more detailed and perceptive knowledge of the features which constitute their environment. How far this is a reflection of general ability is of considerable importance.
5. Analysis of the different kinds of features mentioned by the two sub groups suggests that global/field dependent children seemed more concerned with incidental environmental features and more socially oriented places, whereas children representing the opposite extreme accentuated more landmark type elements. Field independent subjects were also able to generalise better when it came to tasks associated with environmental perception.
6. When the two sub groups were individually interviewed, Witkin's suggestions that Field Independent/analytic individuals will demonstrate a preference for more analytic subjects were not supported for children in this 10 - 13 age group, whereas, as Witkin had also asserted, Field dependent/global children demonstrated a stronger preference than the Field independent sub group for more gregarious activities. Although the analysis did not fully confirm Witkin's suggestions of an association between Field independence and more solitary activities, there was certainly evidence of a stronger bias in this direction for the children in the extreme analytic/field independent sub group.

   In response to questions about freedom of movement in their environment, rather than being associated with cognitive style, differences in this study seem to be dependent upon age, especially for the girls. As was suggested earlier (16,iv,4) older girls appear to be given considerably more freedom than younger girls and boys seem to be granted freedom earlier than girls.

When the children were asked to comment upon changes they had seen, or that they would wish to see in the area where they lived, the major differences appeared to be in relation to the articulacy of the field independent sub group, which adds further evidence of the underlying intellectual element of the analytic/global dimension. Reference to the differences in Verbal reasoning scores confirmed this for the majority of the children, but as stated before, there were exceptions.

Finally, the interview appeared to reveal a more constructively critical approach to the problems of cognitive mapping by the analytic/field independent sub group. This was confirmed in the Field exercise which the two sub groups participated in. This raises another area of potential research.

7. The field exercise required the noting of features felt to be of importance whilst on a short walk. As reported previously field independent individuals noted more features, when compared by age, sex and as full sub groups. There were also definite sex differences however, with the girls tending to note more features than the boys. When the features were analysed for differences, as suggested earlier, the analytic/field independent children included more specific landmark type elements, especially the girls who included a very detailed catalogue of street names. Field dependent's on the other hand included incidental and often ephemeral environmental features. More field independent individuals included orientational and directional detail and several field dependent subjects made orientational errors in their maps of the walk undertaken whilst on the field exercise.

Analysis of the maps of the field exercise revealed similar results to those previously discussed, with analytic field independent individuals scoring more highly on all elements of the map analysis. Comparison of the three maps produced by the children in the follow up study demonstrated a high degree of consistency in the scores for all exercises and further confirms the cognitive map as a consistent means of measuring an individual's perception of his environment.

8. A final element of the Follow up study revealed that Field Independent individual's tended to be more accurate in their estimation of the distance walked whilst on the field exercise, although all groups improved in accuracy with age. This is an area which could be explored in greater detail.

The original intention of this undertaking was to examine the relationships between children's cognitive style and their perception of the environment. The potential of this area for exploration and explanation for both geographers and psychologists has been recognised and commented on by others (Hart 1979, p 18) and especially in terms of the cognitive style dimension identified and so thoroughly researched by Witkin and his colleagues. The main findings of this study, however, appear to raise doubt about the existence of a cognitive style, in the terms described by Witkin, which is independent of the level of intellectual ability of the majority of individuals. What has emerged seems to reinforce the comment of Bruner mentioned in the text (p 47), that in any group,'individual differences exist in massive degree'. The conceptualisation suggested by Witkin, however attractive, appears somewhat simplistic in the face of the wide variations of individual difference that exist within the population. One important point however, is that it is too easy when considering a cognitive style dimension which describes differences in extremes, to view the world as if it is populated by the extremes,rather than the range between the two extremes. As has been demonstrated, the numbers of this sample falling at the ends of the continuum is extremely small.

One final point questions why someone as eminent as Witkin has devoted so much time and effort to an area which recent research has raised doubts about? One of the most recent articles from the Witkin group (Witkin et al 1977) contains an extensive array of supportive evidence, but makes little reference to criticisms levelled at their findings. In any area of research the time and effort demanded involves considerable career investment and one often feels impelled to justify and substantiate a perspective with which one is closely associated, as has been demonstrated by supporters of the work of Piaget in the light of recent critical comment. As has been indicated however, it is possible to identify individuals who demonstrate the capacities identified by Witkin, but which do not reflect levels of general ability. In this study the numbers were extremely small, and by implication it appears that sampling is a crucial factor in the investigation of cognitive styles. It is also the case that any discernable differences, not dependent upon intelligence, are more likely to be identified when the original testing instruments of the Body Adjustment Test and the Rod and Frame Test are used. Most recent research has relied on the Embedded Figures Test as its measure of cognitive style, and the results of this study suggests that by doing so researchers have probably distinguished between their sample in terms of general intelligence rather than by cognitive style.

Brophy (1982), in the conclusion to his study refers to Cronbach (1971),

> "Theories are intellectual tools....conceptual frameworks deliberately devised for effectively directing experimental enquiry and for exhibiting connections between matters of observation that would otherwise be regarded as unrelated."

Witkin's researches have attempted to connect that which had previously been regarded as unconnected, and in doing so has crossed boundaries between diverse psychological areas which were previously treated separately, in particular those of cognition, intelligence, personality and social behaviour. Studies of Environmental Knowing have attempted a similar cross fertilisation of ideas between the social and behavioural sciences, and this study was an attempt to extend that process. The results of the study, however, do not confirm the anticipated association between cognitive style and environmental perception. Despite this, it is hoped that much of interest has been revealed and as has been indicated in the text, that it has raised potentially useful questions for further research.

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APPENDICES.

I. TESTS AND STANDARDISED INSTRUCTIONS.

II. QUESTIONNAIRE AND INSTRUCTIONS FOR COMPLETION.
QUESTIONNAIRE FEATURE ANALYSIS.
MAP FEATURE ANALYSIS.

III. CRITERIA FOR THE ANALYSIS OF THE MAPS.

IV. THE FOLLOW UP STUDY.

APPENDIX I.

Examples of the tests used in the empirical study, with respective standardised instructions.

GROUP
EMBEDDED
FIGURES TEST

By Philip K Oltman, Evelyn Raskin, & Herman A Witkin

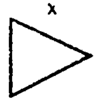
Name ____________________ Sex ______

Today's date ____________ Birth date ____________

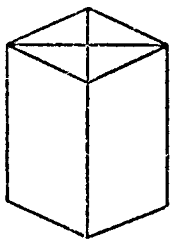
INSTRUCTIONS This is a test of your ability to find a simple form when it is hidden within a complex pattern

Here is a simple form which we have labeled "X"

X



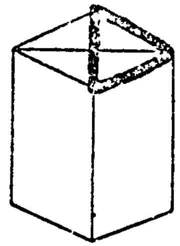
This simple form, named "X", is hidden within the more complex figure below:



Try to find the simple form in the complex figure and trace it *in pencil* directly over the lines of the complex figure It is the SAME SIZE in the SAME PROPORTIONS and FACES IN THE SAME DIRECTION within the complex figure as when it appeared alone

When you finish, turn the page to check your solution

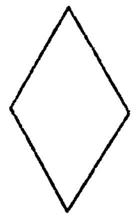
This is the correct solution, with the simple form traced over the lines of the complex figure:

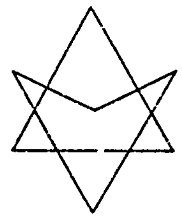


Note that the top right-hand triangle is the correct one the top left-hand triangle is similar, but faces in the opposite direction and is therefore *not* correct

Now try another practice problem Find and trace the simple form named "Y" in the complex figure below it:

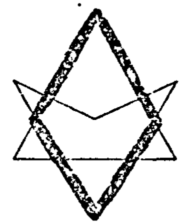
Y





Look at the next page to check your solution

Solution.

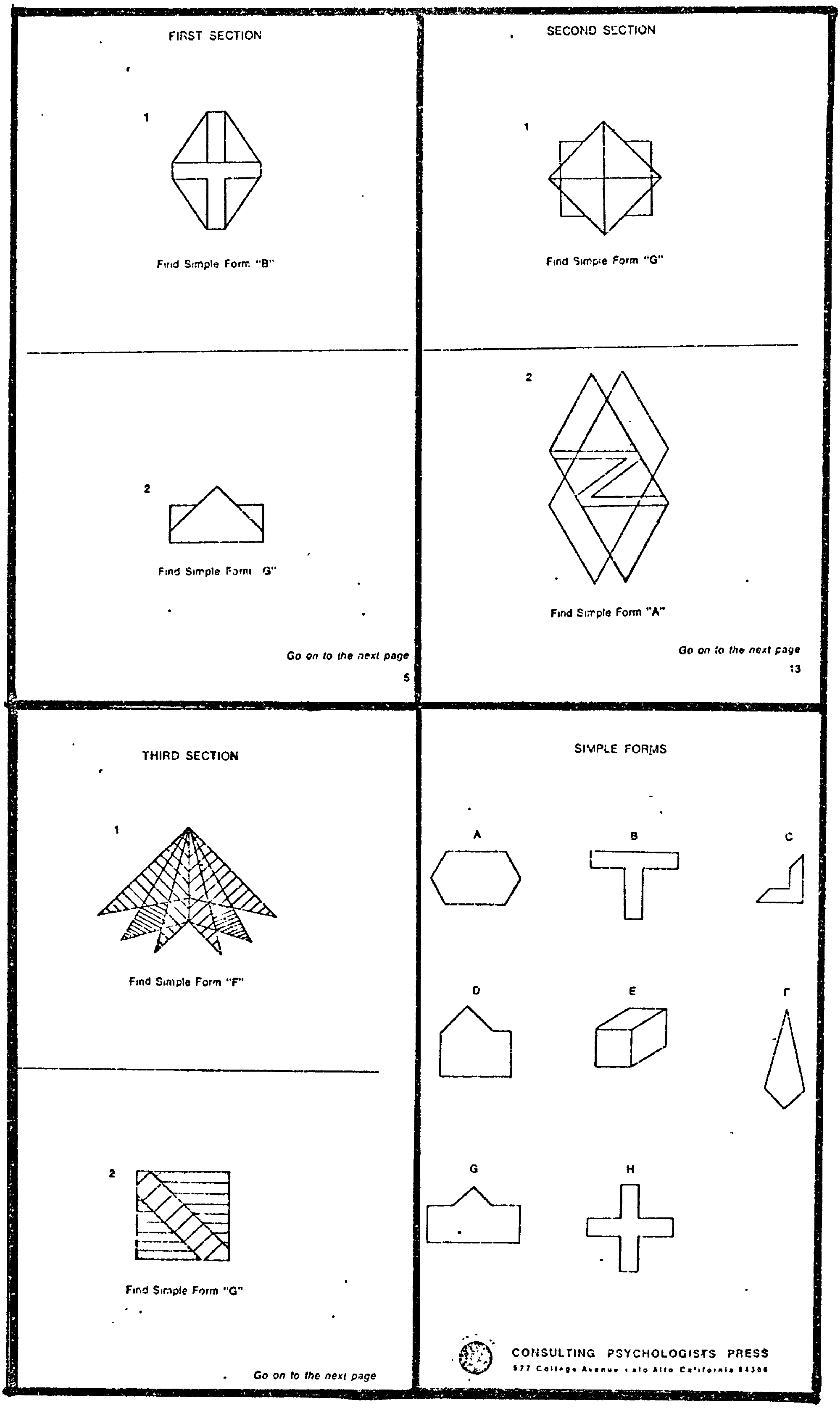


In the following pages problems like the ones above will appear On each page you will see a complex figure, and under it will be a letter corresponding to the simple form which is hidden in it For each problem look at the BACK COVER of this booklet to see which simple form to find Then try to trace it in pencil over the lines of the complex figure Note these points

1. Look back at the simple forms as often as necessary
2. ERASE ALL MISTAKES
3. Do the problems in order Don't skip a problem unless you are absolutely "stuck" on it
4. Trace ONLY ONE SIMPLE FORM IN EACH PROBLEM You may see more than one but just trace *one* of them
5. The simple form is always present in the complex figure in the SAME SIZE, the SAME PROPORTIONS, and FACING IN THE SAME DIRECTION as it appears on the back cover of this booklet

Do not turn the page until the signal is given

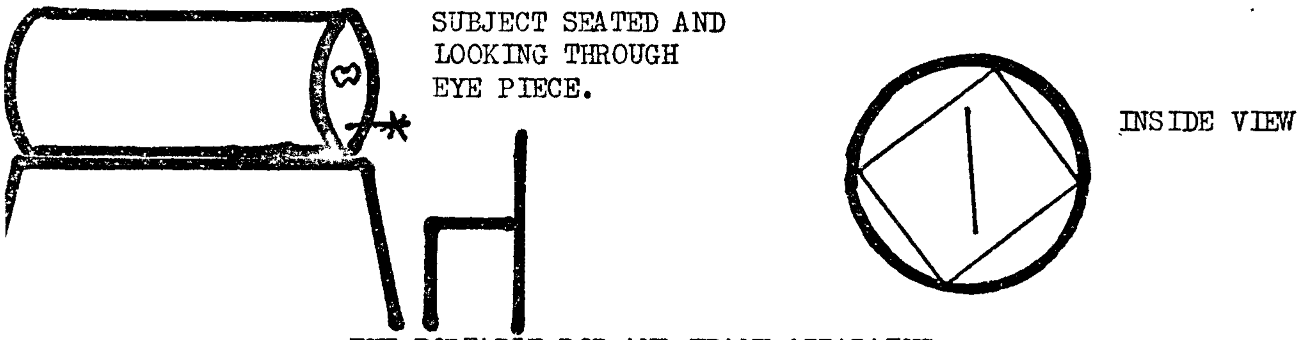
I. THE EMBEDDED FIGURES TEST. (Standardised Instructions)



EMBEDDED FIGURES TEST-SAMPLE ITEMS. (Reduced in Size.)

II. THE ROD AND FRAME TEST. (Oltman, P.K.)

As was explained in the text, a portable apparatus was obtained for this exercise, and the children in the sample were all seen individually to undertake the test. The apparatus is as described in the diagram below, and the exercise is undertaken in a semi-darkened room. The purpose of the test is to determine how well an individual can establish the upright under various conditions.



THE PORTABLE ROD AND FRAME APPARATUS.

Standardised Instructions: (Adapted from those provided by Dr, Phillip Oltman.)

"In this exercise I want to find out how wellyou can decide whether something is upright and straight.

In this box you will see a square frame and a rod just like this. (A small model of the rod and frame was shown to the child.)

I can tilt the frame to the left or to the right. I can also tilt the rod to the left or to the right. I can tilt the frame on its own, or the rod on its own or I can tilt them both together.

At the beginning of each exercise I want you to tell me if the rod and frame are straight or tilted, and if they are tilted which way they are tilted.

Are there any questions?

You will be asked to turn this handle, which moves the rod until you think the rod is straight up and down like a flagpole or a telegraph pole."

TRIAL I. Frame 28 L and Rod 28 L.

"Please tell me the position of the rod and the frame.

Now will you turn the handle to move the rod until you think it is straight up and down like a flagpole or a telegraph pole."(When the subject is finished he/she is asked if he/she is sure.)

TRIAL 2. Frame 28 L and Rod 28 R.

"Please tell me the position of the rod and the position of the frame.

Will you now turn the handle to move the rod so that it is straight up and down like a flagpole or a telegraph pole."(The subject is again asked to confirm that he/she believes the rod to be straight.)

Then the remaining trials are proceeded with:

TRIAL 3.	Frame 28 R and Rod 28 R.		TRIAL 4.	Frame 28 R and Rod 28 L.	
TRIAL 5.	" 28 L and	" 28 L.	TRIAL 6.	" 28 L and	" 28 R.
TRIAL 7.	" 28 R and	" 28 R.	TRIAL 8.	" 28 R and	" 28 L.

The degrees of deviation from the upright over the 8 trials then constitute the Rod and Frame score. A high deviation score is said to represent extreme Field Dependence and a low deviation score to represent extreme Field Independence.

III. ARTICULATION OF BODY CONCEPT SCALE.

In the version of this test, which was very kindly supplied by Dr. Oltman of the Educational Testing Service at Princeton, the following criteria were used to distinguish between the drawings produced by the children of the sample. Examples of the drawings representing each of these categories are also included. The children were simply asked to produce two drawings, one of a man and one of a woman, using instructions adapted from the Goodenough-Harris Draw-a-Man-Test.

Criteria for distinguishing between the drawings.

1. Most articulated drawings: These manifest high form level (e.g., waistline, hips, shoulders, chest or breasts, shaped or clothed limbs, etc.); appendages and details represented in proper relation to body outline, with some articulation in mode of presentation; appropriate, even imaginative, detailing (e.g., young girl in evening clothes, well-dressed man with cigarette, etc.)
2. Moderately articulated drawings: Drawings which show a definite attempt at role assignment (with regard to age, activity, occupation, etc.) through adequate detailing, shaping, clothing; with continuity of outline (i.e., integration of parts) attempted.
3. Drawings intermediate in level of articulation: Drawings in which identification of sex is evident, attempts at shaping and a fair level of integration of parts are manifest and a minimum of detailing is present.
4. Moderately primitive drawings: Drawings which essentially lack features of differentiation through form, integration, identity, or detailing; however, these drawings show slightly more complexity in some respect (e.g., presence of one body part that is unusual in most primitive drawings, such as the neck) than drawings rated 1.
5. Most primitive and infantile drawings: These manifest a very low level of form (ovals, rectangles, sticks, stuck on to each other); no

evidence of role or sex identity (same treatment of male and female with, at most, difference in hair treatment, no facial expression, little shaping or clothing).

(Drawings representing each of these categories can be seen in the following pages. Each of these drawings were drawn by children in the sample.)

IV. AH3.

The standardised instructions for this test are as provided in the manual. ('AH2/AH3-Manual', devised by Heim,A.W., Watts,K.P. and Simmonds,V., published by the National Foundation for Educational Research.)

Examples drawn from the three categories of Verbal, Numerical and Perceptual Reasoning can be seen below. There are 40 questions in each section, and I5, I5, and I2 minutes are allowed for the respective sections.

VERBAL

35 Which one of the six lower words means **either** the same or the opposite of the top word?

softly

hesitatingly	whispering	quietly	quickly	silently	unheard
1	2	3	4	5	6

36 The two top words are alike in some way. Only one of the six lower words is **unlike** the top two. Which is it?

adder **python**

serpent	grass-snake	lizard	cobra	asp	boa-constrictor
1	2	3	4	5	6

NUMERICAL

38 A square floor is covered with 121 tiles All the outer ones are blue, the rest are grey. How many grey ones are there?

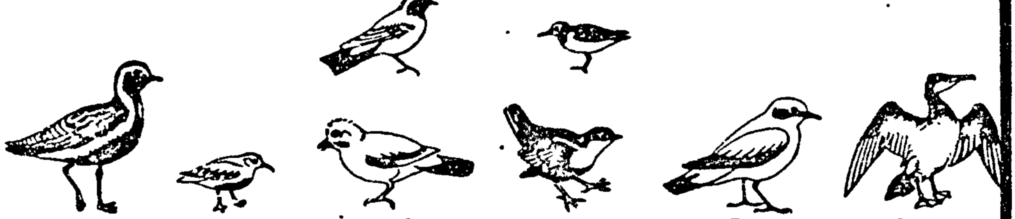
81	80	79	77	100	none of these
A	B	C	D	E	F

39 **3** is to **4** as **12** is to

16	36	11	40	24	18
A	B	C	D	E	F

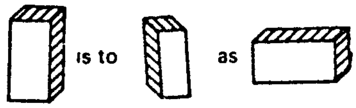
PERCEPTUAL

33 Which one of the six lower pictures is **like** the top two but unlike the other five?



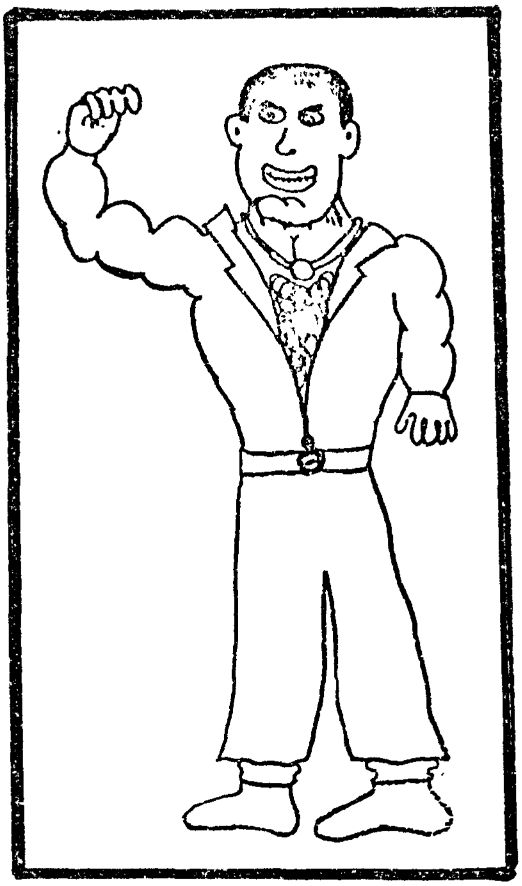
1 2 3 4 5 6

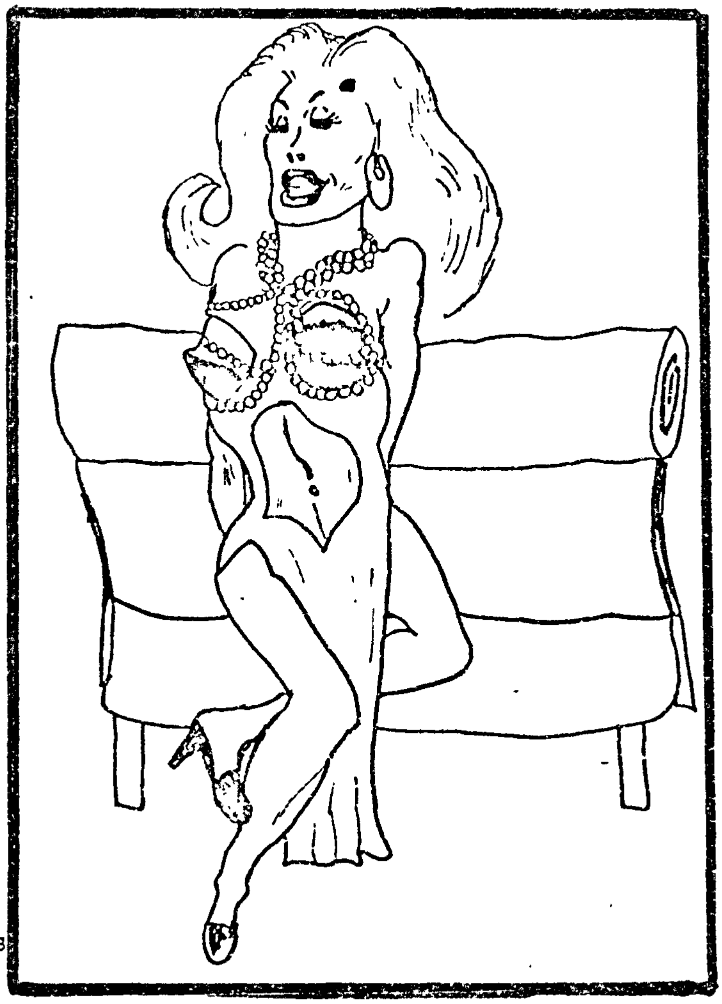
34



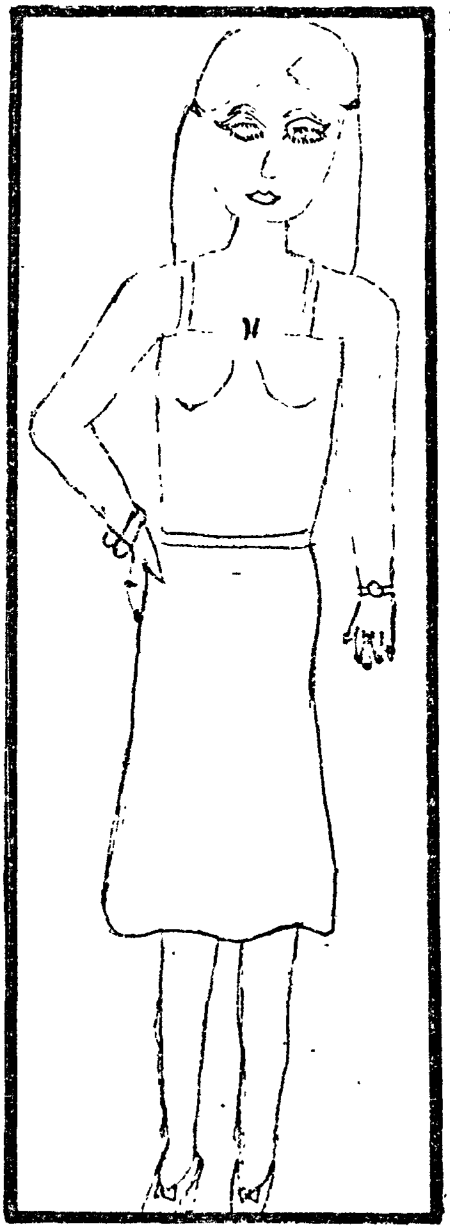
1 2 3 4 5 6

ARTICULATION OF BODY CONCEPT SCALE: RATING I.



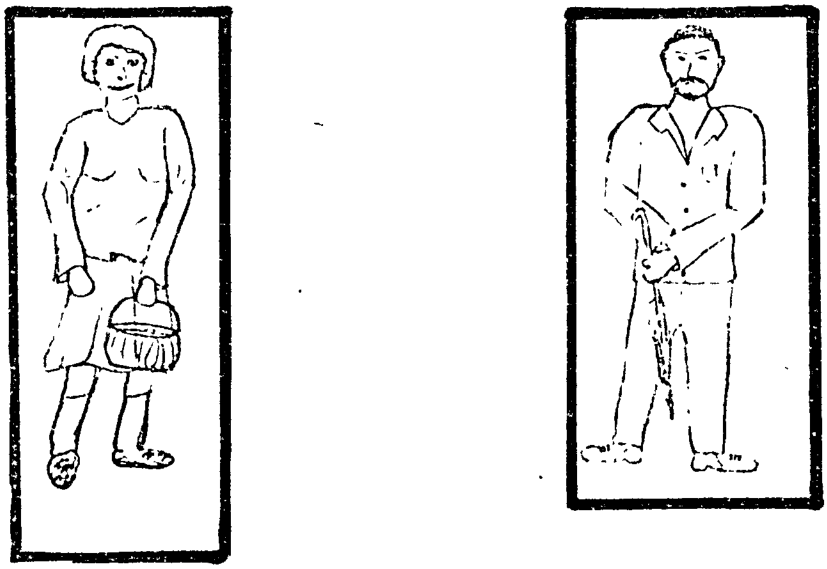


BOY
I2years

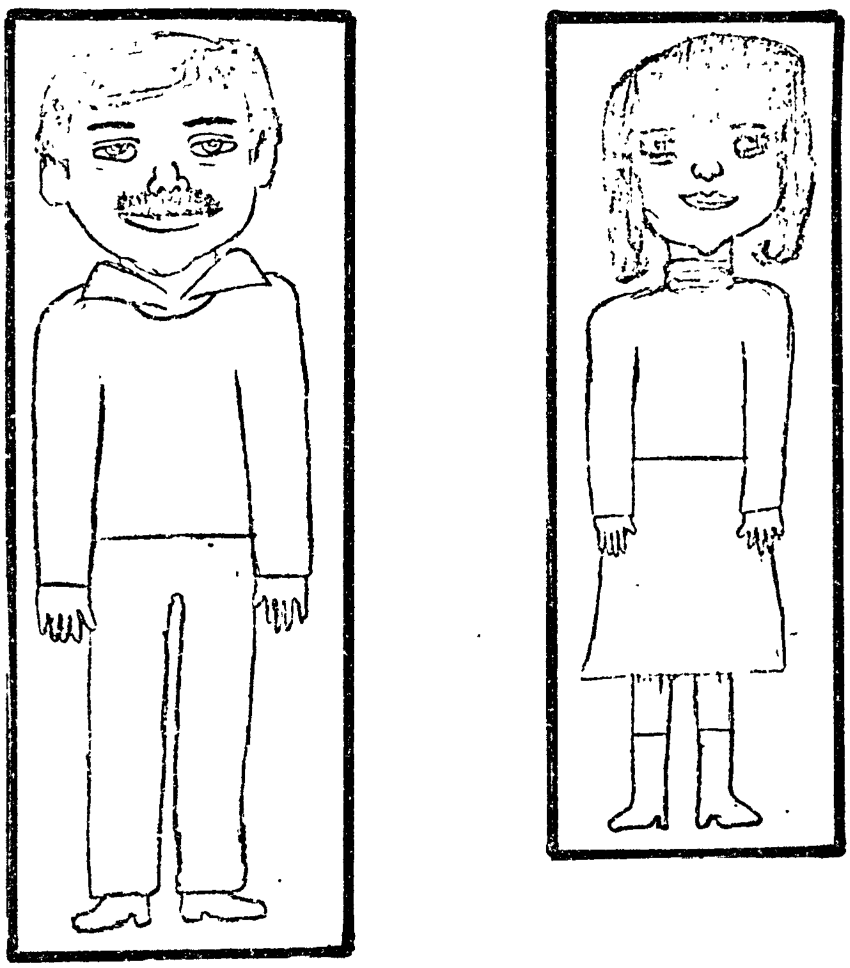


GIRL
I2 years.

RATING 2.

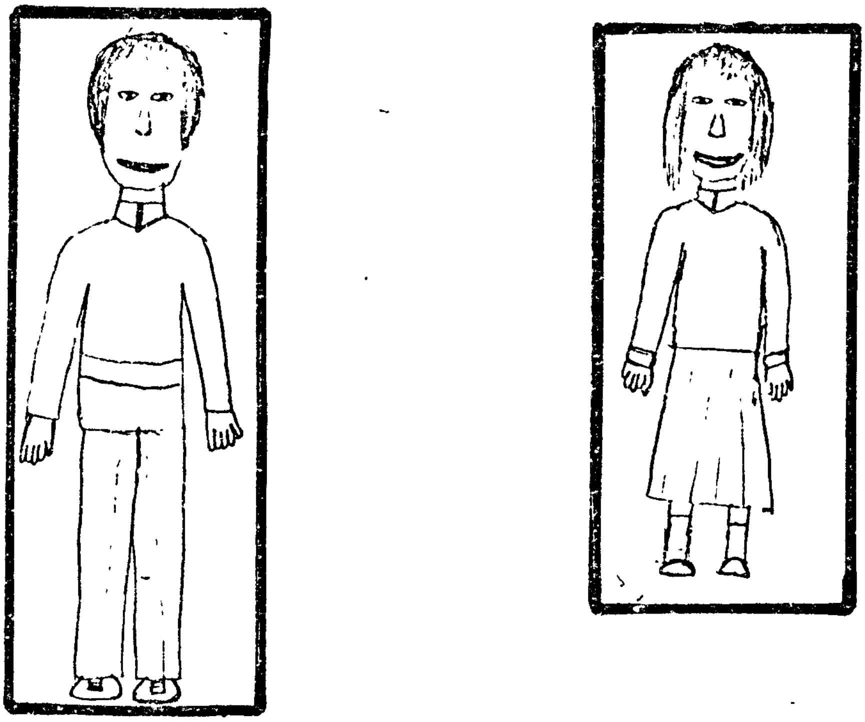


BOY II years.

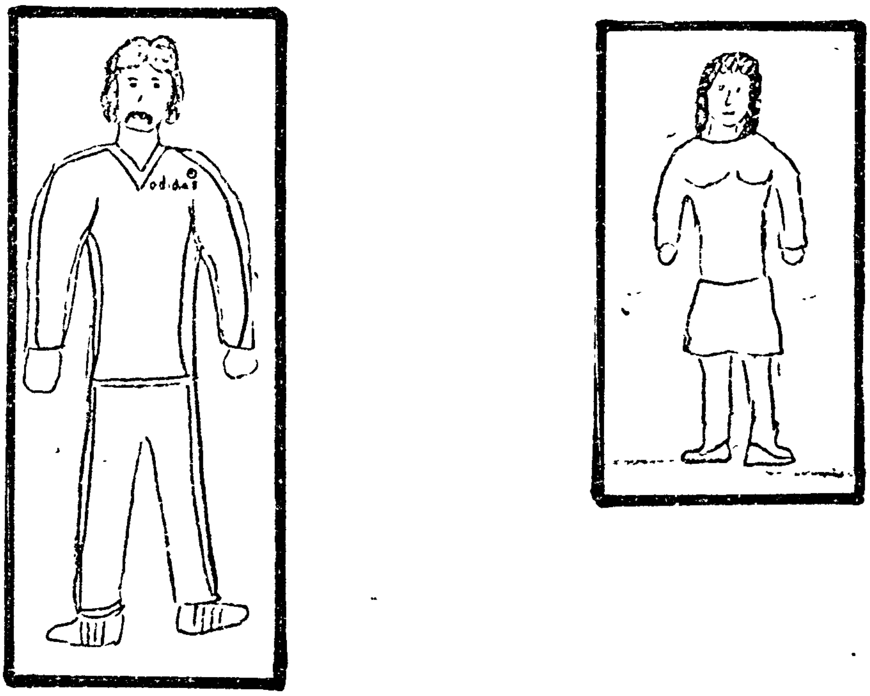


BOY IO years.

RATING 3.

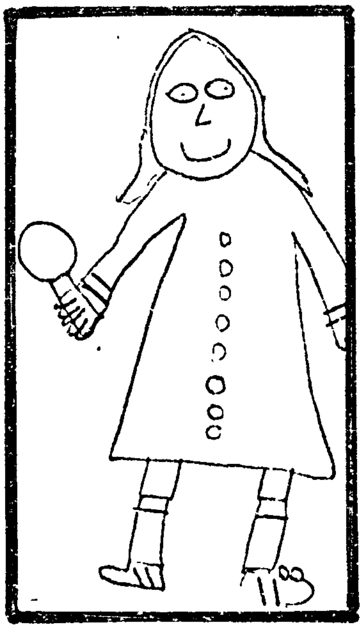
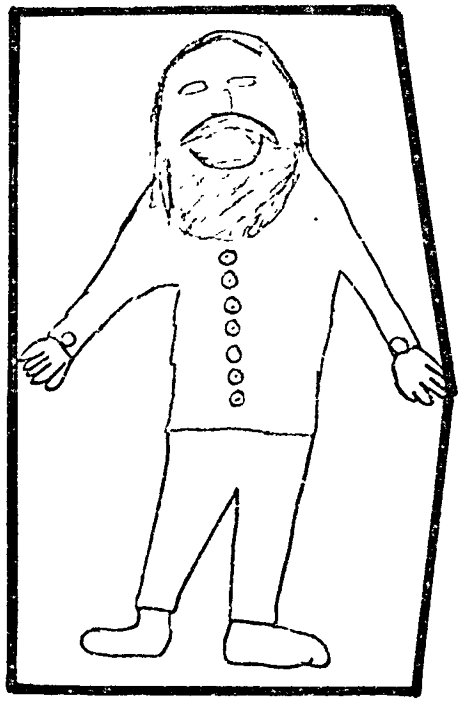


BOY IO years.

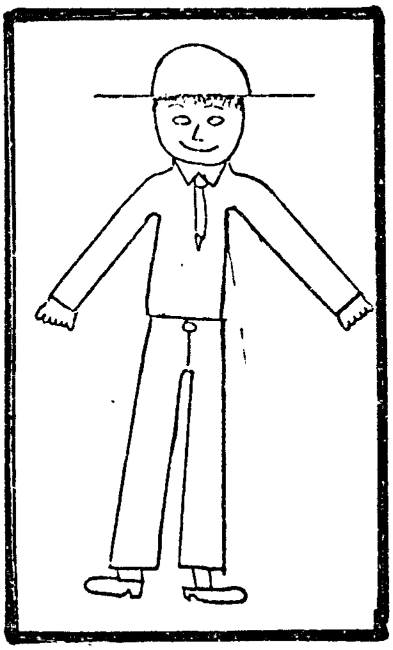
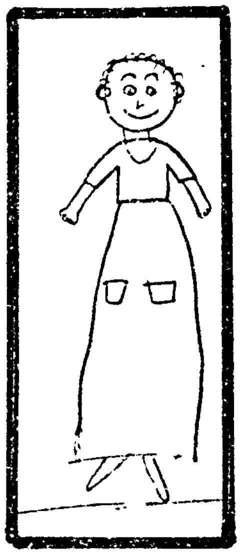


BOY IO years.

RATING 4.

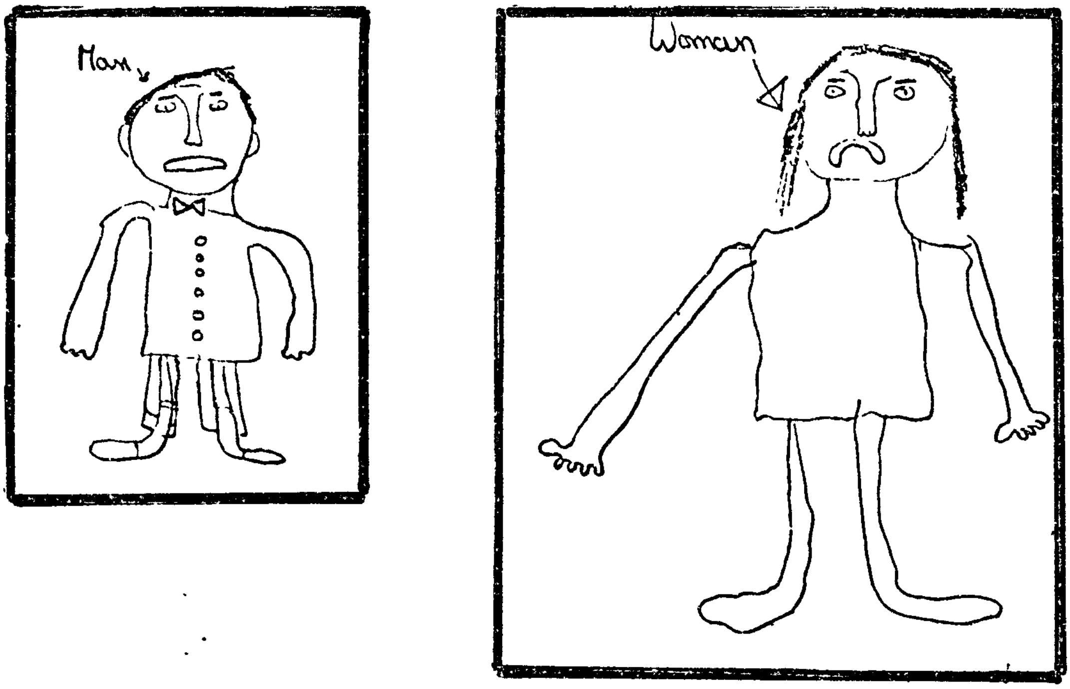



GIRL-IIyears.

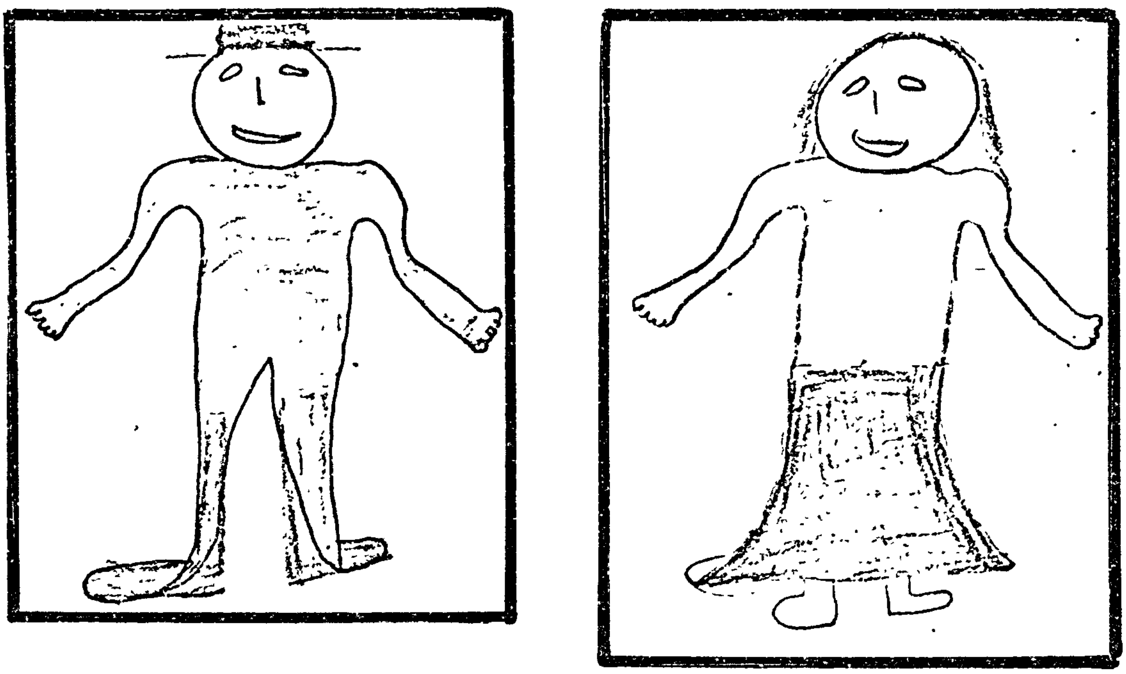



GIRL-IO years.

RATING 5.



BOY-II years.



GIRL-IO years.

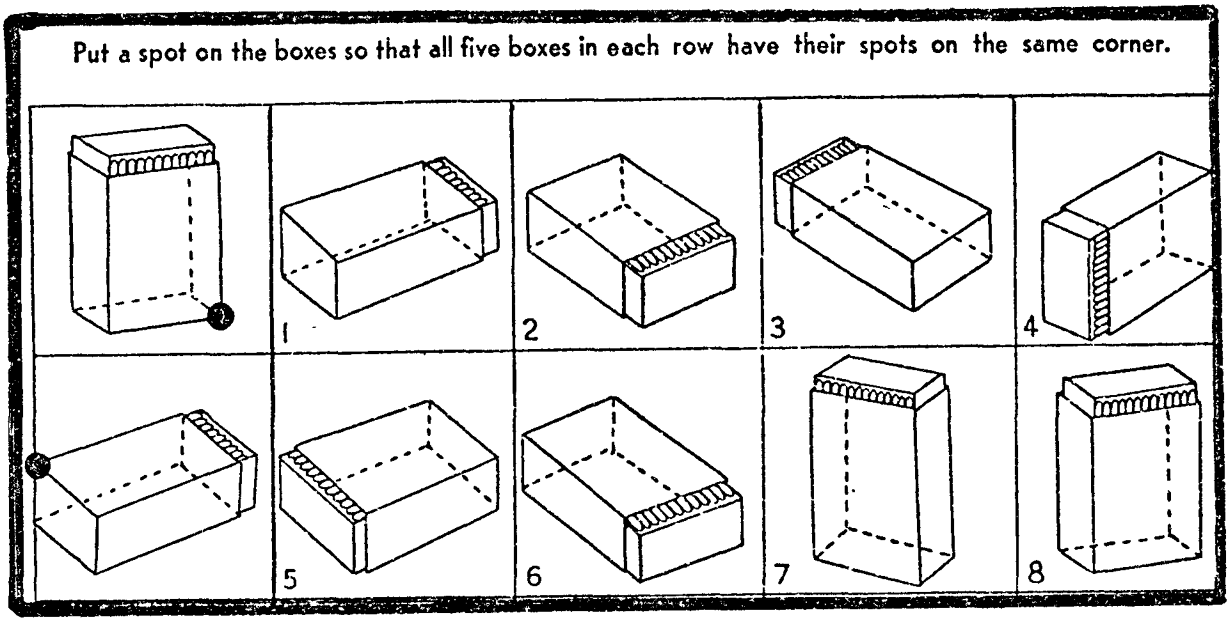
V. SPATIAL TEST TWO. (Watts, A.F., Pigeon, D.A. and Richards, M.K.B.)

The instructions for this exercise were as presented in the manual. (Manual of Instructions for Spatial Test II, published by the National Foundation for Educational Research.)

The Test consists of 5 subtests, and examples of each of these can be seen below:

TEST I. MATCH BOX CORNERS (Time allowed-$3\frac{1}{2}$ mins.)

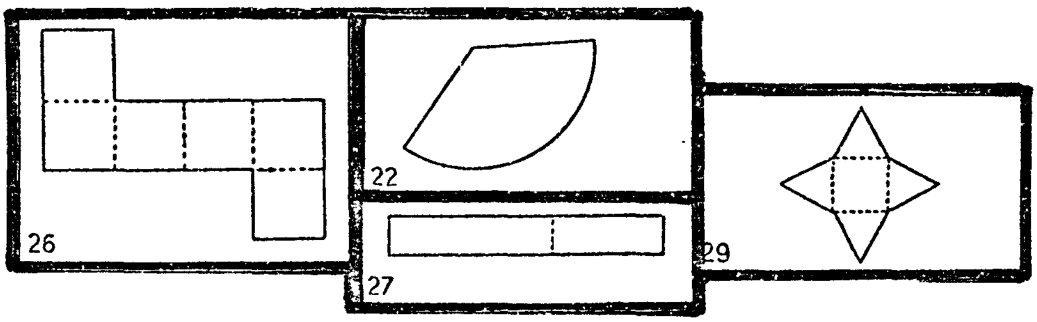
There are 20 items of the following kind in the full test.



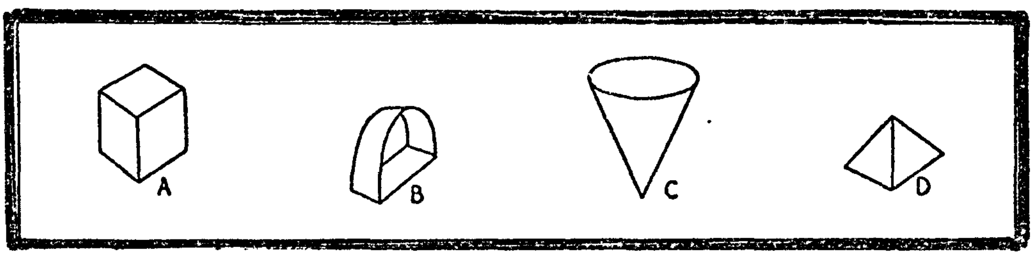
TEST 2. SHAPES AND MODELS (Time allowed-10 mins.)

There are 20 items of the following kind in the full test.

PUT A LETTER ON EACH SHAPE TO SHOW THE MODEL THAT CAN BE MADE FROM IT.



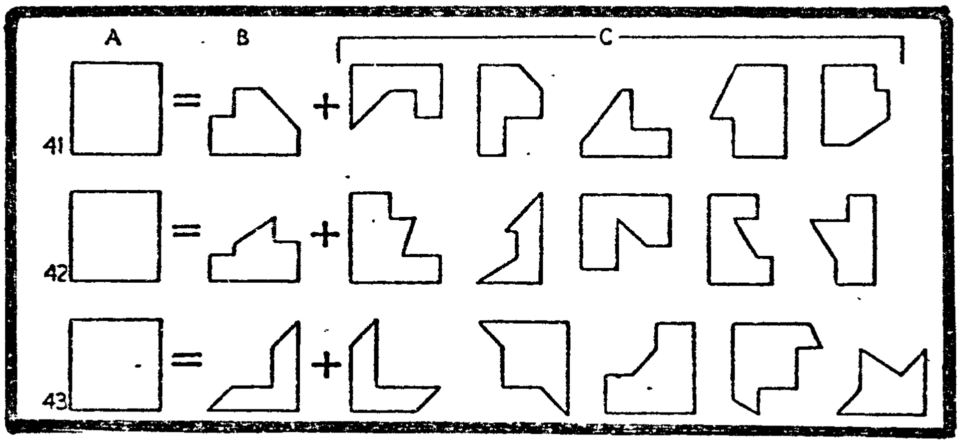
THESE ARE THE MODELS WHICH CAN BE MADE FROM THE SHAPES.



TEST 3. SQUARE COMPLETION (Time allowed-6½ mins.)

There are 20 items of the following kind in the full test.

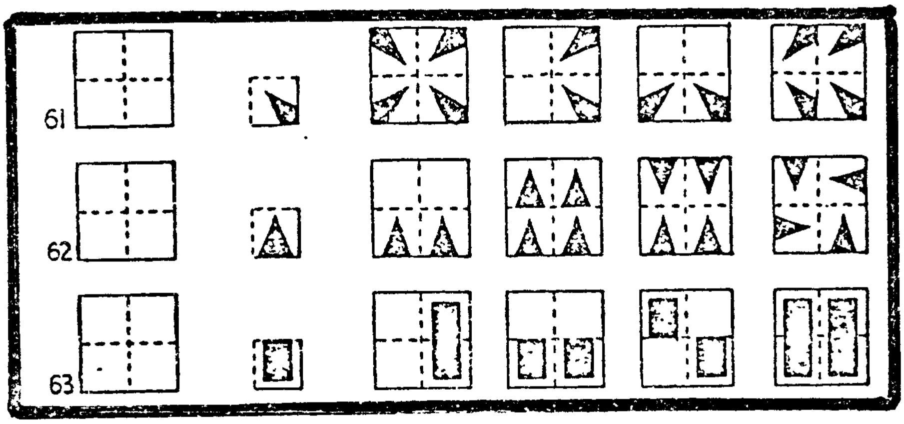
UNDERLINE THE FIGURE UNDER 'C' WHICH WHEN ADDED TO 'B' WILL MAKE THE SQUARE 'A'.



TEST4. PAPER FOLDING (Time allowed-3½ mins.)

There are 20 items of the following kind in the full test.

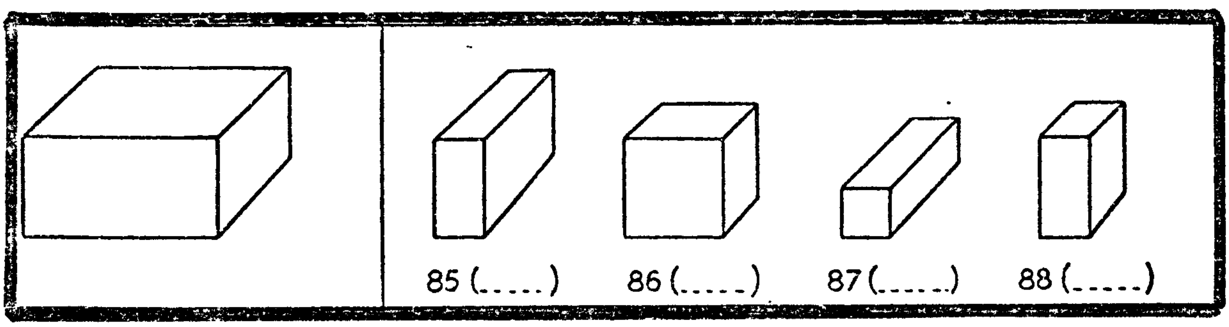
UNDERLINE THE SQUARE ON THE RIGHT THAT LOOKS LIKE THE SMALL SQUARE WHEN IT IS UNFOLDED.



TEST5. BLOCK BUILDING (Time allowed-3 mins.)

There are 5 items of the following kind on the full test.

HOW MANY OF THE SMALLER BLOCKS IN THE ROWS BELOW ARE NEEDED TO BUILD THE LARGER BLOCK ON THE LEFT?



For each of the exercises described, the children undertake a series of practice items to ensure that they are clear about what is expected of them.

VI. THE DRAW A MAN TEST.(Harris,D.B., 1963.)

The test was administered according to the instructions presented in Harris's book, 'Children's Drawings as measures of Intellectual maturity', and the resultant drawings of a Man and a Woman were considered for the existence of the following criteria:

MAN POINT SCALE

1. Head present
2. Neck present
3. Neck, two dimensions
4. Eyes present
5. Eye detail: brow or lashes
6. Eye detail: pupil
7. Eye detail: proportion
8. Eye detail: glance
9. Nose present
10. Nose, two dimensions
11. Mouth present
12. Lips, two dimensions
13. Both nose and lips in two dimensions
14. Both chin and forehead shown
15. Projection of chin shown; chin clearly differentiated from lower lip
16. Line of jaw indicated
17. Bridge of nose
18. Hair I
19. Hair II
20. Hair III
21. Hair IV
22. Ears present
23. Ears present: proportion and position
24. Fingers present
25. Correct number of fingers shown
26. Detail of fingers correct
27. Opposition of thumb shown
28. Hands present
29. Wrist or ankle shown
30. Arms present
31. Shoulders I
32. Shoulders II
33. Arms at side or engaged in activity
34. Elbow joint shown
35. Legs present
36. Hip I (crotch)
37. Hip II
38. Knee joint shown
39. Feet I: any indication
40. Feet II: proportion
41. Feet III: heel
42. Feet IV: perspective
43. Feet V: detail
44. Attachment of arms and legs I
45. Attachment of arms and legs II
46. Trunk present
47. Trunk in proportion, two dimensions
48. Proportion: head I
49. Proportion: head II
50. Proportion: face
51. Proportion: arms I
52. Proportion: arms II
53. Proportion: legs
54. Proportion: limbs in two dimensions
55. Clothing I
56. Clothing II
57. Clothing III
58. Clothing IV
59. Clothing V
60. Profile I
61. Profile II
62. Full face
63. Motor coordination: lines
64. Motor coordination: junctures
65. Superior motor coordination
66. Directed lines and form: head outline
67. Directed lines and form: trunk outline
68. Directed lines and form: arms and legs
69. Directed lines and form: facial features
70. "Sketching" technique
71. "Modeling" technique
72. Arm movement
73. Leg movement

P.321 not in thesis

WOMAN POINT SCALE

1. Head present
2. Neck present
3. Neck, two dimensions
4. Eyes present
5. Eye detail: brow or lashes
6. Eye detail: pupil
7. Eye detail: proportion
8. Cheeks
9. Nose present
10. Nose, two dimensions
11. Bridge of nose
12. Nostrils shown
13. Mouth present
14. Lips, two dimensions
15. "Cosmetic lips"
16. Both nose and lips in two dimensions
17. Both chin and forehead shown
18. Line of jaw indicated
19. Hair I
20. Hair II
21. Hair III
22. Hair IV
23. Necklace or earrings
24. Arms present
25. Shoulders
26. Arms at side (or engaged in activity or behind back)
27. Elbow joint shown
28. Fingers present
29. Correct number of fingers shown
30. Detail of fingers correct
31. Opposition of thumb shown
32. Hands present
33. Legs present
34. Hip
35. Feet I: any indication
36. Feet II: proportion
37. Feet III: detail
38. Shoe I: "feminine"
39. Shoe II: style
40. Placement of feet appropriate to figure
41. Attachment of arms and legs I
42. Attachment of arms and legs II
43. Clothing indicated
44. Sleeve I
45. Sleeve II
46. Neckline I
47. Neckline II: collar
48. Waist I
49. Waist II
50. Skirt "modeled" to indicate pleats or draping
51. No transparencies in the figure
52. Garb feminine
53. Garb complete, without incongruities
54. Garb a definite "type"
55. Trunk present
56. Trunk in proportion, two dimensions
57. Head-trunk proportion
58. Head: proportion
59. Limbs: proportion
60. Arms in proportion to trunk
61. Location of waist
62. Dress area
63. Motor coordination: junctures
64. Motor coordination: lines
65. Superior motor coordination
66. Directed lines and form: head outline
67. Directed lines and form: breast
68. Directed lines and form: hip contour
69. Directed lines and form: arms taper
70. Directed lines and form: calf of leg
71. Directed lines and form: facial features

(Detailed explanations are included in the test manual for the scoring of each of the items listed for both the Man and the Woman.)

VII. THE ORIENTATION EXERCISES.

Exercises I and 2 were undertaken as group exercises with children working individually within each class group. Exercise 3 was administered individually.

In Exercise I, it was explained that the task was to follow a series of instructions, (Nine in all), and that each instruction related to a small plan. Direction I therefore related to Plan I, and Direction 2 related to Plan 2 etc. etc. (This is seen by reference to the copies of the test sheets overpage.)

For Exercise 2, it was explained that the questions related to a more detailed street plan, to which they were refered. Answers to these questions were written on the space provided on the question sheet. (Again this can be seen by reference to the sheets overpage.)

DIRECTIONS.

ORIENTATION EXERCISE I.

Direction 1. (Use Plan 1)
Starting from the place marked with an 'X', walk along Lena Avenue, turn right at the junction, and put a tick in the circle at the end of this road.

Direction 2. (Use Plan 2)
Starting from the place marked with an 'X', walk along Lewis Street, then turn left at the road junction, and put a tick in the circle at the end of this road.

Direction 3. (Use Plan 3)
Starting from the place marked with an 'X', walk along Laurel Street to the junction with Arley Hill. At this junction turn left and walk along to the next junction and then turn right, and put a tick in the circle at the end of this road.

Direction 4. (Use Plan 4)
Starting at the place marked with an 'X', walk up Fry's Hill to the junction and then turn west, and put a tick in the circle at the end of this road.

Direction 5. (Use Plan 5)
Starting at the place marked with an 'X', walk south along Evans Road to the cross-roads and then turn west and put a tick in the circle at the end of this road.

Direction 6. (Use Plan 6)
Starting from the place marked with an 'X', walk along Downs Road to the junction with Elm Road. At this junction turn south.Walk to the next set of cross-roads and here turn East and put a tick in the circle at the end of this road.

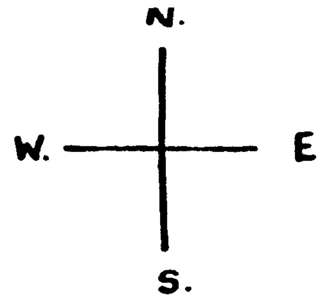
Direction 7. (Use Plan 7)
You are at the place marked with an 'X' and wish to make a telephone call. In what road is the nearest Post Office Telephone?

Direction 8. (Use Plan 8)
John lives in Fox Road and goes to the nearest school. On his way to school he passes a building which is NOT another house. What is this building?

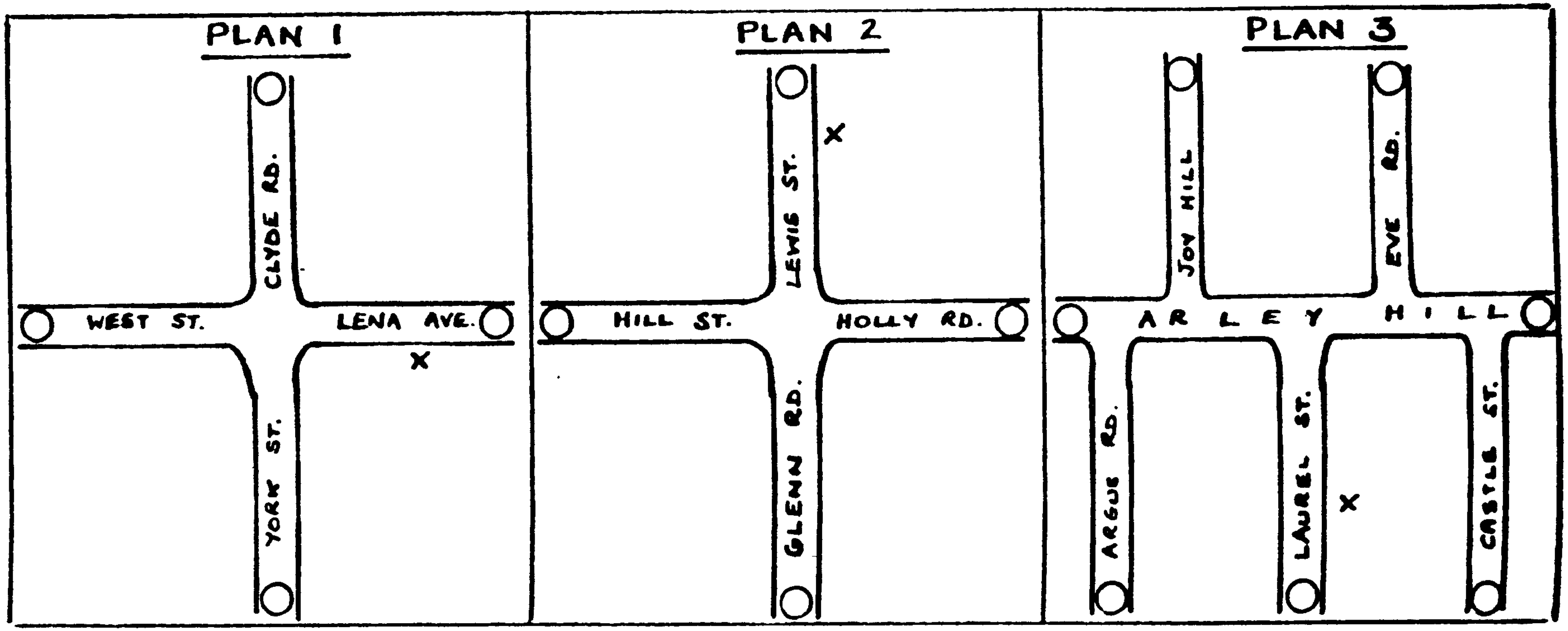
Direction 9. (Use Plan 9)
Your car has broken down in Harrow Road and you need to telephone for help. Go to the cross-roads. In what road is the R.A.C. telephone box that you could use?

ORIENTATION EXERCISE I.

AME ______________ SCHOOL ______________



✝	Means	Church.
Sch.	Means	School.
P.	Means	Post Office.
T.	Means	Post Office Telephone.
R.	Means	R. A. C. Telephone.



DIRECTIONS 2.

ORIENTATION EXERCISE 2.

NAME.........................   SCHOOL....................

START AT POINT 'A'.

?rom point 'A', walk along Wood Road and turn left into Blake Road. What is the building on your left? ....

Valk on along Blake Road until you meet a road junction. What is the name of the road which faces you? ....

START AT POINT 'B'.

'rom point 'B', walk along Digby Street o the junction with Shamrock Road and oman Avenue. Turn left into Roman Avenue, hat is the building on your right a little ay up Roman Avenue? ....

urn left opposite the church. What is the ame of this road? ....

TART AT POINT 'C'.

rom point 'C', walk due East across the Park. hat is the name of this Park? ....

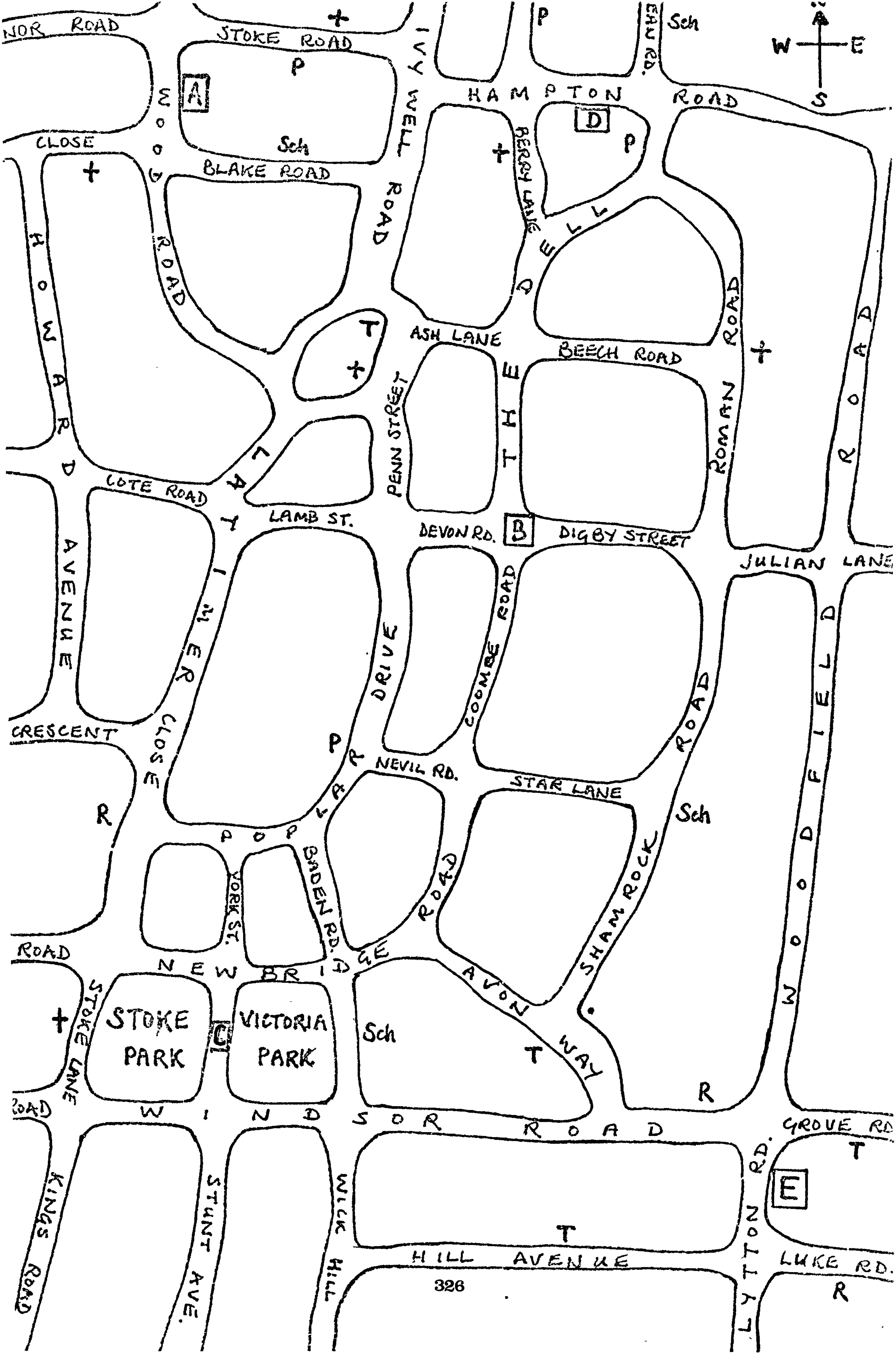
ıen you come to the first road there is a ıilding opposite you. What is this building? ....

ırn left now and walk along the road to the rst set of cross-roads. At these cross-ıads what is the name of the road which .ces you? ....

'ART AT POINT 'D'.

lk West along Hampton Road. At the first set of cross-roads, what is the name of the road your left? ....

little way along the road you have named, at is the building on your right? ....


NOR ROAD
STOKE ROAD
IVY WELL ROAD
HAMPTON ROAD
Sch
W E S
A
P
Sch
CLOSE
WOOD ROAD
BLAKE ROAD
D
P
BERRY LANE
THE DELL
HOWARD AVENUE
T
ASH LANE
BEECH ROAD
ROMAN ROAD
PENN STREET
THE
COTE ROAD
LAMB ST.
DEVON RD.
B
DIGBY STREET
JULIAN LANE
LIMERICK CLOSE
DRIVE
COOMBE ROAD
ROAD
CRESCENT
P
POPLAR
NEVIL RD.
STAR LANE
R
Sch
YORK ST.
BADEN RD.
ROAD
SHAMROCK ROAD
WOODFIELD ROAD
ROAD
NEW BRIDGE
AVON WAY
STOKE LANE
STOKE PARK
C
VICTORIA PARK
Sch
T
R
ROAD
WINDSOR ROAD
GROVE RD
KINGS ROAD
STUNT AVE.
WILK HILL
LYTTON RD.
E
T
HILL AVENUE
LUKE RD.
R

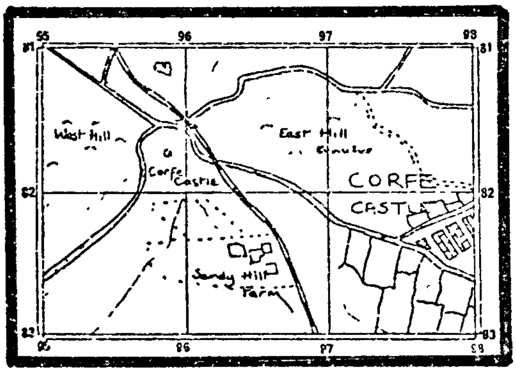
For Orientation Exercise 3, the standardised procedure described below was adopted:

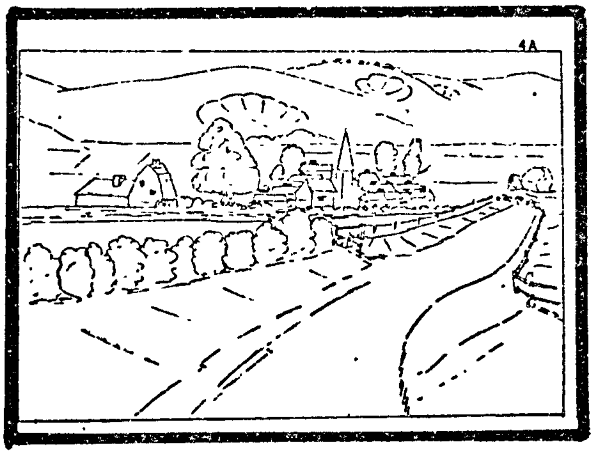
"I am going to show you a small map extract and three pictures of landscape views. One of these pictures is a picture of the area that is shown on the map. I want you to look very carefully at each picture and decide which picture matches what is shown on the map."

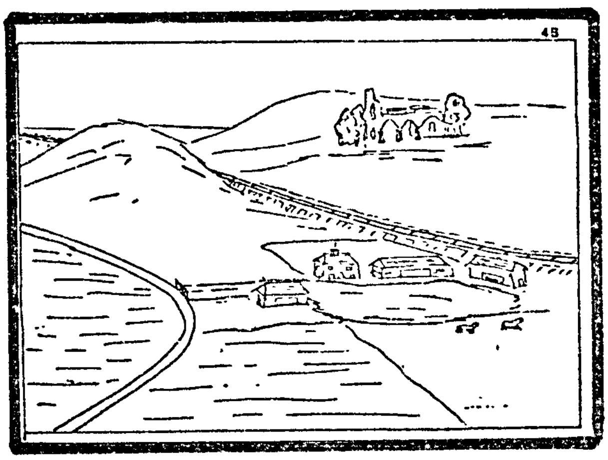
For this exercise, there were 5 different sets of a map extract and pictures. A copy of one of the sets can be seen below, these have been reduced in size, and in the original are coloured appropriately.

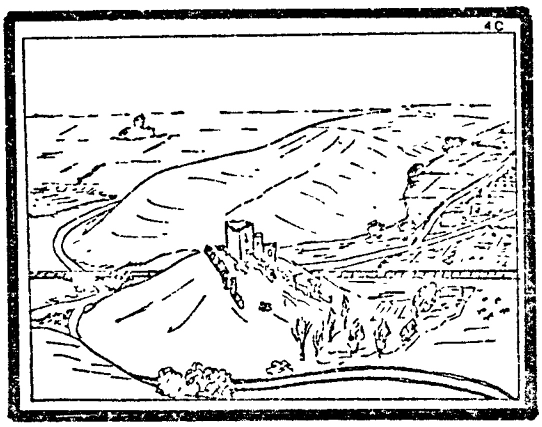
<u>Example of one of the Exercises used in Orientation Exercise</u> 3.

Map Extract Number 4:









VIII. THE DRAW A PLAN TEST.(Thorstad I974.)

The procedure adopted was as described in the Test Manual:

"I want you to draw a plan of your house. I only want the ground floor. Imagine that you are a bird and are looking straight down on top of it. Imagine that you have taken away the roof and the bedrooms so that you can see the ground floor. I want you to show me where the Kitchen is, the Hall, the Stairs, the Dining Room, the Sitting Room (Lounge, Living Room, Front Room) and any other rooms you may have. Show where the doors and the windows are. Put the names of the rooms on your plan. (It is permissible to remind individuals once about the omission of an item.)

The Plans are then scored for the following items: (Each of which is clearly explained in the test manual.)

I. Roof Absent.
2. Chimney Absent.
3. Upstairs Absent.
4. Plane of outside wall Absent.
5. Floor.
6. Depth.
7. Horizontal Structure.
8. Connectedness.
9. Commanality.
IO.Outside Wall I.
II.Outer Wall 2.
I2.Rooms Proportion.
I3.Hall I.
I4.Hall 2.
I5.Hall Proportions.
I6.Horizontal Stairs.
I7.Staircase I.
I8.Staircase 2.
I9.Staircase Proportion.
20.Treads I.
2I.Treads 2.
22.Doors I.
23.Doors 2.
24.Doors Type I.
25.Doors Type 2.
26.Doors Type 3.
27.Doors Proportion
28.Windows I.
29.Windows 2.
30.Windows Type I.
3I.Windows Type 2.
32.Windows Type 3.
33.No unaccounted space.
34.No vertical walls.
35.Proportions I.
36.Proportions 2.
37.Proportions 3.
38.Proportions 4.
39.Quality I.
40.Quality 2.

One major problem of applying this test is that some children live in Flats or Bungalows, where no stairs exist. This effected the plans of 34 children in the sample. To account for this in the analysis of the results and so as not to exclude these children from the analysis, the average score on the 'Stairs' section of the test was calculated for those who had completed this section of the test. The average score was then added to the results of those whose plans were of Flats or

Bungalows:

431 completed plans, Total score on the Stairs section: 1599,

Therefore Average Score= 3.7099,

A score of 4 was added to the results of those living in Flats or Bungalows to make their results comparable with the rest of the sample.

IX. MAPS: STANDARDISED INSTRUCTIONS.

Map I.

"This morning/afternoon, I would like you to draw a map for me. On this piece of paper I would like you to draw me a map of the Area where you live, on it could you show me your favourite places, the places that you like to go to. Include anything that you think is important or interesting. If this area has a name, for example 'Chesterton' or the 'Estate', write this as a title at the top of your map."

Map 2.

"Today I would like you to draw me another map, not of the area where you live this time, but of your route from Home to School. Show me all the places that you pass, and put on all the things that you can remember, or think are important. Remember to name the things you include on your map."

X. PERSONALITY QUESTIONNAIRE.

A copy of the personality questionnaire given to the Teachers is included overpage. There was a copy of this for each child in the sample. As was explained in the text, the investigator was available for consultation whilst the forms were being completed. (This was undertaken as a Year Group exercise in the Rural School.)

For each of the following Personality characteristics, could you please assess the 'relative' capacity that.................... behaviour has demonstrated to you, when compared to his/her peers. The five boxes represent an increasing capacity for each of the characteristics listed, from no such behaviour having been demonstrated to you to it's being a very strong feature of his/her personality.

	NEVER DEMONSTRATED	ONLY RARELY DEMONSTRATED	HAS DEMONSTRATED ON SEVERAL OCCASIONS.	FREQUENTLY DEMONSTRATES	A DOMINANT FEATURE OF THEIR PERSONALITY.
LEADER.					
SOLITARY.					
INTROVERT.					
INDIVIDUALISTIC.					
FOLLOWER.					
GIVES UP EASILY.					
EXTRAVERT.					
CONFORMIST.					
PERSEVERES.					
INDEPENDENT.					
GREGARIOUS.					
DEPENDENT ON OTHERS.					

APPENDIX 2.

I. Questionnaire and Instructions for completion.

2. Questionnaire Feature analysis.

3. Map Feature analysis.

I. QUESTIONNAIRE. (Undertaken after the completion of the AREA Map.)

INTRODUCTION.(Standardised Instructions.)

"On the set of papers in front of you, you will see that there are a series of questions with spaces underneath them for you to write your answer. There is nothing to worry about, this is not a test. I am trying to find out about the different ways that children of different ages think and feel about where they live.

There are I2 questions for you to answer, and you will see that they are all about the area where you live. You can use your map to help you if you like.

If there are any questions, please put your hand up."

QUESTIONS ON THE QUESTIONNAIRE.(These were read through to each group before they began to fill in their answers.)

I. What are your favourite places in the area where you live?

2. Why do you like these places? What do you do in these places?

3. Are there any places that you do not like in the area where you live?

4. Why don't you like these places?

5. There are 3 visitors coming to see the area where you live. They will be coming at different times and have never visited you before. What do you think you would show them, where would you take them?

   (i) Imagine that the first visitor is your cousin who is about your age.

   (ii) Imagine that the second visitor is an adult that you know well, perhaps an Aunt or an Uncle that has come to visit you for the first time.

   (iii) Imagine that the last visitor is somebody that you do not know, and that you have been asked to show them around the area where you live. What would you show this person?

6. Do you think that there are any Dangerous places in the area where you live? If so, where are they, and why do you think that they are dangerous?

7. Do you think that there are any Beautiful places in the area where you live? If so, what are they, and why do you think that they are beautiful?

8. Are there any places where you feel Uncomfortable or at all frightened in the area where you live? If so, where are these places, and what is it that worries you about them?

9. Where do you feel the safest and most <u>Comfortable</u> in the area where you Iive?

IO. Are there any <u>Sounds</u> that come to your mind when you think about the area where you live?

II. Are there any <u>Smells</u> that come to your mind when you think about the area where you live?

I2. I would like you to imagine that you are making a <u>Guide Book</u> of the area where you live. To make this more interesting, you can include some photographs. If I asked you to imagine that you were going to take 5 photographs, what would you have photographed to make the Guide a more interesting description of the area where you live?

......

For Questions IO and II further help was given.
After the children had been working through the questions for some time and some of them were nearing questions IO and II, they were all asked to listen again.
"When you come to answer questions IO and II I want you to think carefully before you answer. Question number IO asks about the sounds you might think of which you often hear in the area where you live. For example, near where I live there is a Railway line, so I often hear the sound of trains when I go home. Some of you might hear the noise of Factories, and others the sound of animals. So think carefully before you answer, don't just repeat the examples that I have just given you. Try to think of your own ideas. It might help if you close your eyes to help you picture your home area.
You could also do this when you think about Question II, which asks about Smells that come to your mind when you think of your home area. This might sound strange, and I expect the <u>usual</u> answers come to your mind, but could you please think carefully and sensibly before you answer. To give you an example which might help, a friend of mine lives near a sweet factory, and whenever I go to see him , the first thing I always notice is a very strong smell of sugar in the air. Can you think of anything like this when you close your eyes and think of your own area? If not, don't worry, perhaps you can think of something later and will tell me about it at one of our future meetings."

2. QUESTIONNAIRE ANALYSIS.

As has been explained earlier, (Chapter 5.) the analysis of the questionnaire for the whole sample revealed further information about children's perceptions of their environment, which was difficult to analyse on the basis of cognitive style. This section presents a resumée of the findings of this analysis in terms of the various sub-groups employed in the study. (i.e. By Residence, Sex and Age.)

The questions selected for the Questionnaire are typical of those found in Environmental Perception research, and the work of Lynch(1977), Hart(1979), Uzzell(1976) and Moore and Young(1978), were especially useful in the formulation of topics for consideration. As can be seen in the Questionnaire, the topics selected were as follows:-

1. Favourite places and reasons for liking them.
2. Disliked places and reasons for disliking.
3. Comfortable as opposed to Uncomfortable places.
4. Dangerous places.
5. Beautiful places.
6. Noises associated with the environment.
7. Smells associated with the environment.
8. Two Tasks: (i) Selection of features to be shown to a related child, a related Adult, and to other Adults.
   (ii) Selection of a series of Guide Photographs of the home area.

The discussion of the results of this analysis of responses will follow the above order.

1. Favourite places and reasons for liking.

As can be seen from Table i., there is a progressive increase in the number of Favourite places mentioned as the children get older, with the girls tending to mention more features, a factor which occurs with all age groups in the sample and as has been found by other researchers, (Bishop, 1973, Mathews, 1980.) The types of features mentioned compare favourably with other studies of this kind, although the number of mentions per feature are lower than those described for example in the CUUIS study undertaken in the United States, (reported in Moore and Young 1978, p.106-111) which was based upon the analysis of features shown in maps of 8-12 year old American children's favourite places. There were however, a larger number of features mentioned by the children in this study. (This was also the case for the two maps produced for this project, the results of which will be discussed later.) When the various favourite elements are considered as 'Composites',

TOPIC	BOYS										GIRLS										SAMPLE I.				SAMPLE 2		
	IO+			II+			I2+			Boys Total	IO+			II+			I2+			Girls Total	BOYS		GIRLS				
	R	U	TOT	R	U	TOT	R	U	TOT		R	U	TOT	R	U	TOT	R	U	TOT		R	U	R	U	R	U	TOTAL
Favourite Places	22	I9	34	36	27	47	43	30	50	66	36	22	48	4I	32	56	3I	35	49	8I	54	49	62	57	72	65	88
Disliked Places	I4	IO	2I	I4	I2	20	20	IO	25	42	I7	I2	25	I6	I7	26	I9	20	22	50	33	23	35	34	50	4I	68
Comfortable Places	8	8	I2	4	8	I2	I7	II	2I	25	IO	5	II	I3	IO	I7	II	I4	I8	22	I9	I8	I9	I9	26	25	33
Uncomfortable Places	IO	6	I5	7	II	I3	I5	7	I9	34	I3	4	I5	II	I5	2I	II	I8	25	37	24	I9	23	27	3I	32	45
Dangerous Places	I3	8	I7	9	7	I5	I4	7	8	27	II	6	I5	I2	II	I7	IO	I2	2I	32	I8	I7	2I	20	24	30	40
Beautiful Places	IO	7	I4	8	I2	I8	I6	II	I9	24	I5	9	I9	I5	I3	23	I5	II	20	28	20	I5	25	20	28	22	32
Noises	I2	I2	I9	IO	I5	20	2I	8	26	34	I2	7	I5	II	I2	I8	20	I7	29	33	26	I9	25	2I	34	27	43
Smells	9	I4	23	9	9	I6	I6	8	I8	29	7	8	IO	II	I4	2I	7	I5	20	29	23	I9	I6	25	27	30	39
TASKS:																											
I. Cousin.	25	I8	33	25	32	43	33	3I	49	67	29	20	39	29	33	46	28	3I	50	66	48	47	44	5I	55	60	76
Adult.	20	I8	27	20	24	33	34	23	45	55	25	I9	36	26	28	37	29	29	43	62	39	40	46	46	54	53	73
Visitor.	24	20	34	23	24	36	32	30	47	58	29	20	40	29	33	48	30	29	43	64	45	43	49	46	53	5I	68
2. Guide-Photos.	38	8	39	35	46	62	48	39	64	88	45	26	56	45	35	60	39	46	64	83	58	60	60	57	70	78	I03

R=RURAL, U=URBAN

TABLE I. A COMPOSITE TABULATION OF THE NUMBER OF DIFFERENT FEATURES MENTIONED FOR EACH OF THE QUESTIONS ON THE QUESTIONNAIRE. (Details given for each age group and in their Rural and Urban sub-groups.)

Table ii. Favourite Places

Common Features	Total References	Mention Rate
Own House	I3I	0.29
Green	50	0.II
Park	46	0.I0
Shops	40	0.09
N'd Roads	35	0.08
Own Road	33	0.07
Rec.	32	0.07
Sweet Shop	27	0.06
Own Garden	26	0.06
Fields	26	0.06
Playing Fields	26	0.06
Named Stores	24	0.05
River/Brook/Stream	22	0.05
Public House	2I	0.05
N'd Places	I9	0.04
Woods	I7	0.04
Trees	I7	0.04
Swimming Pool	I6	0.04
Tracks/Alleys	I5	0.03
Playground	I5	0.03
'Chippy'	I2	0.03
Church	I2	0.03
Post Office	II	0.02
Friend's House	II	0.02
Common	II	0.02
Garage	9	0.02
Church/Village Hall	8	0.02
Own Camp/Den	8	0.02
N'd Buildings	8	0.02
Car Parks	7	0.02
Football Gnd.	7	0.02
Library	7	0.02
Youth Club	6	0.0I
Swings	6	0.0I
My 'Area'	6	0.0I
Own Room	6	0.0I
Council Dump	6	0.0I
School	5	0.0I
Station	5	0.0I
Building Site	5	0.0I
NONE	5	0.0I
Flats	4	0.0I
Old School	4	0.0I
Garages (en bloc)	4	0.0I
Factories	4	0.0I
Waste/Derelict Areas	3	0.0I
Orchards	3	0.0I
Relation's House	2	0.0I
Meadows	2	0.0I

On Urban Maps only	Total References	Mention Rate
Cemetry	8	0.04
N'd B'dings	4	0.02
Market	3	0.0I
Sports Hall	2	0.0I
Comm'y Centre	2	0.0I
Hospital	2	0.0I
Subway	2	0.0I
T.A.Centre	I	0.004
Airport	I	0.004
Bus stop	I	0.004
Monastery	I	0.004
Adventure Playground	I	0.004
Bingo Hall	I	0.004
Dancing Sch.	I	0.004
Cycle Track	I	0.004
On Rural Maps Only		
Heath	I9	0.08
Stud	I0	0.04
Stables	7	0.03
Farms	4	0.02
Cafe	4	0.02
Yard	4	0.02
Paddock	3	0.0I
Police Station	2	0.0I
Water Tower	2	0.0I
Windmill	2	0.0I
Market	I	0.004
Physical Features	I	0.004
'The Village'	I	0.004
Rides	I	0.004
'The view'	I	0.004
Bus shelter	I	0.004
Hotel	I	0.004
Restaurant	I	0.004
Cinema	I	0.004
Town Centre	I	0.004
MAJOR COMPOSITES		
PLAY PLACES	268	0.59
PERSONAL or HOMESITE	229	0.50
SHOPS	I04	0.23
HORSES etc. (Rural only)	40	0.20

TABLE iii. Reasons for Liking particular places. (Mention rate.)

COMMON REASONS	TOTAL REFS.	MENTION RATE
Playing	330	0.67
Sweets	7I	0.2
Quiet	67	0.2
Friend's	45	0.I
Shopping	39	0.I
Warmth/Family Associations	33	0.I
Cycling	28	0.I
Climbing	28	0.I
Swimming	25	0.I
Food	23	0.I
Swings	2I	0.I
Football	20	0.05
Animals	I8	0.04
Walking	I5	0.03
Lots to do	I3	0.03
Watch Sport	II	0.02
Fishing	IO	0.02
Reading	IO	0.02
Space Invaders	IO	0.02
Drinking	7	0.02
Riding(Motor Bikes)	7	0.02
Conkers	7	0.02
Scouts/Guides etc	6	0.0I
Youth Club	6	0.0I
Away from Adults	5	0.0I
Hobbies	3	0.0I
Boating/Canoeing	2	0.004
Skating	2	0.004
Trains	2	0.004
Choir	2	0.004
Bingo	2	0.004
URBAN CHILDREN ONLY		
Dancing	3	0.0I
Judo	2	0.004
RURAL CHILDREN ONLY		
Riding	I5	0.03
Watching others	3	0.0I
Places of Interest	3	0.0I
Television	3	0.0I
Carting	2	0.0I
Kite Flying	2	0.0I
Scrumping	2	0.0I
Tennis	I	0.004
Birdwatching	I	0.004
Picnics	I	0.004

Play-places, Personal and 'Home-site' elements and Shops emerge as the most positively regarded features of the environment. These results are similar to those identified in the CUULS project and to Lynch's study of 'Growing up in Cities', although the adolescents in Lynch's research did not consider shops as important as the younger children of this and the CUULS study. As has also been suggested by Bishop, (1973) it appears that young children make considerable use of the shops in their environment, especially the 'sweet shops'. It is also interesting to note the very specific distinctions made by children between the various play - places that exist in their environment. To some extent this supports comments by Bishop, (1973) and others, Uzzell (1976), about the differences between adult and child perceptions. Lynch had previously commented, (Lukashok and Lynch 1956.) that adult memories of childhood play places were often labelled quite simply as the Park, or the Play-Area, whereas the results cited here offers the Green, Rec, Park, Fields, Playing Fields, Meadows, Heath, Playground etc. In addition to these, Car-parks, Garages, Building sites and Council Dumps were mentioned with play as the main reason for liking. The enthusiasm for play places is contrary to the low rating described in Maurer and Baxter's (1972) study.

Evidence offered as reasons for liking a particular place or feature revealed information of further interest. Clearly, playing is the major influence, but again the variety of activities associated with a particular place are extensive and clearly delineated by the children, as can be seen in Table iii. As has already been indicated, shops were often cited primarily for the purchase of sweets, food or drinks and a surprising variety of places served this purpose i.e. sweet shops, fish and chip shops, post offices, garages and even the local Hospital shop.

The girls of the sample appeared to prefer places that offered peace, quiet and privacy and one also begins to identify the emergence of more adolescent pastimes especially with the older girls, who cited 'meeting friends' and 'away from adults' as major reasons for liking somewhere. There are also other sex differences demonstrated between the types of activity associated with favourite places, with the boys appearing to refer to more active pastimes in general. One final distinction was between the urban and rural sub-groups. The urban girls in particular seemed to enjoy the shopping facility offered by a large city centre, whereas the rural boys appeared to be becoming 'Hooked' on the space invaders game.

2. <u>Disliked Places and reasons for Disliking</u>.

The majority of disliked features and places have a clear association with the preservation and security of self. Evident in Tables iv and v , TABLE iv. Disliked Features / Table v. Reasons for Disliking

COMMON FEATURES	NUMBER OF REFS	MENTION RATE
NONE	I83	0.4
N'd Roads	58	0.I3
Specific Houses	3I	0.07
School	20	0.04
N'd Shops	I5	0.03
Passages/ Alleyways	II	0.02
Churchyard	I0	0.02
Garage	9	0.02
Brook/Pond/ River	9	0.02
At Night	8	0.02
Play Area	7	0.02
Factory	7	0.02
Flats	6	0.0I
Public Houses	6	0.0I
N'd Areas	6	0.0I
Woods	6	0.0I
Park	6	0.0I
Football Pitch	3	0.0I
Bridge	2	0.004
Allotments	2	0.004
New Houses	2	0.004
Green	2	0.004
Fields	2	0.004
URBAN CHILDREN ONLY		
Hospital	4	0.02
Community Centre	4	0.02
Building Site	3	0.0I
Subway	2	0.0I
Rec	2	0.0I
Restaurant	2	0.0I
Orchard	I	0.004
Church Hall	I	0.004
Funeral Parlour	I	0.004
O.A.P'S Home	I	0.004
Fire Station	I	0.004
Derelict Site	I	0.004
Airport	I	0.004
Garden Centre	I	0.004
Market	I	0.004
Roundabout	I	0.004
Telephone Box	I	0.004
RURAL CHILDREN ONLY		
Stable	4	0.02
Stud	3	0.0I
Own Area	3	0.0I
Trees	3	0.0I
Police Station	3	0.0I
Sewer	3	0.0I
Paddock	2	0.0I
Bus Shelter	2	0.0I
Own House	2	0.0I
Farms	2	0.0I
Heath	2	0.0I
Water Tower	2	0.0I

RURAL FEATURES (Cont)	No. of Refs.	Mention Rate.
Common	I	0.004
Swings	I	0.004
Sports Hall	I	0.004
Pit/Dump	I	0.004
Railway Line	I	0.004
Toilets	I	0.004
Lorry Park	I	0.004
Car Park	I	0.004
Carrot Wash	I	0.004
Station	I	0.004
Underpass	I	0.004
Road System	I	0.004
Telephone Ex.	I	0.004
Other Children	I	0.004
Paddock	I	0.004

REASONS FOR DISLIKING--TABLE v.

COMMON REASONS	No. of Refs.	Mention Rate
Traffic	38	0.08
Smell	37	0.08
Complaining Adults	34	0.07
Frightening	3I	0.07
Bullying	23	0.05
Noise	I8	0.04
Untidy	I6	0.04
Personal Exp	I6	0.04
At Night/Dark	I5	0.03
Dislike it	I4	0.03
Ugly/Dull	7	0.02
Excluded	7	0.02
Neighbours	6	0.0I
Glass	3	0.0I
Strangers	2	0.004
Boring	2	0.004
URBAN ONLY		
Tramps	3	0.0I
Derelict	I	0.004
No Friends	I	0.004
Muddy	I	0.004
Cold	I	0.004
Expensive	I	0.004
RURAL ONLY		
Dangerous	I0	0.04
Animals	9	0.04
Nothing to do	7	0.03
Nowhere to play	6	0.03
Poor Facilities	5	0.03
Polluted	2	0.0I
Police	2	0.0I
Schoolwork	2	0.0I

is a conscious association between disliking and dangerous elements in the children's environment. (It needs to be recognised that many of the comments made refer only to a small proportion of the sample and that the most positive response to the question of disliked elements was that there were NO disliked features.) As with the previous section, there is an age association demonstrated in the results, but one that works in the opposite direction i.e. the younger children tending to refer to more disliked places than the older ones. This is interesting in that one might have anticipated more to dislike from children with a more extended Home-range,(i.e. Older children are likely to be given more freedom in their environment.) There is evidence from a few responses of individual's social perception of the environment, (e.g. Glass, poor road surfaces, pollution etc.). There are also indications of sex differences, with more girls mentioning 'At night', the 'Dark', and 'Tramps and Drunks' as reasons for disliking a particular place. It is the case however, that both sexes describe features as 'Frightening'. More boys commented about 'Adults who complain' as a reason for disliking somewhere, and the girls appeared to be more conscious of the immediate physical appearance of places, describing them as 'Dull','Dreary', 'Ugly' or 'Untidy'. It was also interesting that both boys and girls commented on irritating noises and smells as factors contributing to their disliking somewhere, prior to their having to comment on such factors in the Questionnaire, which seems to suggest that they do naturally consider auditory and olfactory information in their interpretation of places.

3. Comfortable, Uncomfortable and Dangerous Places.

When these characteristics are considered, similar results to those already discussed begin to emerge. It is evident that most children are happiest and confident in their immediate locality. There is evidence of a limited number of older children beginning to go beyond the immediate locality,(to swimming pools and the various Parks and Recreation grounds.) Girls again make significantly more references to the'Dark', 'Night' and 'Unlit Places', and the 'Woods' as areas where they are uncomfortable. More boys seem to have no such fears, commenting that they are happy and confident everywhere, and that there wasn't anywhere where they felt uncomfortable. These results are similar to those described by Lynch (1977), and it was interesting that no reference was made to disliked areas in the terms described by Ladd (1970). Any major differences between the urban and rural sub groups arise primarily from the environment in which the children live, and in fact the similarity between the features described by both sub groups is remarkably high. For example, 'Traffic' is clearly seen as an important environmental

TABLE vi. COMFORTABLE PLACES.

COMMON FEATURES	NO. OF REFS.	MENTION RATE
Own House	353	0.8
Own Garden	29	0.06
Own Road	29	0.06
Near my 'Area'	20	0.05
In Bed	I8	0.04
The Green	II	0.04
Own Room	9	0.02
Friend's	8	0.02
Own Den	7	0.02
Park	6	0.0I
Other N'd Roads	5	0.0I
Swimming Pool	5	0.0I
Fields	5	0.0I
With Others	5	0.0I
Rec	4	0.0I
School	2	0.004
Police Station	2	0.004
River	2	0.004
URBAN CHILDREN ONLY		
NONE	4	0.02
Everywhere	3	0.0I
Other Rooms	3	0.0I
Shops	2	0.0I
Neighbour's	I	0.004
Church Hall	I	0.004
Cemetery	I	0.004
Daylight	I	0.004
RURAL CHILDREN ONLY		
Church	3	0.0I
Heath	2	0.0I
Relation's	I	0.004
Swings	I	0.004
Public Houses	I	0.004
Cafe	I	0.004
Stable	I	0.004
Market	I	0.004

TABLE vii. UNCOMFORTABLE PLACES.

COMMON FEATURES	NO. OF REFS.	MENTION RATE
NONE	256	0.6
At Night	62	0.I4
Woods/Trees	3I	0.07
N'd Roads	27	0.06
Passages/ Alleys	I8	0.04
Cemetery	I6	0.04
Church	IO	0.02
N'd Buildings	8	0.02
Empty Buildings	6	0.0I
Park	5	0.0I
Bridge	5	0.0I
N'd Houses	4	0.0I
Fields	4	0.0I
Building Site	2	0.004
Playground	2	0.004
River	2	0.004
Bullying	2	0.004
Factory	2	0.004
Dump	2	0.004
URBAN CHILDREN ONLY		
Unlit Roads	8	0.04
Greens	7	0.03
Common	5	0.02
Garages	4	0.02
N'd Areas	3	0.0I
Public Houses	3	0.0I
Video Cameras	2	0.0I
Subway	2	0.0I
Crowds	I	0.004
Lorry Park	I	0.004
Swimming Pool	I	0.004
Football Gnd.	I	0.004
Flats	I	0.004
RURAL CHILDREN Only		
Alone	7	0.03
Farms	4	0.02
Heath	4	0.02
Police Station	3	0.0I
Personal Experience	3	0.0I
Railway	2	0.0I
Elec.Sub Stat.	2	0.0I
Paddock	2	0.0I
Animals	I	0.004
School	I	0.004
Garden Centre	I	0.004
Coal Yard	I	0.004
Out of My Area	I	0.004

TABLE viii. DANGEROUS PLACES.

COMMON FEATURES	NO. of Refs.	MENTION RATE
NONE	I55	0.3
Roads/Traffic	I39	0.3
River(s)/Water	22	0.05
Railway	2I	0.05
Woods/Trees	I7	0.04
Building Site	I6	0.04
Alleys/Tracks	II	0.02
Gas/Electricity Installations	9	0.02
Derelict B'dings	8	0.02
At Night	6	0.0I
Lorry Park	5	0.0I
Park/Green	4	0.0I
Rec	2	0.004
Sand Pit	2	0.004
Car Park	2	0.004
URBAN CHILDREN ONLY		
Wharehouse/Factory	7	0.03
Playground	6	0.03
Play Equipment	4	0.02
Strangers/Drunks	4	0.02
Public Houses	3	0.0I
Quarry/Pits	2	0.0I
Subway/Tunnel	2	0.0I
Market	I	0.004
Meadow	I	0.004
Fields	I	0.004
Lock	I	0.004
Airport	I	0.004
Fire Station	I	0.004
RURAL CHILDREN ONLY		
Farms/Barns	6	0.03
Stud/Stables	6	0.03
Garages	4	0.02
Junkyard/Dump	4	0.02
Horses	4	0.02
Sewer	3	0.0I
Heath	I	0.004
Water Tower	I	0.004
Other Animals(Bull)	I	0.004

TABLE ix. BEAUTIFUL PLACES/FEATURES.

COMMON FEATURES	No. of Refs.	MENTION RATE
NONE	208	0.46
Woods/Trees	30	0.07
N'd Buildings	23	0.05
River/Stream	2I	0.05
Own House	I8	0.04
Fields	I8	0.04
Church	I7	0.04
Gardens	I3	0.03
N'd Roads	I2	0.03
Green(s)	II	0.02
Own Area	9	0.02
Own Garden	8	0.02
Park	7	0.0I
Churchyard	7	0.0I
Rec	6	0.0I
Specific Houses	5	0.0I
Public Houses	5	0.0I
Flowers	4	0.0I
School	3	0.0I
URBAN CHILDREN ONLY		
Common	6	0.03
Shops	5	0.02
Bowling Green	2	0.0I
Playing Fields	I	0.004
RURAL CHILDREN ONLY		
Heath	I7	0.07
Stables/Stud	9	0.03
Horses	7	0.03
Views	5	0.02
Footpaths/Walks	5	0.02
Bridge	2	0.0I
Race Course	I	0.0I
Paddocks	I	0.004
Own Den	I	0.004
Thatched Garage	I	0.004

This tabulation demonstrates a feature which emerges throughout the questionnaire responses, that what is beautiful, comfortable and attractive for some is dangerous and uncomfortable for others. This reinforces the belief that the circumstances in which a place is experienced or the context in which it is considered is fundamental to one's perception of it.

hazard by many children, as are the woods and the river. It is of note that more rural children commented on the 'Railway' as dangerous, probably as a result of the open nature of Railway systems in the country. As a result Railway lines are more accessible and there is less liklihood of being observed. A further interesting difference in the features described as dangerous, was reference to 'Strangers' or 'Drunks', especially at night, which was particularly noted by the Urban girls. (Each of the references to this category was supported by descriptions of personal experience or local knowledge which categorised them as dangerous.)

As with the last section, there/were many children who felt that there was no danger in the area where they lived, and this was true of both boys and girls and urban and rural sub-groups.

4. Beautiful Places.

The analysis of responses in this section revealed that in general the girls of the sample described more features of their environment as beautiful, and this was confirmed for all age groups in both rural and urban sub-groups. The differences between the sexes were relatively small, but it was evident that the girls were able to identify something of beauty where they lived. Similarly there were fewer girls who said there was nothing that could be thought of in this way in the area where they lived. In general the type of features included by both sexes tended to be similar, with minor exceptions. (For example, only the girls described 'Fields' as things of Beauty.) Comparison between the rural and urban sub-groups revealed that the rural group tended to refer to a slightly wider range of beautiful elements, perhaps indicating the difficulties of identifying beauty in an urban setting for children of this age. Other studies by Lynch (1977) and Uzzell (1976) have identified a similar range of responses to questions about beauty in the environment of children.

5. Noises and Smells associated with the Environment.

Despite the fact that researchers suggest that an environmental image will contain associated noises and smells, there is little evidence of attempts to identify what these might be. The results of the analysis for this study revealed how perceptive some children are when the senses of sound and sight are called upon. (As can be seen in Tables x and xi)

Although many children failed to respond to this section of the Questionnaire, or merely suggested that no sounds or smells came to their mind when they thought of the area where they lived, those who did respond produced a most interesting range of answers. As was suggested in

TABLE X. NOISES ASSOCIATED WITH THE ENVIRONMENT

COMMON FEATURES	NO. OF REFS.	MENTION RATE
Traffic	I26	0.28
NONE	I25	0.28
Animals	6I	0.I3
Children's Voices	32	0.07
Trains	28	0.06
Adult Voices	20	0.05
Birds	I4	0.03
Building/Road Works	I2	0.03
Football Crowd	II	0.02
Wind	II	0.02
Trees	II	0.02
Music	6	0.0I
Church Bells	6	0.0I
Factory	5	0.0I
River	4	0.0I
Garage	3	0.0I
Neighbour's	3	0.0I
Tree Cutting	2	0.004
Ducks	2	0.004
URBAN CHILDREN ONLY		
Aircraft	I7	0.04
Pub Noises	5	0.02
Ambulances	3	0.02
Footsteps	2	0.0I
Tennis Courts	2	0.0I
School Bell	2	0.0I
Rain	I	0.004
Ice Cream Vans	I	0.004
Fire Bell	I	0.004
RURAL CHILDREN ONLY		
Horses	35	0.07
Farm Machinery	I4	0.03
Dogs	4	0.02
Chickens	3	0.0I
Pigeons	2	0.0I
Cows	2	0.0I
Heating System	2	0.0I
Quiet	2	0.0I
Motorway	2	0.0I
Dry Leaves	I	0.004
Church Clock	I	0.004
Telephone	I	0.004
Choir	I	0.004
Swings	I	0.004
Geese	I	0.004
Pheasants	I	0.004
Turkeys	I	0.004

TABLE XI. SMELLS ASSOCIATED WITH THE ENVIRONMENT

COMMON FEATURES	NO. OF REFS	MENTION RATE
NONE	2II	0.46
Horses	67	0.I5
Fish & Chips	23	0.05
Smoke/Bonfires	2I	0.05
Petrol/Diesel	I9	0.04
Cooking	I7	0.04
Exhaust Fumes	I6	0.03
Animals	I3	0.03
Rubbish/Refuse	I0	0.02
Cut Grass	9	0.02
Flowers	9	0.02
Farm Smells	8	0.02
Sewage	6	0.0I
Cafe/Restaurant	4	0.0I
Gasworks	4	0.0I
River	4	0.0I
Pubs/Beer	3	0.0I
Drains	3	0.0I
Paint	2	0.004
URBAN CHILDREN ONLY		
Baking	6	0.03
Tar	3	0.02
Laundry	2	0.0I
Swimming Pool	2	0.0I
Dogs	I	0.004
Glue	I	0.004
Cut Wood	I	0.004
Builders	I	0.004
Tobacco	I	0.004
Fresh Air	I	0.004
Crops (Allotment)	I	0.004
RURAL CHILDREN ONLY		
Pigs	5	0.02
Factory	4	0.02
Garage	3	0.0I
Paraffin	I	0.004
Apples	I	0.004
Chickens	I	0.004
Coal Yard	I	0.004
Toilets	I	0.004
Fertiliser	I	0.004

in response to dangerous environmental features, 'Traffic' was the most regularly identified noise, folowe d by the noises of animals. Of particular interest here was the tendency of urban children to use the generic term 'animals' or just Dogs and Cats, whereas the rural children distinguished a considerable variety of animal noises. This was also demonstrated when the smells associated with an environment are considered. Horses were mentioned by a fairly large section of the sample, especially the rural children. It is also possible to identify the influence of immediate or reasonably recent experience in the responses. (e.g. Bonfires, Paint.) It is also possible to reinforce earlier comments about the importance of food in the minds of many children with references to 'Fish and Chips','Cooking', and 'Baking'. Finally the effects of 'Traffic' in a nasal sense is demonstrated in references to 'Petrol/ Diesel' smells and to 'Exhaust Fumes'.

6. Two Tasks.

As a final element of the Questionnaire, the children were presented with two tasks which required them to consider their knowledge and environmental preferences in terms of others. The first task asked them to select what features or places they might show to a related child, (probably of the same age as themselves) a related adult and an unknown adult. The analysis of the detail of these results can be seen in Tables XII and XIII)

A progressive increase in the number of features mentioned is demonstrated as the children get older, thus the children I2+ suggested more features for each category, and as has previously been indicated, the girls tended to offer more suggestions than the boys. It was also the case that more features were listed for showing to a related child than to either adult, and that generally more features were suggested for the related adult than for the visitor, as might have been expected.

When the features themselves are considered, the appropriateness of selection becomes apparent, thus a related child is more likely to be shown the House , Bedroom or Road, Local Play places or secret places. Similarly a related adult is more likely to be shown 'Our House' or 'the same as a related child', although the sim ilarity of features selected for a known and unknown adult is comparatively high, suggesting that children find it easier to consider such selection in their own terms. The features identified as appealing to adults seems to bear this out to some extent, for example there is a high incidence of 'Landmark' type elements in Lynch's terminology.Thus shops, Pubs, Churches, Schools and Named Buildings receive support. Some of the features listed do not immediately appear appropriate for example, 'The Bus Station','The Post

TABLE XII. COMMON FEATURES TO BE SHOWN TO A COUSIN, A RELATED ADULT AND A VISITOR.

COMMON FEATURES TO COUSIN.	NO. OF REFS	MENTION RATE.
Own House	I22	0.27
Shops	II6	0.25
All Round	60	0.I3
Green	44	0.I
Schools	39	0.I
Park	38	0.I
Secret Places	36	0.I
Church	34	0.I
Playing Fields	30	0.I
River	30	0.I
Swimming Pool	29	0.I
Rec.	26	0.06
Other Roads	2I	0.05
Pub	20	0.05
Own Garden	I9	0.04
N'd Buildings	I9	0.04
Own Road	I7	0.04
Friend's House	I7	0.04
Common	I7	0.04
Alleys/Tracks	I5	0.03
Fields	I5	0.03
Woods	I4	0.03
Town Centre	I4	0.03
Ask/Show a map	I3	0.03
Play Areas	I2	0.03
N'd Places	II	0.02
Village/Church Hall	9	0.02
Animals/Pets	8	0.02
Own Room	8	0.02
Garages	8	0.02
Sites/Landmarks	6	0.0I
Flats	5	0.0I
Sports Centre	5	0.0I
Station	5	0.0I
Trees	4	0.0I
Factories	4	0.0I
Post Office	2	0.004
Relation's House	2	0.004
Cafe	2	0.004
Garden Centre	2	0.004
Farms	2	0.004
Police Station	2	0.004

COMMON FEATURES TO REL'N.	NO. OF REFS.	MENTION RATE.
Shops	95	0.2
All Round	83	0.I8
Own House	77	0.I7
Church	48	0.II
Pub	48	0.II
Schools	44	0.I
Same as Cousin	37	0.I
Other Roads	25	0.05
Town/Shop Centre.	22	0.05
Offer a map/ Ask them	I9	0.04
Own Garden	I8	0.04
N'd B'dings	I7	0.04
River	I7	0.04
N'd Places	I5	0.03
Green	I4	0.03
Park	I4	0.03
Library	I0	0.02
Fields	I0	0.02
Playing F'ds	8	0.02
Woods	7	0.02
Own Road	7	0.02
Sites/Land-marks	7	0.02
Post Office	6	0.0I
Animals/Pets	6	0.0I
Station	5	0.0I
Hospital	5	0.0I
Cemetry	5	0.0I
Factories	5	0.0I
Play Areas	5	0.0I
Post Box	4	0.0I
Friend's House	4	0.0I
Common	4	0.0I
Church Hall	3	0.0I
Bowls Club	3	0.0I
Alleys/Short	3	0.0I
Cuts	3	0.0I
Own Room	3	0.0I

COMMON FEATURES TO VISITOR	NO. OF REFS.	MENTION RATE.
Shops	96	0.2
All Round	93	0.2
Own House	55	0.I2
N'd Roads	48	0.I
Same as Rel'n.	46	0.I
Schools	44	0.I
Church	44	0.I
N'd B'dings	35	0.I
Pubs	3I	0.I
Town Centre	30	0.I
Park	30	0.I
River	22	0.05
Sites/Land-marks	I8	0.04
Own Garden	I3	0.03
Playing F'ds	I3	0.03
Ask/Show Map	I3	0.03
Other Houses	I2	0.03
Swimming Pool	II	0.02
Play Areas	II	0.02
Common	I0	0.02
Own Area	9	0.02
Green	9	0.02
Post Office	9	0.02
Station	8	0.02
Hospital	8	0.02
Graveyard	7	0.02
Own Road	7	0.02
Garages	7	0.02
Alleys/Short-cuts	6	0.0I
Fields	6	0.0I
Police Station	5	0.0I
Car Park	4	0.0I
Building Site	4	0.0I
N'd Places	3	0.0I
Post Box	2	0.004

TABLE XII (cont.) FEATURES SHOWN TO A COUSIN, A RELATED ADULT AND A VISITOR. URBAN CHILDREN ONLY.

COUSIN	NO OF REFS	MENTION RATE	ADULT RELATION	NO. OF REFS	MENTION RATE	VISITOR	NO. OF REFS	MENTION RATE
N'd Buildings	I2	0.05	N'd Buildings	I4	0.06	N'd Buildings	2I	0.09
Football Gnd.	9	0.04	Museums	IO	0.04	Rec	II	0.05
Library	7	0.03	Football Gnd.	5	0.02	Post Box	7	0.03
Youth Club	6	0.03	Youth Centre	4	0.0I	Library	7	0.03
Hospital	4	0.0I	Swimming Pool	3	0.0I	Bus Stop	6	0.03
Graveyard	4	0.0I	Stables	3	0.0I	Museum	6.	0.03
Museums	4	0.0I	Rec	2	0.0I	Bowls Club	4	0.0I
Swings	3	0.0I	Police Station	2	0.0I	Airport	3	0.0I
Building Site	3	0.0I	Toilets	2	0.0I	Factories	3	0.0I
Post Box	2	0.0I	Doctor	2	0.0I	Doctors	2	0.0I
Toilets	2	0.0I	Bus Stop	2	0.0I	Youth Centre	2	0.0I
Market Place	2	0.0I	Phone Box	2	0.0I	Toilets	2	0.0I
Cinema	2	0.0I	Swings	I	0.004	Swings	I	0.004
Airport	I	0.004	Market Place	I	0.004	Sports Centre	I	0.004
Subway	I	0.004	Community Centre	I	0.004	Community Centre	I	0.004
Community Centre	I	0.004	Cinema	I	0.004			
Bowls Club	I	0.004	Garden Centre	I	0.004			
Adventure Playground	I	0.004	Garage	I	0.004			
Meadows	I	0.004	Dentist	I	0.004			
T.A.Centre	I	0.004						
Bus Stop	I	0.004						
Phone Box	I	0.004						

TABLE XII (cont.) FEATURES SHOWN TO A COUSIN, A RELATED ADULT AND A VISITOR. RURAL CHILDREN ONLY.

COUSIN	NO. OF REFS.	MENTION RATE	ADULT RELATION	NO. OF REFS	MENTION RATE	VISITOR	NO. OF REFS	MENTION RATE
Heath	20	0.09	Heath	I8	0.08	Heath	I8	0.08
Stud/Stables	20	0.09	Stud	II	0.05	Stud/Stables	I8	0.08
Horses	I2	0.05	Horses	II	0.05	Horses	7	0.03
Own Area	IO	0.04	Race Course	4	0.02	Race Course	4	0.02
Trains	6	0.03	Meadows	4	0.02	Hotel	4	0.02
Paddock	3	0.0I	Farms	3	0.0I	Village Hall	4	0.02
Yard	2	0.0I	Relation's House	2	0.0I	Paddock	3	0.0I
Fish & Chip Shop	2	0.0I	Hotel	2	0.0I	Woods	3	0.0I
Court House	I	0.004	Paddock	2	0.0I	Farms	3	0.0I
Bridge	I	0.004	Yard	2	0.0I	Garden Centre	2	0.0I
Hotel	I	0.004	Trees	I	0.004	Trees	2	0.0I
Caravan	I	0.004	Orchard	I	0.004	Fish & Chip Shop	2	0.0I
Car Park	I	0.004	Trains	I	0.004	Friend's Hse.	2	0.0I
Race Course	I	0.004	Bridge	I	0.004	Cinema	I	0.004
			Fish & Chip Shop	I	0.004	Bridge	I	0.004
			Building Site	I	0.004	Yard	I	0.004
			Bus Station	I	0.004			

TABLE XIII. PHOTOGRAPHS SELECTED FOR INCLUSION IN A GUIDE BOOK OF THE CHILDREN'S HOME AREA.

COMMON FEATURES	NO. OF REFS	MENTION RATE
Church	I22	0,27
Shops	I02	0.22
Own House	99	0.2I
School	84	0.2
Public Houses	68	0.2
N'd Roads	68	0.2
Town/Shopping Centre	56	0.I3
Park	55	0.I2
Other Houses	48	0.II
Green	43	0.I
River	4I	0.I
Woods	3I	0.I
Playing Fields	30	0.I
N'd Buildings	29	0.I
Station/Railway	28	0.I
Fields	27	0.06
Swimming Pool	26	0.06
General/Aerial Views	26	0.06
N'd Areas	24	0.05
Own Road	2I	0.05
Gardens	2I	0.05
Pond	I9	0.04
Own Garden	I5	0.03
Football Ground	I4	0.03
Footpaths/Track	I3	0.03
Church/Village Hall	I3	0.03
Churchyard	II	0.02
Factories	II	0.02
Bridges	II	0.02
Playground	I0	0.02
Post Office	9	0.02
Hospital	9	0.02
Trees	8	0.02
Garage(s)	7	0.02
N'd Places	6	0.0I
Old Primary School	6	0.0I
Police Station	5	0.0I
Hotel/Restaurant	5	0.0I
Cinema/Theatre	4	0.0I
Allotments	4	0.0I
Council Dump	4	0.0I
Fire Station	3	0.0I
Building Sites	2	0.004
N'd People	2	0.004
Tennis Courts	2	0.004

URBAN FEATURES ONLY	NO. OF REFS	MENTION RATE
N'd Buildings	46	0.2I
Common	23	0.I
Rec	I5	0.06
Museums	7	0.03
Library	6	0.03
N'd Areas	6	0.03
Swings/Play Areas	6	0.03
Airport	3	0.0I
Lake	3	0.0I
Youth Centre	3	0.0I
T.A.Centre	2	0.0I
Boat Yard	2	0.0I
Flats	2	0.0I
Health Centre	2	0.0I
Community Cntr.	2	0.0I
Youth Centre	2	0.0I
Y.M.C.A.	2	0.0I
Sports Hall	2	0.0I
Tech.	2	0.0I
Subway	I	0.004
Market	I	0.004
Galleries(Art)	I	0.004
Monestry	I	0.004
Fen	I	0.004
Bus Shelter	I	0.004
Lock	I	0.004
Nursery	I	0.004
Doctors	I	0.004
Garden Centre	I	0.004
Bath House	I	0.004

RURAL FEATURES ONLY	NO. OF REFS	MENTION RATE
Stables/Stud	47	0.2I
Heath	42	0.I8
Clock Tower	40	0.I7
Race Course	3I	0.I4
Horses	25	0.II
Farms	I0	0.04
N'd Buildings	8	0.04
Physical Features	8	0.04
Brook	6	0.03
Water Tower	6	0.03
Paddock	5	0.02
Old Station	5	0.02
Windmill	4	0.02
Jockey Club	4	0.02
Ford	3	0.0I
Other Animals	2	0.0I
Farm Machinery	2	0.0I
Memorial	2	0.0I
Motorway	2	0.0I
Own Den	I	0.004
Orchard	I	0.004
Meadows	I	0.004
Bank	I	0.004
Fish & Chip Shop	I	0.004
Yard	I	0.004

Office', or 'The Post-Box'. Follow up questions, either whilst completing the Questionnaire, or in the follow up interview always provided an extremely logical explanation for their inclusion.

Any differences that emerged between the urban and rural sub-groups can be attributed to the availability of certain features in each environment, and the number of features commonly mentioned was quite high. Similar findings emerged in the analysis of Task 2, which required the children to select 5 features or places for inclusion in a Guide-Book of the area where they lived. Again many of the children were most thoughtful in their responses to this task and reference was made to all of the features previously included in the Questionnaire responses. In all, I03 different features were mentioned as can be seen in Table xiii and it was again the case that urban and rural differences arose from the different natures of each of those environments. As with Task I, a progressive increase with age in the number of features included is demonstrated, with considerable similarities in the number and type of feature mentioned by boys and girls. When the features are considered in rank order of mentions there is further evidence of the emphasis placed by children of this age on 'Landmarks'. Churches was the most popular inclusion. 'My House' also emerged as a strongly supported Guide-Book inclusion, confirming yet again the importance of the immediate locality and personal homespace for these children. Shops were also confirmed in their importance, especially for the girls, (The urban girls particularly).

Many of the comments made here were further demonstrated when the two maps, (of the Area where the children lived and of their route from Home to School) were analysed for the type of features which were included.

3. Map Analysis.(Feature Inclusion) (TABLE XIV)

When the maps are considered for the number of features mentioned by the children, an increase in the number is again demonstrated with age, although the differences between the II+ and I2+ age groups are small. The differences between these two groups and the results of the younger children provides some evidence of the developmental nature of Environmental knowledge discussed in the text of the thesis, or alternatively may be associated with changes in parental attitude at about the time of traditional primary/secondary transfer. (It needs to be remembered that the children in the rural school were in a middle shool and therefore did not physically change schools, yet their results indicate a trend similar to that of the urban children who had changed school, and who now had to travel further distances to get to school.)

The Table below also identifies a factor of importance by which to compare the two mapping tasks. In all cases the Area maps included more detail, particularly when you consider the maps of the girls of the sample

	BOYS			GIRLS		
	IO+	II+	I2+	IO+	II+	I2+
ROUTE MAPS	5I	62	62	4I	59	63
AREA MAPS	55	70	8I	63	77	89

Number of Features mentioned on the Maps.

The greater detail included on the area maps and indicated in the above table is probably associated with the importance of the immediate environment to the children which was mentioned earlier,'The Home-Site Princple' described by Moore and Young (I978) and Hart (I979). The differences between the maps may also be a direct result of the nature of the two tasks, a factor which was raised in Chapter 5 and was previously hinted at by Sieverts (I967) in his study of children's perception of Berlin. During the route from home to school either comparatively little attention is paid to the environmental detail which is passed, or alternatively and probably more likely, that there is so much detail that individuals are more selective about what they attend to, an example of Calland'S (I973) Distance-Decay principle.
When the number of features are considered in terms of differences between the urban and rural sub-groups another interesting factor emerges especially when the Route Maps are considered. The Rural children appear to include more detail on their maps as can be seen in the tabulated results below

	BOYS			GIRLS		
	IO+	II+	I2+	IO+	II+	I2+
URBAN MAPS	25	39	4I	25	34	43
RURAL MAPS	36	44	42	29	42	50

Number of Different features included on the Route Maps
by the Urban and Rural Sub-groups.

The results of this analysis suggest that the longer route undertaken by many of the rural children, many of whom have to travel in to school from some distance, allows the possibility of more environmental detail to be considered and seems to contradict the points made above and the comments of Downton (I973) who suggested that the length of route to school could effect attention to detail.
When the features themselves are considered there are considerable similarities demonstrated between the groups in the kinds of features attended

TABLE XIV. A COMPOSITE ANALYSIS OF THE FEATURES SHOWN ON THE ROUTE AND AREA MAPS.

COMMON FEATURES	MENTION RATE	COMMON FEATURES (cont.)	MENTION RATE	URBAN FEATURES ONLY	MENTION RATE	RURAL FEATURES ONLY	MENTION RATE
ROADS	0.8	Town/Market Centre	0.02	Colleges	0.03	Clock Tower	0.2
Own House	0.6	Playground	0.02	School.Hall	0.03	Heath	0.I
School	0.5	Library	0.02	Nursery	0.0I	Stud	0.I
Other Houses	0.3	Hotel	0.02	Youth Hostel	0.0I	Stables	0.I
Shops	0.3	Fire Station	0.02	Technical College	0.0I	Farms	0.03
Roundabouts	0.3	Pond/Lake	0.02	Community Centre	0.0I	Old Station	0.03
Parks/Greens	0.2	Churchyard	0.0I	Football Gnd.	0.0I	Grain Silos	0.03
Public Houses	0.I	Subway/Under-Pass	0.0I	Named Garden	0.0I	Paddock	0.02
Named Areas	0.I	Hospital	0.0I	Gas Works	0.0I	Physical Features	0.02
Bus Stops	0.I	Building Site	0.0I	Tennis Courts	0.0I	Street Signs	0.02
Church	0.I	Own Camp/Den	0.0I	Off License	0.0I	Water Tower	0.02
Garages/Petrol	0.I	Station	0.0I	Pits/Quarry	0.0I	Yard	0.0I
Trees	0.I	Allotments	0.0I	Science Labs	0.0I	Barns/sheds	0.0I
Footpaths	0.I	Old Peoples Home	0.0I	Workshop	0.0I	Men's Club	0.0I
Bridges	0.I	Sports Hall	0.0I	G.P.O.Sorting Office	0.0I	One Way System	0.0I
Zebra Crossing	0.I	Youth/Activity Centre	0.0I	Bingo Hall	0.0I	By Pass	0.0I
Fields	0.04	Own Garage/Parking Space	0.0I	Launderette	0.0I	Memorial	0.0I
Car Parks	0.04	Bowls Club	0.0I	Nature Reserve	0.0I	Garden Centre	0.0I
River	0.04	Offices	0.0I	Lock	0.0I	Caravan Centre	0.0I
Post Office	0.04	Animals	0.0I	Market Place	0.0I	Gas/Electricity Installations	0.0I
N'd Buildings	0.04	Vehicles	0.0I	Dentist	0.0I	Cafe	0.0I
Swimming Pool	0.04	Mill	0.0I	Doctor	0.0I	Moat	0.0I
Gardens	0.04	Bus Station	0.0I	Multi-Storey Car Park	0.0I	Car Wash	0.0I
Factories	0.03	Toilets	0.0I	Bath House	0.004	Animal Research Centre	0.0I
Sports Field	0.03	Bench	0.0I	Theatre	0.004	Ancient Monument	0.0I
Friend's House	0.03	Nurses Home	0.0I	Pavillion	0.004	Horse Crossing	0.0I
Railway Line	0.03	Derelict/Waste	0.0I	Dog's Home	0.004	Ford	0.0I
Personal Detail	0.03	Bank	0.0I	Wood Yard	0.004	Telephone Ex.	0.0I
Telephone Box	0.03	Vets	0.0I	Golf Club	0.004	Bus Shelter	0.004
Swings	0.02	Lorry Park	0.0I	Signal Box	0.004	Greenhouses	0.004
Other Towns/Villages	0.02	Council Yard	0.0I	Airport	0.004	Private Road	0.004
Traffic Lights	0.02	Lamp Posts	0.0I	Traffic Bollards	0.004		
Post Box	0.02	Orchard	0.0I				
Woods	0.02	Garages	0.0I				
Flats	0.02	Village/Church Hall	0.0I				
Police Station	0.02	Sewer/Sewage Works	0.0I				
Own Garden	0.02	Electricity Sub Station	0.0I				
		Cinema	0.0I				

TOTAL NUMBER OF DIFFERENT FEATURES SHOWN ON EACH OF THE MAPS	Total number of Features	Common Features	Urban Only	Rural Only
AREA MAPS	I29	67	3I	3I
ROUTE MAPS	99	48	32	I9
COMBINED	I39	76	32	3I

to by children of this age. Roads emerge as the most regularly included map element in both maps confirming the importance of 'paths' in children's perceptions of the structure of their environment, as Ladd (1970) found. The children's own house also achieves a high mention rate offering further evidence in support of the 'home-site principle' mentioned earlier, and as was demonstrated in the questionnaire, shops and play places were also regularly included in the maps. Many of the features listed could be categorised in Lynch's terms as Landmarks and as Bishop (1973) comments they tend to be those of the greatest significance to them rather than because of architectural significance. It seems therefore that paths, nodes and landmarks are the dominant structural elements of the maps, and this finding is similar to that discussed in other similar research analysing recall sketch maps for children within this age range.

When the results are compared with similar studies, notably the CUULS study mentioned earlier, comparison with Table xxviv indicates that more features were included in the maps of this sample, and that there are some obvious cultural differences. It is still the case however that the dominance of Home-site, playplaces and the shops is apparent for both samples despite the different cultural backgrounds.

The rural children's inclusion of vegetative/farming elements seems to compare with the findings of Maurer and Baxter (1972), where their sample of multi-ethnic 7-14 year olds ranked Grass, Trees and Flowers highly (by 42%, 52% and 22% of their sample respectively), whereas their results of 90% reference to Houses, 70% references to Homes and 69% references to Streets compares favourably with the results of the full sample. One obvious difference is similar to that identified by Moore and Young (1978) when they compared Maurer and Baxter's findings with those of the CUULS study, and that was the low ranking of 'play-places' in the Maurer and Baxter sample, although the 69% reference to streets could well be included within the purvue of play places if other studies are anything to go by. However the Berkley Park Use Study (Mason et al 1975.) presents evidence that children and adolescents are the predominant users of parks. In 5 out of 6 parks they monitored, under 19's represented more than 75% of the user population. In half of these, 6-12 year olds were the most dominant users. The results of this study would seem to suggest that 10-13 year old British children also make considerable use of such places.

The number of references made by children in this study to many of the elements listed is often small, beyond the features already discussed. This may perhaps suggest that individuals vary more than has previously been suggested in the features that they perceive to be of importance

Place elements	Number of mentions	Mention rate
1 Child's own house	210	.79
2 Through streets	209	.79
3 Child's mention of self	174	.66
4 Friends/relatives home	127	.48
5 Child's school	105	.40
6 Child's friend(s)	94	.35
7 Store(s)	93	.35
8 Community park	90	.34
9 Single trees	82	.31
10 Lawns	82	.31
11 Fences	70	.26
12 Playground/schoolyard/equipment	70	.26
13 Traffic	69	.26
14 Community buildings	69	26
15 Dwellings/apartments	61	.23
16 Neighbors/sitter's house	57	22
17 Yard for play/stoop	57	.22
18 Dirt/sand/gravel/tanbark	56	.21
19 Creek/stream	55	.21
20 Trails/shortcuts/paths/alley	53	.20
21 Sidewalks	51	.19
22 Child's parents	51	.19
23 Swimming pool	47	.18
24 Sports field	47	.18
25 Hill mountains	46	.17
26 Dead-ends/driveways	45	.17
27 Child's siblings	44	.17
28 Building interiors	43	.16
29 Sports playing court	41	.15
30 Topography	38	.14
31 Shrubs	38	.14
32 Buses/BART/stops	37	.14
33 Tall grass/weeds/leaves	37	.14
34 Climbing trees	36	.14
35 Tree clusters	32	.12
36 Child's relatives/other adults	31	.12
37 Cats/dogs	30	.11
38 Climatic conditions	29	.11
39 Agricultural land	27	.10
40 Forts/clubhouses	25	.09
41 Water Play	25	.09
42 Fruiting trees/vines	25	.09
43 Rocks	25	.09
44 Regional park/fairground/campground	24	.09
45 Vacant lot/land under development	24	.09
46 Railroad	23	.09
47 Parking lot	23	.09
48 Misc buildings/structures for playing	23	.09
49 Shopping/commercial strip	22	.08
50 Pond/lake/reservoir/ocean	22	.08
51 Gas station	19	.07
52 Fish/aquatic life	19	07
53 Bridges/tunnels	18	.07
54 Dirt roads	18	.07
55 Flowers	18	.07
56 Treehouse	18	.07
57 Garden	16	.06
58 Skating rink/bowling alley	16	.06
59 Church	16	06
60 Wild animals	16	.06
61 Shopping center/plaza	15	06
62 Horses	14	.05
63 Abandoned buildings/structures	14	.05
64 Farm animals	13	.05
65 Wild birds/insects	13	.05
66 Movie theater/drive-in	10	.04
67 Tree-swing	10	.04
68 Other domestic animals	8	.03
69 Secret/hiding places	7	.03
70 Asphalt/concrete	6	.02
71 Woodland	5	.02
72 Culvert or stream	2	.01

THE 'CUULS' STUDY : AMERICAN 8-12 YEAR OLDS N=265 in their environment. Although, as found by Bishop (1973), regular reference was made to such features as pubs, post boxes and offices and to telephone boxes, whereas contrary to the findings of Bishop, churches and schools were regularly included.

One final factor concerned the differences between the rural and urban sub-groups. As might be expected, the rural group made more reference on their maps to features like woods, trees and fields. On the other hand, the urban group included more detail about the street furniture and especially to features like traffic lights and zebra crossings, which again reinforces the experiential nature of environmental knowing and the subsequent influence on a representation of that knowledge in a recall sketch map.

APPENDIX 3.

Criteria adopted for the analysis of the Maps produced by the Sample.

The following criteria were adopted for the main analysis of the recall sketch maps produced by the children in the sample. There were 5 elements in this analysis, each of which was derived from the literature and adapted for the purposes of this study.

The five elements of the analysis were as follows:

I. An analysis of the area depicted on the map in terms of its EXTENT. (This section was only considered in relation to the map of the area where the children lived.)

2. An analysis of the degree of ABSTRACTION demonstrated in the maps. (i.e. How far they considered conventional mapping techniques in terms of symbolisation particularly. All of the children in the sample had had some experience of maps as part of the school curriculum, although obviously some had had more than others.)

3. An analysis of the PERSPECTIVE adopted by the mapper, (i.e. How far were they able to separate themselves from the activity ,'disembed' in Witkin's terminology, and adopt the overhead perspective associated with conventional mapping.)

4. An analysis of the ACCURACY or Quality of the map.

5. An analysis of the STYLE adopted in the map.

(Categories 2 to 5 were applied to both of the maps produced by the children, whereas as has already been indicated, Category I applied only to the map of the Area where the children lived.)

AREAL EXTENT.

A small pilot study undertaken prior to the full study had demonstrated differences between relatively Field Dependent and Field Independent individuals in their responses to drawing a map of the area where they lived, especially with respect to the dimensions of that area. In the discussion of the derivatives and associated characteristics of the dimension identified by Witkin it has been suggested that Field Independent subjects demonstrate greater independence, and are more likely to be given greater freedom by their parents to develop this independence. If this is so, it might be hypothesised that this would be demonstrated in their more extensive exploration and knowledge of their locality, which would be reflected in any representation of their 'home area' as, for example in a recall sketch map. Such individuals would see their home area as more extensive therefore than those who might be classified at the opposite pole of the Field Dependence/Independence dimension. This hypothesis was investigated by analysing the maps in the terms described below. It was also investigated in the Questionnaire completed by the whole sample, and in the Interview with the Follow up sample who represented the extremes of the Witkin dimension within the sample. The sub divisions of this category are similar to those employed by Klett and Alpaugh (I976) in their analysis of the 'Scale' of maps of the San Fernando Valley drawn by children aged $6\frac{1}{2}$ years, $9\frac{1}{2}$ years and $10\frac{1}{2}$ years. Their sub-divisions of cognitive map analysis into the dimensions of SCALE, PERSPECTIVE and ABSTRACTION is derived from the work of Blaut and Stea, (Blaut, McCleary and Blaut (I970) and Stea and Taphanel (I975)) who argue that any cognitive representation of the environment is based upon these three important cognitive transformations.

THE EXTENT OF THE AREA MAPS.

The following instructions were given to the judges for the preliminary analysis of this category.

Could you please consider the EXTENT of the area represented in these Maps by sorting them into 5 categories based on the following guide-lines:

I. Own Immediate Personal Space. (The road where the child lives, his own house and houses nearby, his most immediate environment. Klett and Alpaugh refer to this as 'Sub-Focal')

2. The Immediate Locality.(This category represents an extension of category I, to include the square and local network of streets, which are likely still to be limited in number. It really represents what the child can see about him when outside his house. Klett and Alpaugh describe this as 'Focal'.)

3. The Local Area. (This will now include parts of the environment which have been experienced over time and therefore goes beyond the 'immediate locality' as described above. Maps in this group demonstrate an improved representation of the street network and local environmental features. 'Local' in Klett and Alpaugh's terms.)

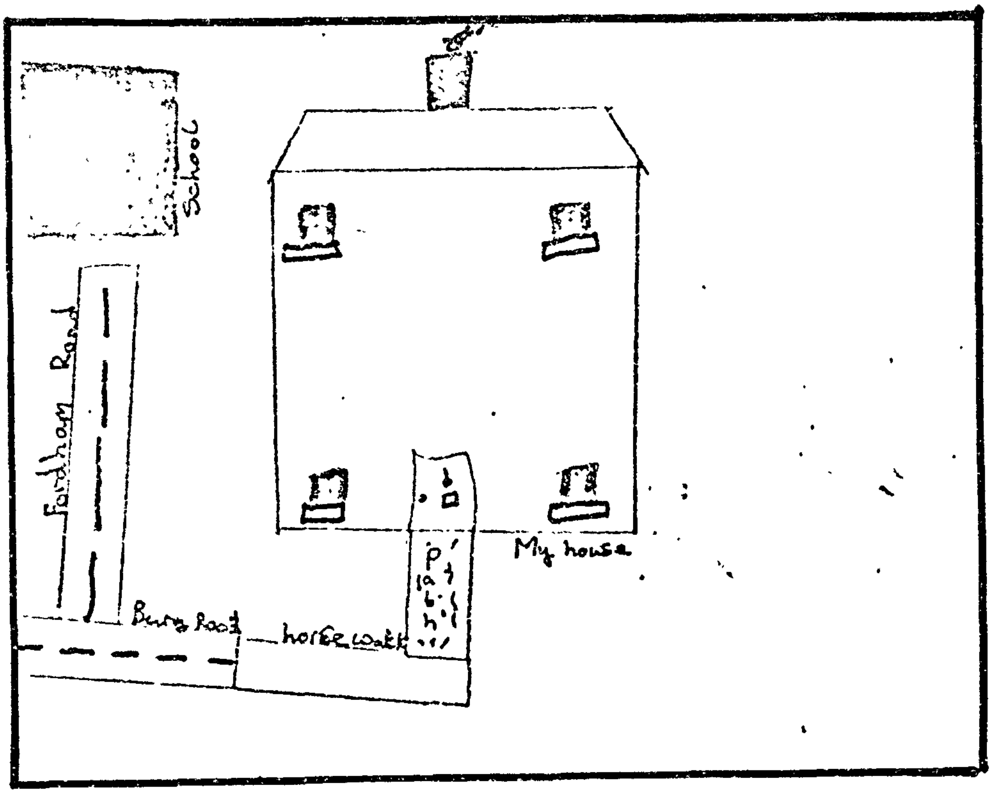
4. A clear concept of the Area. (The area is now seen as an entity in its own right . Inter-connections are extensive and clearly represented. This category demonstrates an improvement on the previous one. 'Valliudinal' in the analysis by Klett and Alpaugh.)

5. The Village or Town or Area is now seen as part of a larger system. (Inter-connections and directions elsewhere are included, roads are seen to continue beyond the immediately described space. Klett and Alpaugh categorise this as 'Macro'.)

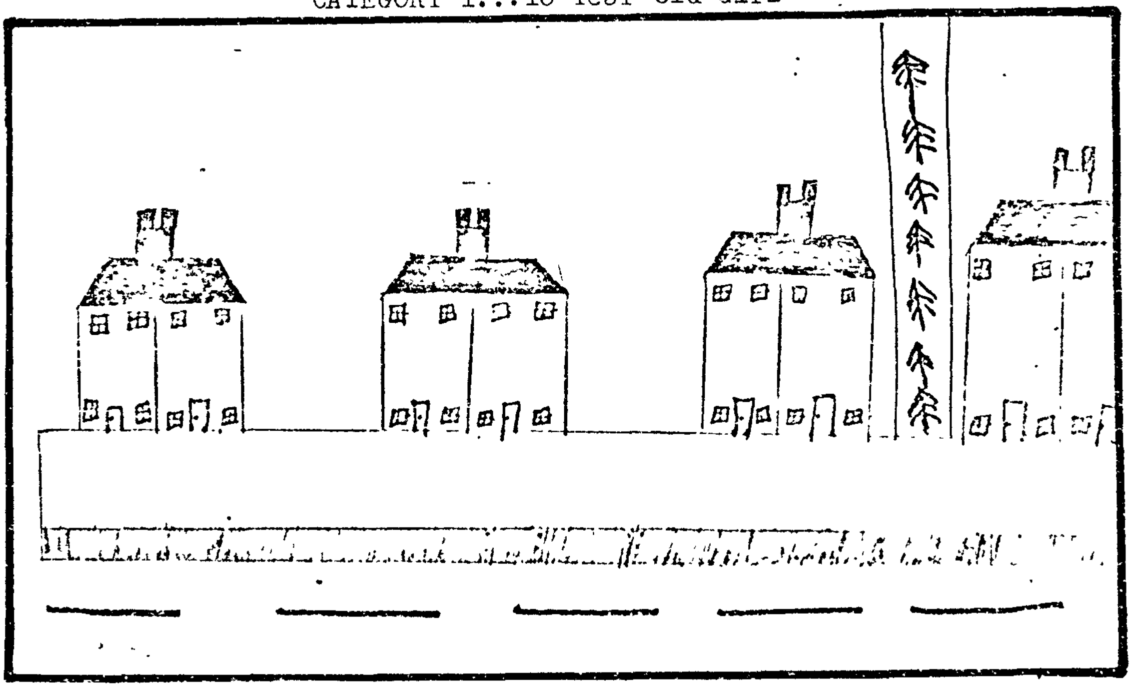
Example maps for each of the 'Extent' categories are included in the following pages. These have been reduced in size. The tables below indicate the percentages of the sample achieving the various categories previously described, by sex and by age group.

SAMPLE.	I	2	3	4	5
I0 - II year olds	I6%	40.8%	3I.2%	II.2%	0.8%
II - I2 " "	I6.6%	47.4%	28.2%	7.I%	0.7%
I2 - I3 " "	4.6%	32%	38.3%	I8.3%	6.8%
TOTAL	II.8%	39.7%	32.9%	I2.5%	3.I%
BOYS.	**I**	**2**	**3**	**4**	**5**
I0 - II year olds	I3.I%	44.3%	27.9%	I3.I%	I.6%
II - I2 " "	I5.8%	35.5%	34.2%	I3.2%	I.3%
I2 - I3 " "	5.4%	34.4%	32.3%	I6.I%	II.8%
TOTAL	I0.9%	37.4%	3I.7%	I4.4%	5.6%
GIRLS.	**I**	**2**	**3**	**4**	**5**
I0 - II year olds	I8.8%	37.5%	34.4%	9.3%	-
II - I2 " "	I7.5%	58.8%	22.5%	I.2%	-
I2 - I3 " "	3.6%	29.3%	45.I%	20.7%	I.3%
TOTAL	I2.8%	42%	34%	I0.6%	0.6%

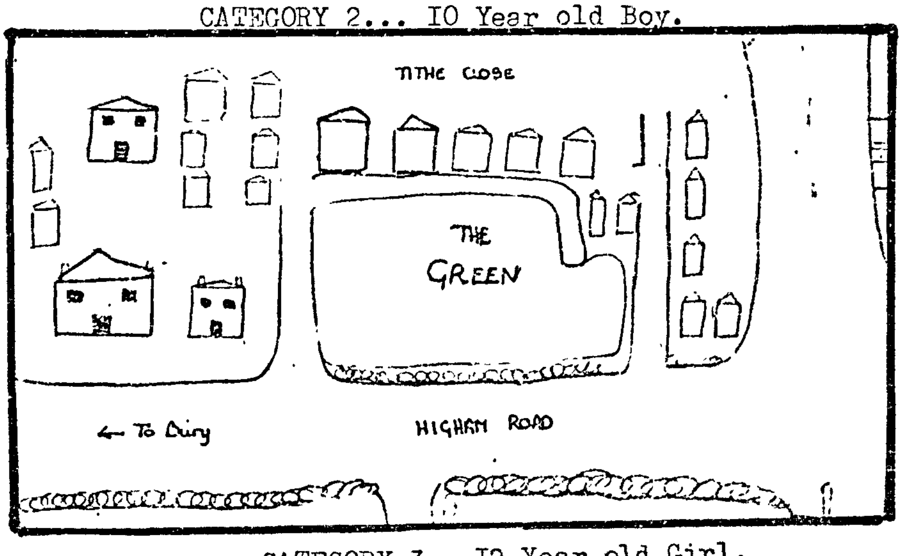
EXTENT OF THE AREA MAPS: SAMPLE MAPS



CATEGORY I...IO Year old Girl

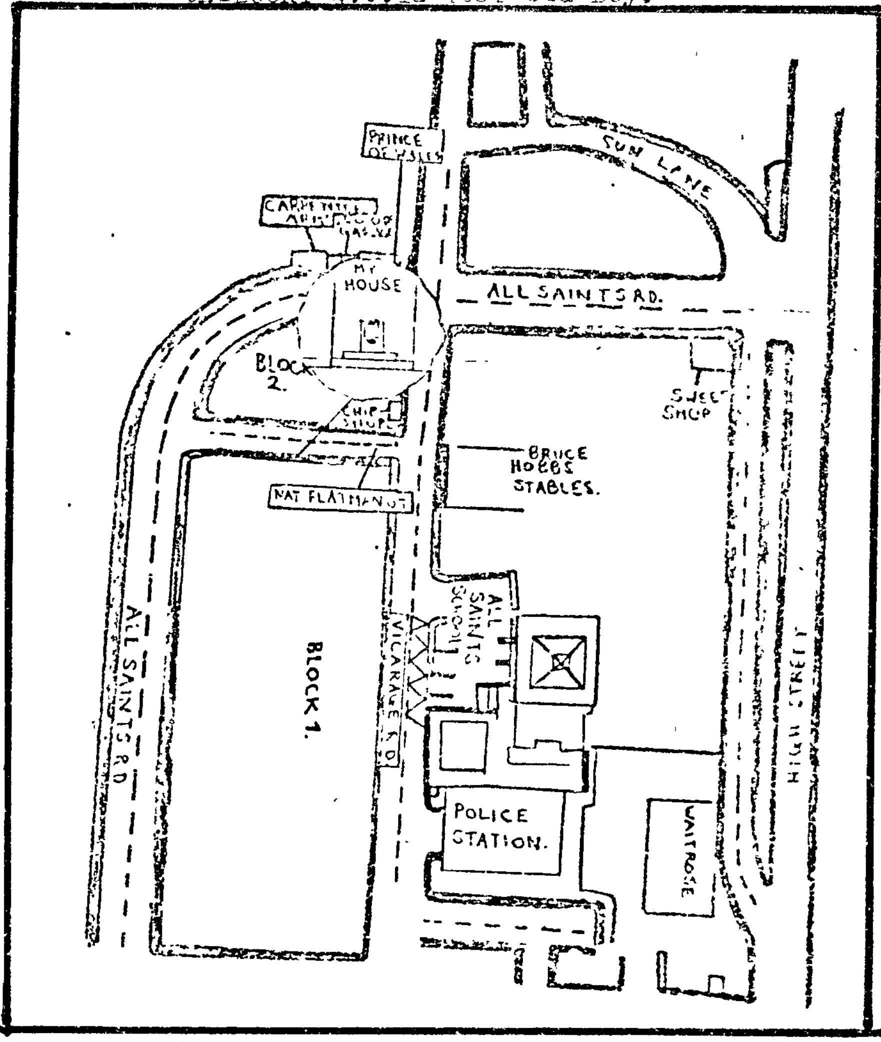


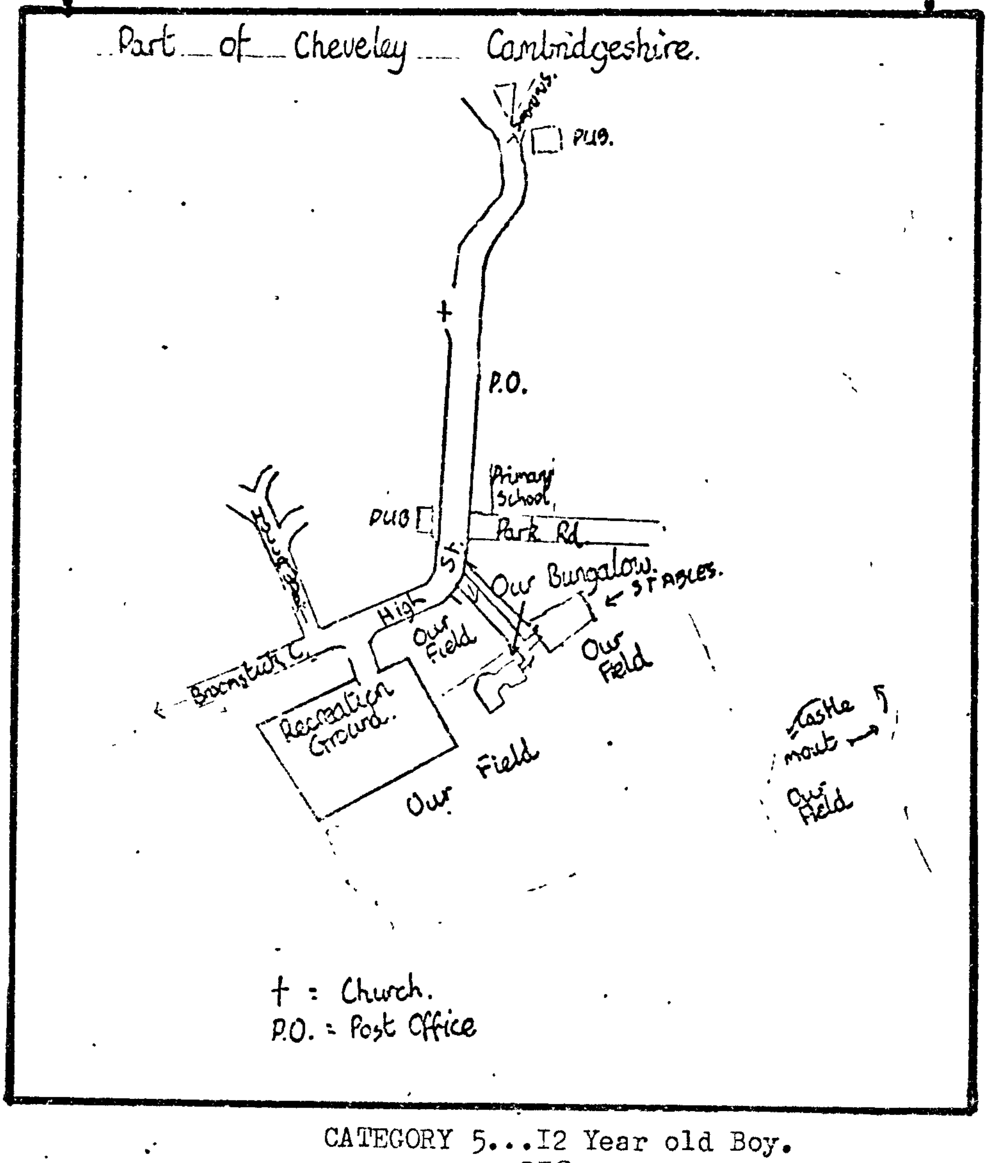
CATEGORY 2... IO Year old Boy.



CATEGORY 3...I2 Year old Girl.

CATEGORY 4...I2 Year old Boy.





CATEGORY 5...I2 Year old Boy.

2. The Degree of ABSTRACTION demonstrated.

A major element of conventional mapping is the use of symbolisation. To a great extent the use of symbols is dependent upon experience and knowledge of maps, as well as education about maps and their various purposes. It is the case however that the quality of a map and the ability to represent detail on that map is dependent upon selecting appropriately from the considerable environmental detail contained within an environment, and the representation of that detail in a common form interpretable by others. Children find great difficulty in selecting appropriately and often attempt to include everything on their maps. Bishop (1973), would argue that what children regard as appropriate is likely not to be seen so by adults. However, the stage at which an individual recognises that it is not possible to include everything on the map, and that one has to engage in some form of selection, is an important one inthe development of map understanding. Similarly, the recognition that a map does not and cannot convey all of the detail of an environmental setting is another landmark in the development of map understanding, (Sandford 1972). The use of symbols is also an important aspect of the development of map understanding, particularly that of recognising potential use by others and that maps are often 'Social' documents requiring common, accepted and usually abstract forms of representation. It is important to remember that the fact that a map is not symbollically portrayed does not detract from its potential value, as many historical maps demonstrate. Yet, analysis of maps in terms of the mode of presentation it is argued, is an important indicator of the child's level of mapping ability. As a child gets older, gains more experience of maps and is educated into conventional mapping wisdom, one would expect an increasing level of abstract representation. That this need not be so has been demonstrated elsewhere, (Catling 1978, Conner 1969). The ability to represent things symbollically requires an individual to abstract oneself from the situation and an analysis of the situation in the terms described earlier, (i.e. recognise that it is not possible to include everything, and therefore it is necessary to engage in a process of selection.) It is hypothesised that this equates with Witkin's 'Disembedding' ability, and that more Field/Independent Individuals are likely to achieve greater success than Field Dependent individuals in such aspects of mapping.

For the analysis of the degree of abstraction demonstrated, the following criteria were adopted, which demonstrate an increasing degree of abstraction in the representation. They are similar to those of Catling (1979), who distinguished between 'Egocentric', 'Objective' and 'Abstract' representations based on a Genevan description of development, and to Ladd's criteria of 'Pictorial', 'Symbolic' and 'Abstract' maps, which clearly reflects Bruner's levels of representation, and Klett and Alpaugh's sub-category, 'Abstraction'.

THE DEGREE OF ABSTRACTION DEMONSTRATED.

The following Instructions were given to the judges for the preliminary analysis of this category.

Could you please consider the degree of ABSTRACTION demonstrated in these maps. This implies a progression from a pictorial representation through to a cartographically, symbol ically portrayed map. Could you sort the maps into 5 piles representing a progressive development from one end of the continuaa to another and place them in the appropriate folders, (numbered from I to 5). The following categories are offered as a guide, you may of course find no maps to represent one or more of the categories.

I. PICTORIAL. (Maps in this group will be totally pictorial. Often of a very limited area, an individual house for example, which may be drawn in three dimensions.

2. EXTENDED PICTORIAL. (Maps in this group will still be in the form of a picture, but of a more extensive area and will probably include more features represented as drawings, some of which will be flat and two dimensional.)

3. PICTURE MAP. (The beginnings of symbolisation are demonstrated in the maps in this category. Some elements will therefore be in symbolic form, but some pictures remain, often as if in an overhead form.)

4. APPROACHING A CONVENTIONAL MAP. (Some maps will be in an 'As if from an aeroplane perspective,' so true symbolisation and abstraction is not yet fully developed.)

5. A TRUE MAP. (Abstact symbolisation is now complete.)

Example maps for each of the 'Abstraction' categories are presented in the following pages, again they have been reduced in size. A tabulated analysis of the proportions of the sample (by Percentage) achieving each of the above categories is presented overpage with differences by age and sex.

THE DEGREE OF ABSTRACTION DEMONSTRATED IN THE AREA AND ROUTE MAPS.

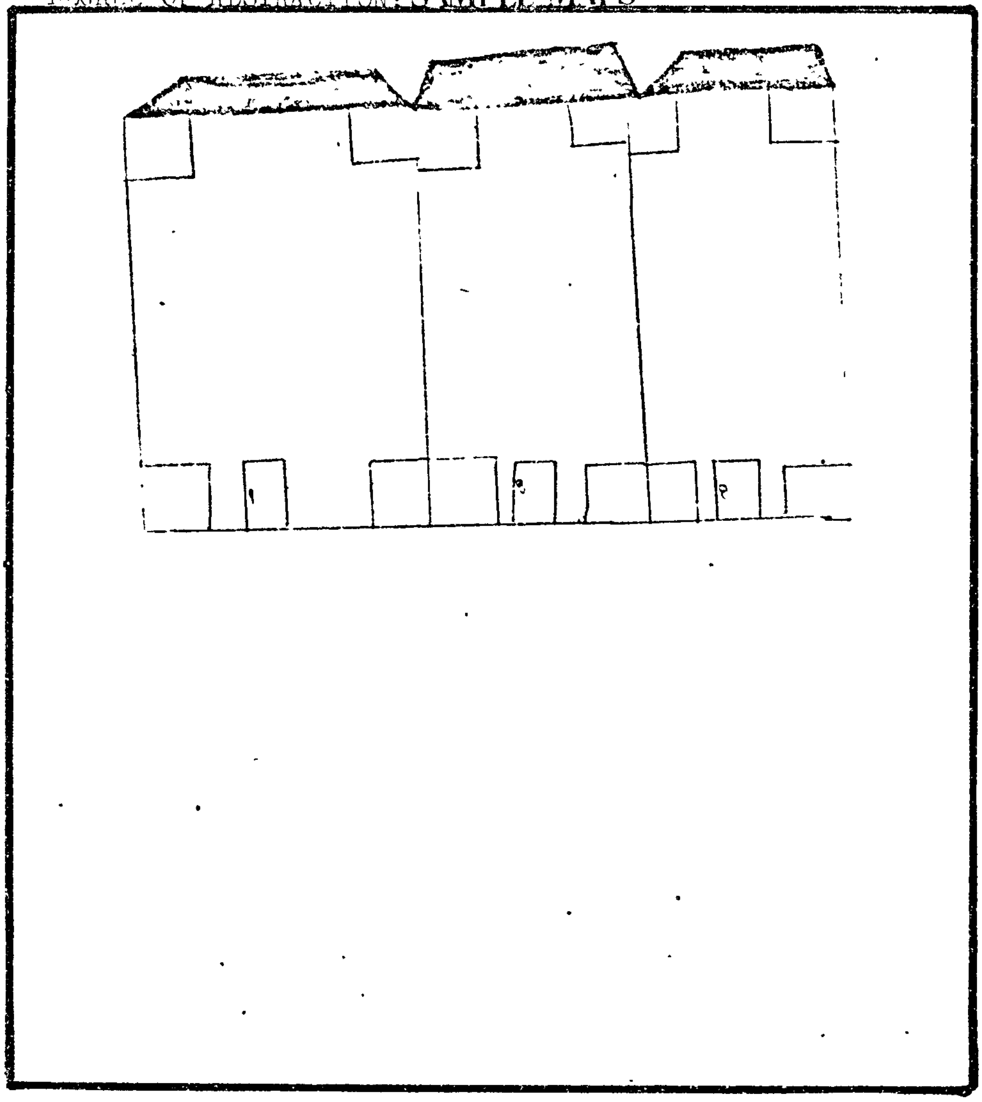
MAP I. THE AREA MAP

SAMPLE	I	2	3	4	5
IO - II year olds	I6.8%	I2%	24%	29.6%	I7.6%
II - I2 " "	I7.9%	5.I%	I4.I%	39.I%	23.8%
I2 - I3 " "	2.9%	7.4%	I5.4%	42.9%	3I.4%
TOTAL	II.8%	7.9%	I7.3%	37.9%	25.I%
BOYS.					
IO - II year olds	8.2%	8.2%	3I.I%	39%	I3.5%
II - I2 " "	I3.2%	5.3%	I8.4%	38.2%	24.9%
I2 - I3 " "	I.I%	5.4%	I6.I%	43%	34.4%
TOTALS	6.9%	6.I%	20.9%	40.4%	25.7%
GIRLS.					
IO - II year olds	25%	I5.6%	I7.2%	20.3%	2I.9%
II - I2 " "	22.5%	5%	I0%	40%	22.5%
I2 - I3 " "	4.9%	9.8%	I4.6%	42.7%	28%
TOTAL	I6.8%	9.7%	I3.7%	35.4%	24.4%

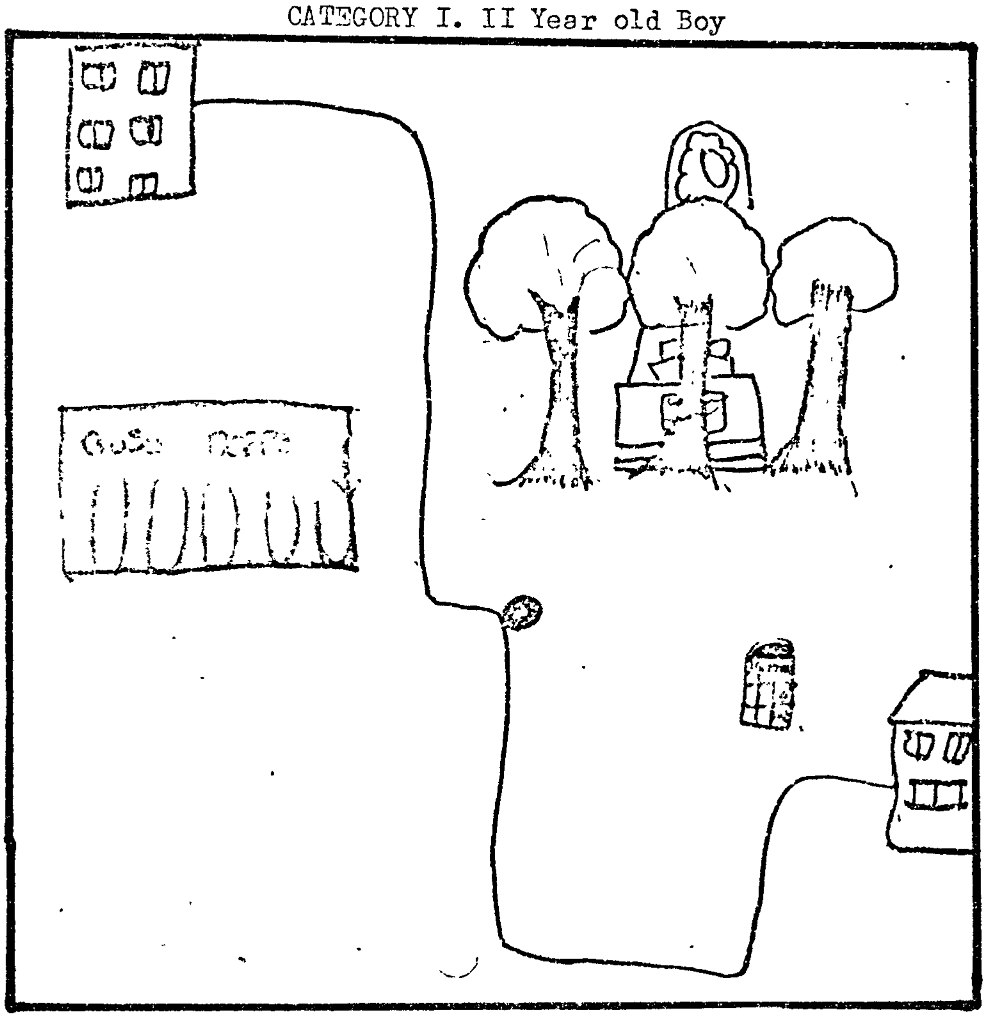
MAP 2 THE ROUTE MAP.

SAMPLE.	I	2	3	4	5
IO - II year olds	8.2%	26.2%	I8.9%	22.I%	24.6%
II - I2 " "	2.8%	II.7%	I9.3%	33.I%	33.I%
I2 - I3 " "	-	2.5%	II.I%	25.9%	60.5%
TOTAL	3.3%	I2.4%	I6.I%	27.3%	40.9%
BOYS					
IO - II year olds	5.I%	I8.6%	I6.9%	28.8%	30.6%
II - I2 " "	I.5%	7.6%	I8.2%	39.4%	33.3%
I2 - I3 " "	-	I.2%	8.4%	33.7%	56.7%
TOTAL	I.9%	8.2%	I3.9%	34.I%	4I.9%
GIRLS					
IO - II year olds	II.I%	33.3%	20.6%	I5.9%	I9.I%
II - I2 " "	3.8%	I5.2%	20.3%	27.8%	32.9%
I2 - I3 " "	-	3.8%	I3.9%	I7.7%	64.6%
TOTAL	4.5%	I6.3%	I8.I%	20.8%	40.3%

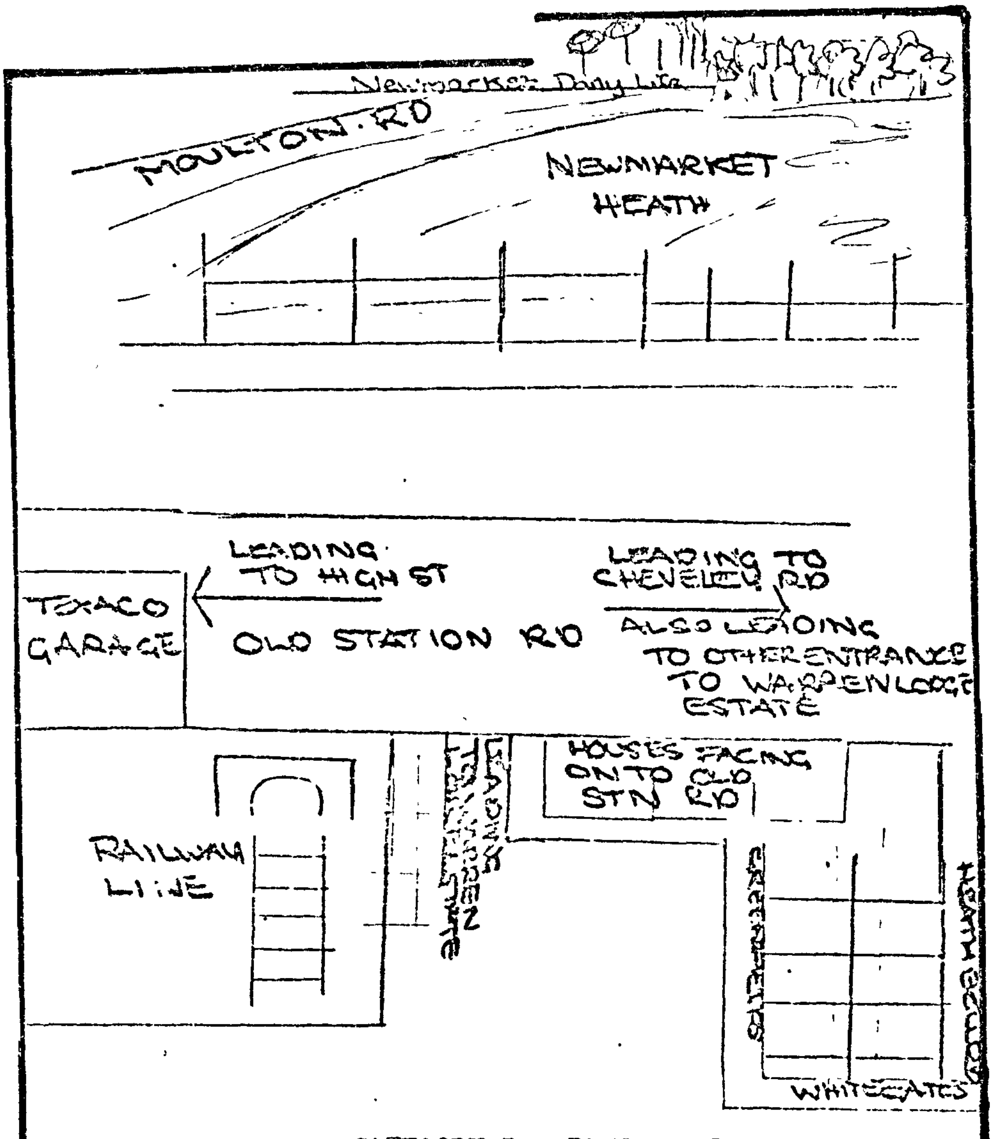
DEGREE OF ABSTRACTION: SAMPLE MAPS



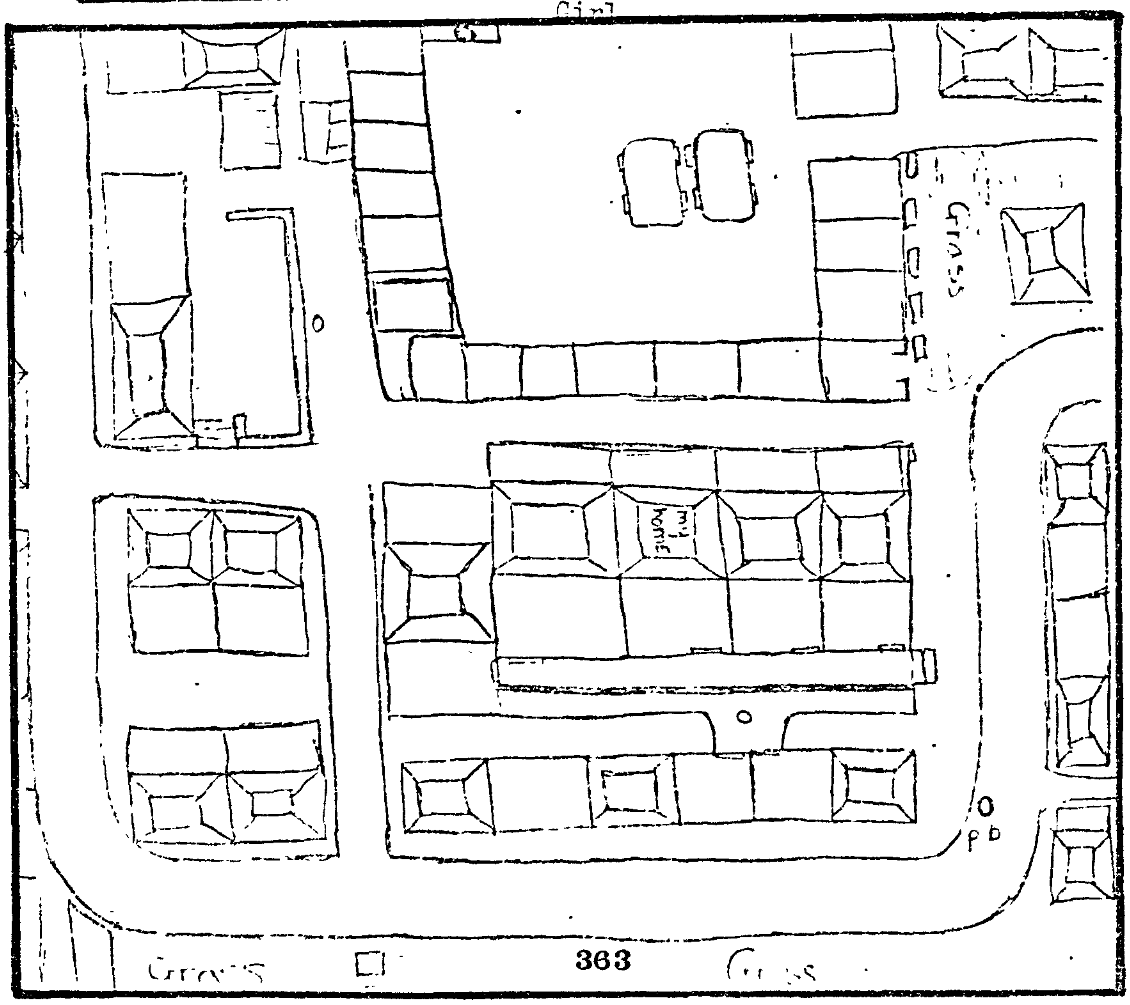
CATEGORY I. II Year old Boy



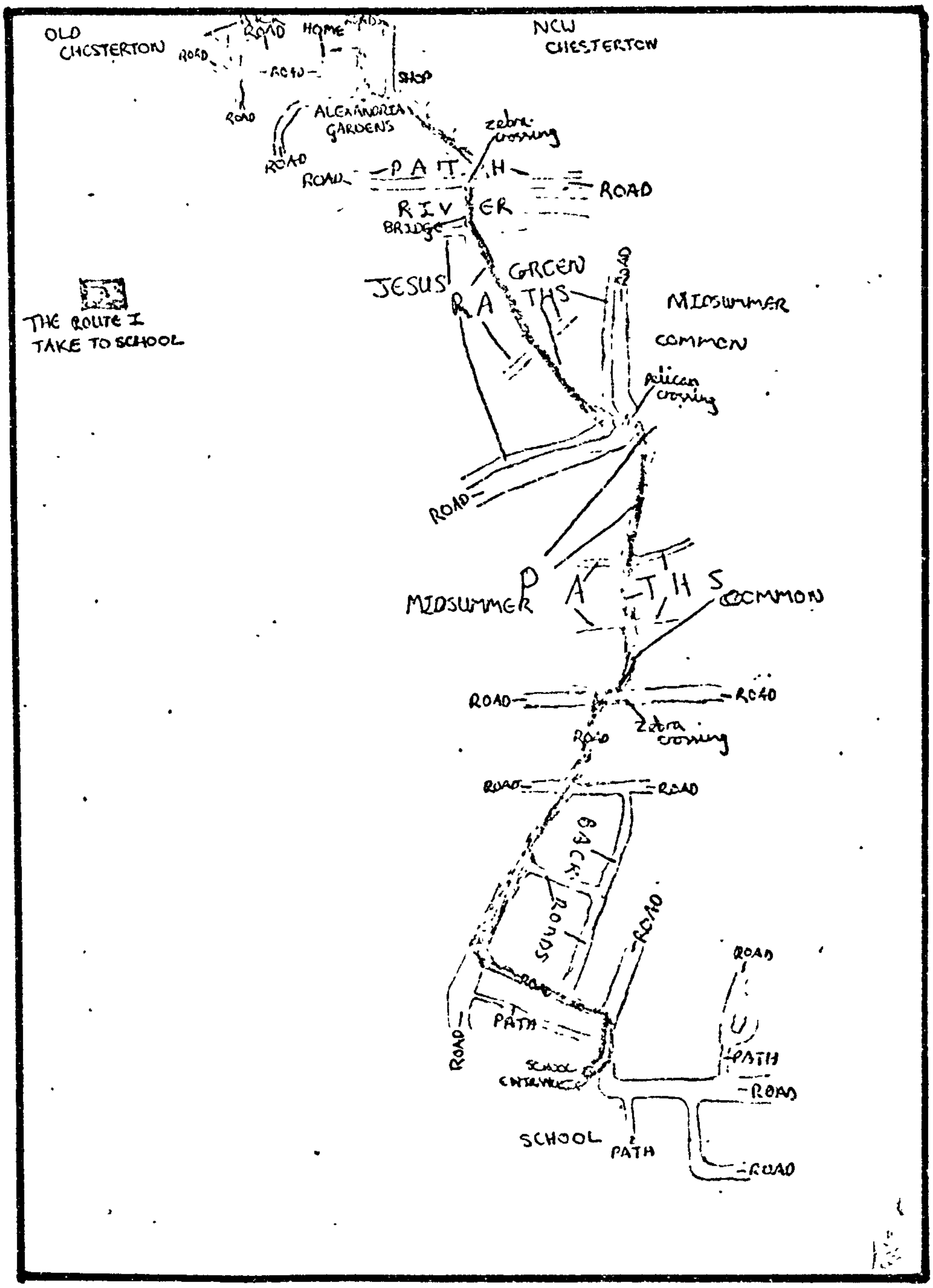
CATEGORY 2...IO Year old Girl



CATEGORY 3...I2 Year old Girl



CATEGORY 4...I2 Year old Boy.



CATEGORY 5...I3 Year old Boy.

3. The PERSPECTIVE adopted.

Klett and Alpaugh (I976), in applying the ideas first suggested by Blaut and Stea (I970, I975 op.cit.), argue that the ability to represent things in symbolic and abstract form on a map is dependent on the perspective adopted by the mapper. It is clear that if an individual views a map as an overhead view of the landscape, the resulting document will be less pictorial and more typical of the conventional map. The mental transformations required to adopt such a perspective has obvious associations with spatial ability,as well as requiring the 'disembedding' ability discussed for the earlier categorisations. As such it is hypothesised that the greater spatial ability of field independent individuals allied with their ability to separate elements from the surrounding visual field will lead them to adopt an overhead perspective when drawing their maps, whereas field dependent subjects are less likely to do so.

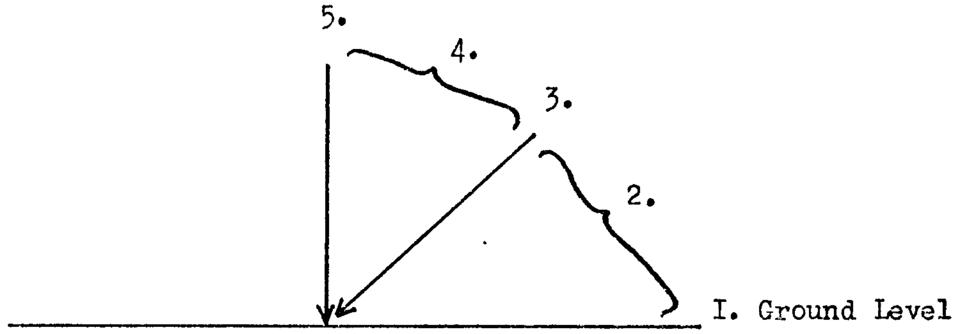
Klett and Alpaugh (I976) identify three main perspectives, those of Ground Level, as if an individual is drawing what he sees or is thinking about with his line of sight parallel to the ground; a Downward Oblique viewpoint, where the line of sight is at an acute angle with the ground producing maps which include features displayed at some very odd angles; and finally an Overhead viewpoint, where the line of sight is perpendicular to the ground and the resulting maps more symbolic. Maps in this final category can often take the overhead view almost literally, as for example one I2 year old in the study who commented, "I tried to think about my map as if I was in an aeroplane looking down." As a result, such maps might include roof tops, chimneys, the tops of trees, and on one occasion, even the heads of people walking in the street.

The analysis employed in this study adopted and slightly modified those of Klett and Alpaugh, with the inclusion of 'mixed ' categories between I and 2, and 2 and 3, as Klett and Alpaugh had also done in their analysis. The following diagram was also included to help in the analysis, and it can be seen that the progression represents a move from a more egocentric towards a more abstract perspective

THE PERSPECTIVE ADOPTED.

The following instructions were given to the judges for the preliminary analysis of this category.

Could you please consider the Perspective from which you think these maps have been drawn by sorting them into 5 piles using the guide lines described here. There may of course be categories for which there are no maps. It is hoped that the diagram will be of some help in your deliberations:



I. An Egocentric Viewpoint. (Maps of this category adopt a Ground level viewpoint, as if the mapper is face on to the features mapped, Position I in the above diagram.)

2. Intermediate. (A mixed category which contains some elements at stage I, (face on) and some as described for category 3, at an Oblique angle to the ground)

3. Downward Oblique. (Line of sight for this category is in position 3. in the diagram, and as a result features are often 'splayed' out at odd angles. The vantage point may therefore vary from feature to feature.)

4. Intermediate. (A mixed category between stages 3 and 5. Maps in this category are therefore likely to contain some elements drawn from an oblique perspective and the beginnings of an overhead viewpoint.)

5. An Overhead Viewpoint. (All elements are presented as if the viewpoint adopted is perpendicular to the ground, some elements may not yet be symbolised, for example some houses may be portrayed with the roof or chimney indicated.)

Example maps for each of the 'Perspective' categories are presented in the following pages, which have again been reduced in size. A tabulated analysis of the percentages of the sample who achieved the above categories is presented overpage with differences by age and by sex.

THE PERSECTIVE ADOPTED IN THE AREA AND ROUTE MAPS.

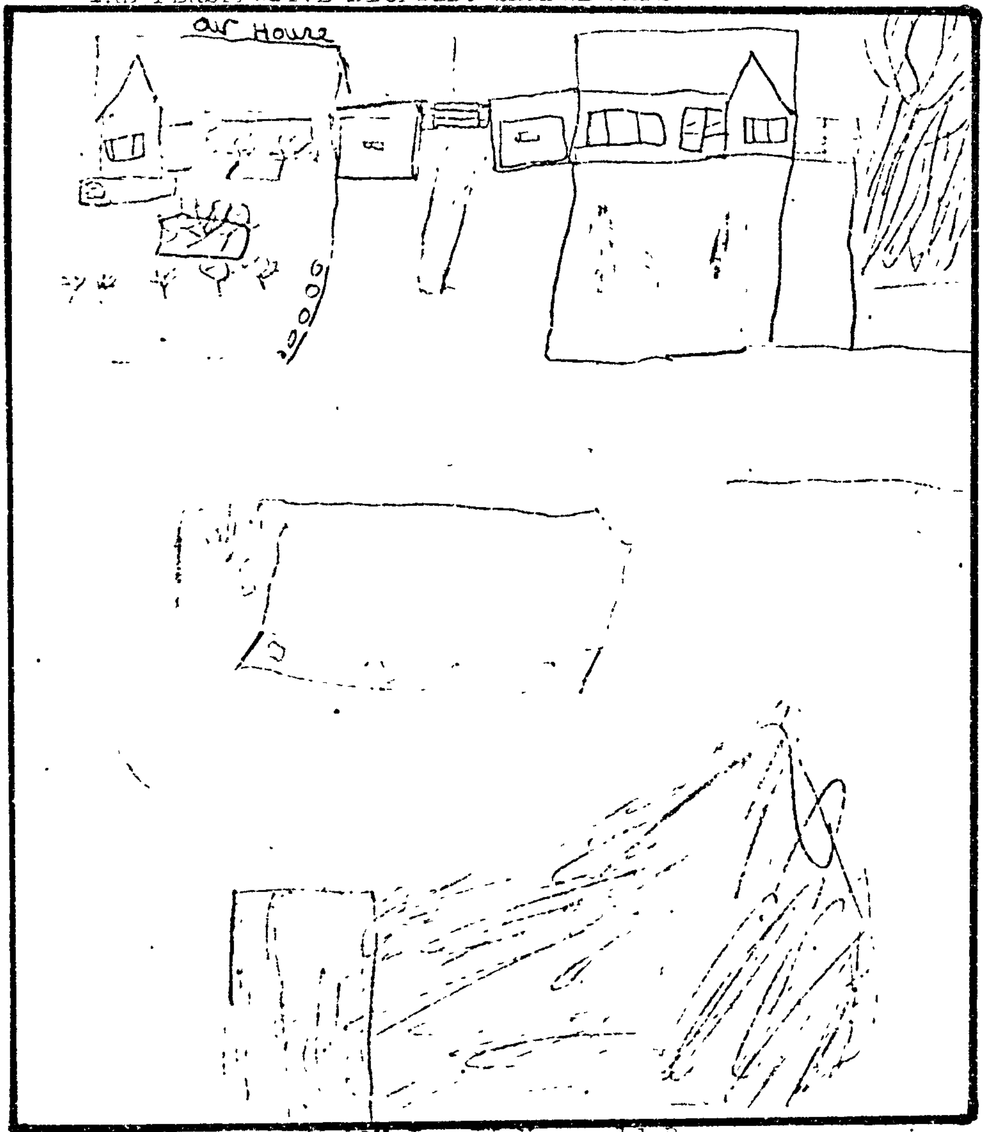
MAP I.THE AREA MAP.

SAMPLE.	I	2	3	4	5
IO - II year olds	8.8%	9.6%	I4.4%	29.6%	37.6%
II - I2 " "	7.I%	IO.9%	IO.2%	2I.8%	50%
I2 - I3 " "	2.3%	2.9.	9.I%	I4.8%	70.9%
TOTAL	5.7%	7.5%	IO.9%	2I.3%	54.6%
BOYS.					
IO - II year olds	3.4%	8.2%	6.6%	40.9%	40.9%
II - I2 " "	6.6%	9.2%	6.6%	22.4%	55.2%
I2 - I3 " "	I.I%	I.I%	IO.8%	I3.9%	73.I%
TOTAL	3.5%	5.7%	8.3%	23.8%	58.7%
GIRLS					
IO - II year olds	I4.I%	IO.9%	2I.9%	I8.8%	34.3%
II - I2 " "	7.5%	I2.5%	I3.8%	2I.2%	45%
I2 - I3 " "	3.7%	4.9%	7.3%	I5.8%	68.3%
TOTAL	7.9%	9.3%	I3.7%	I8.6%	50.5%

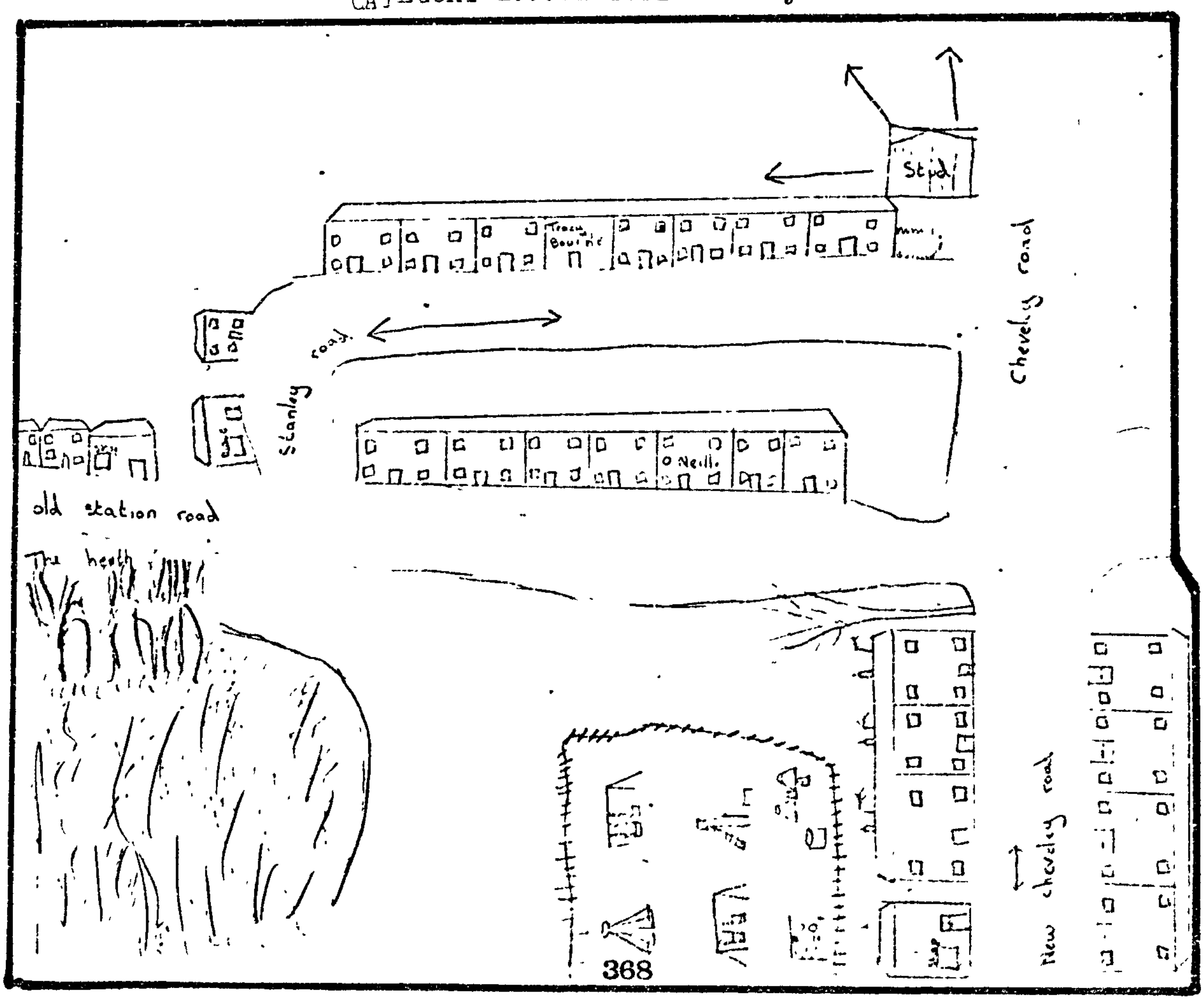
MAP 2. THE ROUTE MAP.

SAMPLE	I	2	3	4	5
IO - II year olds	5.7%	II.5%	I6.4%	I8.8%	47.5%
II - I2 " "	0.7%	4.I%	I2.4%	22.8%	60%
I2 - I3 " "	I.2%	-	4.9%	I6.I%	77.8%
TOTAL	2.3%	4.7%	IO.7%	I9.I%	63.2%
BOYS.					
IO - II year olds	I.7%	5.I%	8.5%	I8.6%	66.I%
II - I2 " "	-	6.I%	7.6%	I9.6%	66.7%
I2 - I3 " "	-	-	3.6%	I5.7%	80.7%
TOTAL	0.5%	3.4%	6.2%	I7.8%	72.I%
GIRLS.					
IO - II year olds	9.5%	I7.5%	23.8%	I9.I%	30.I%
II - I2 " "	I.3%	2.5%	I6.5%	25.3%	54.4%
I2 - I3 " "	2.5%	-	6.3%	I6.5%	74.7%
TOTAL	4.I%	5.9%	I4.9%	20.4%	54.7%

THE PERSPECTIVE ADOPTED: SAMPLE MAPS

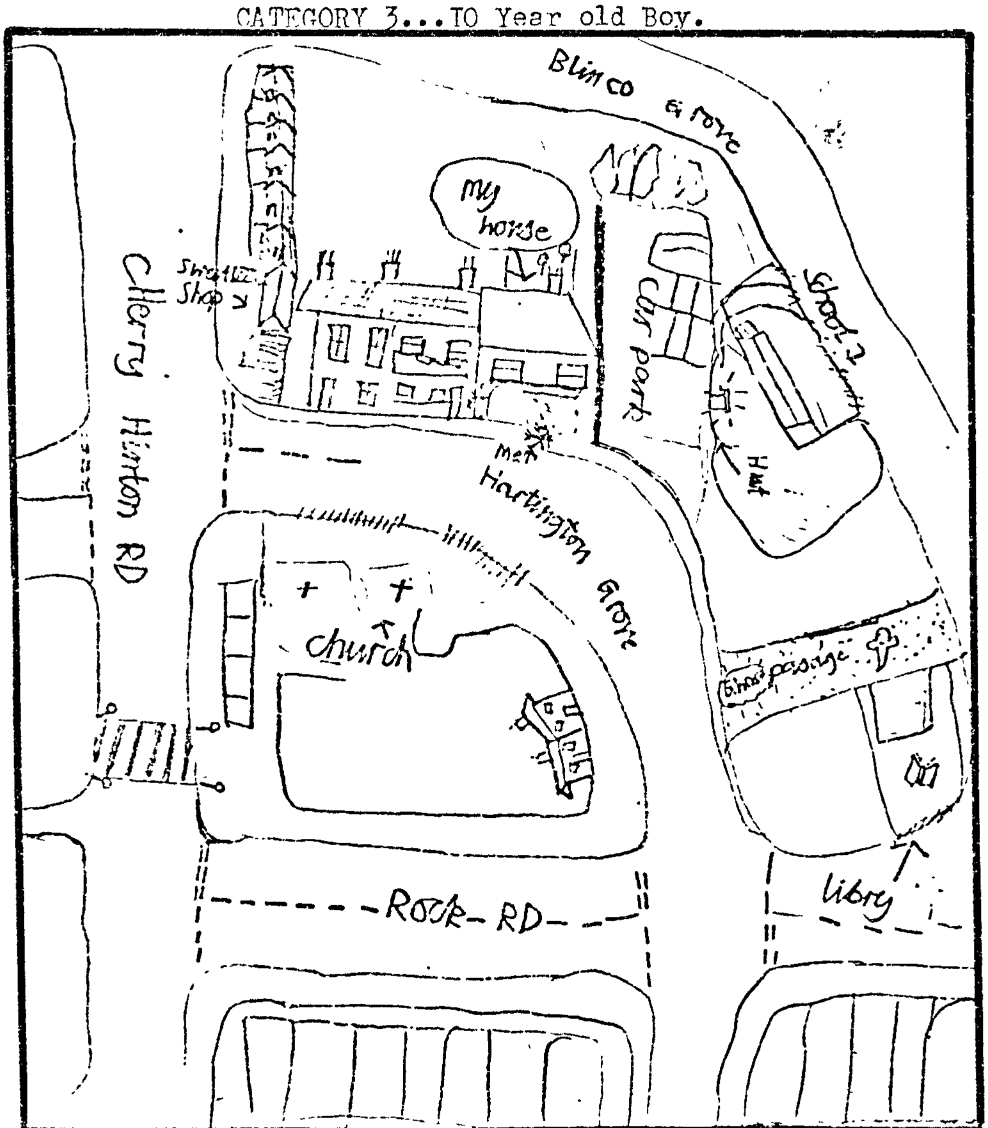


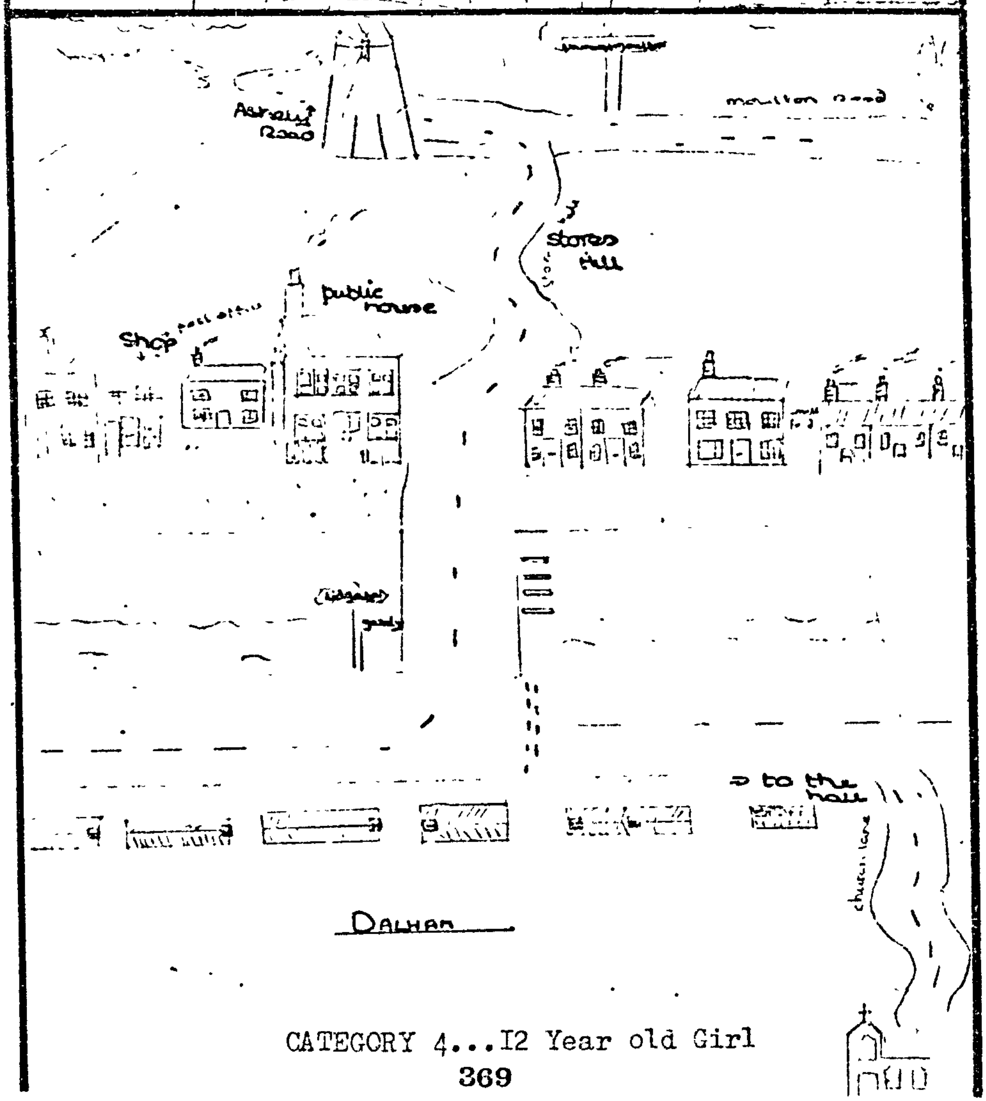
CATEGORY 1...11 Year old Boy.



CATEGORY 2. IO Year old Girl

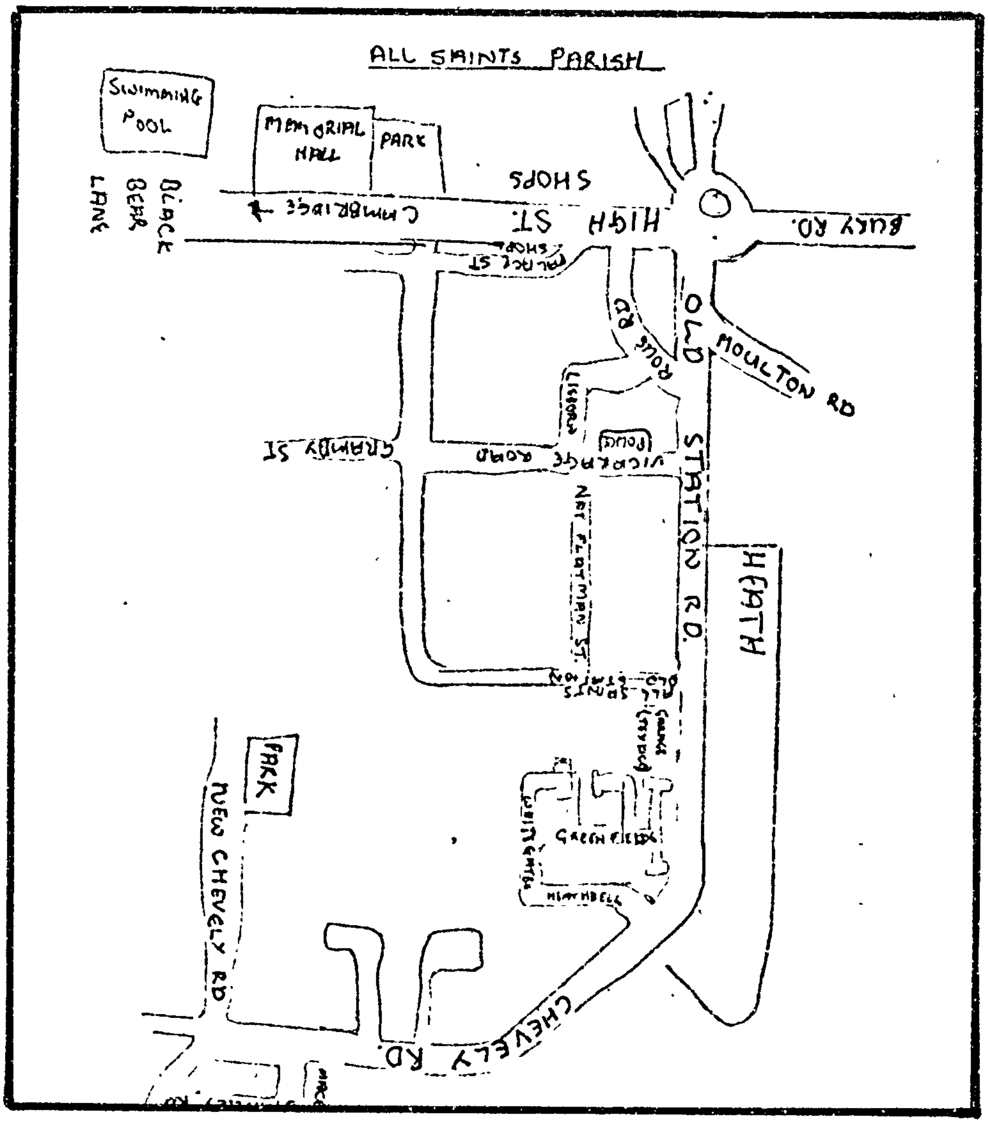
CATEGORY 3...10 Year old Boy.





CATEGORY 4...12 Year old Girl

CATEGORY 5...I2 Year old Boy.



4. The Accuracy or Quality of the Map.

A central question one needs to ask about any map is, could it serve the true purposes of a map? Is it possible to use it as a directional or locational document? This raises important questions about the map's quality, its accuracy and its inclusion of relevant detail with respect to its intended purpose. The fourth means of analysis attempted to consider these factors, to assess the organisation of the map as a complete and integrated whole. It was a central hypothesis of this study that there would be a relationship between elements of the map analysis and measures of Field dependence/independence, and in terms of this particular element there is an obvious use of the 'analytic ability' associated by Witkin with Field Independence. Field Independent subjects are said to be more analytic and precise, and it is suggested that this will be demonstrated in the quality of the maps produced by the sample.

As in the previous categories,a 5 point scale was adopted to represent a progressive improvement in the quality of the maps. The criteria for this analysis was derived from previous analyses of this kind. Appleyard (1969)included a consideration of accuracy in his study of Ciudad Guayana, by comparing the recall maps of his sample with the local city map. Bycroft (1974), included a focus of this kind when he asked his judges to undertake an 'wholistic' sorting of his maps, and as Bycroft comments (p.29), the analysis of some measure of the quality or accuracy has been included in most cognitive mapping studies since Lynch.

The Accuracy of the Maps.

The following instructions were given to the judges for the preliminary analysis of this category.

Could you please consider the organisation of these maps in terms of their quality. Could the map serve the true purposes of a map, is it accurate in terms of its representation of scale, orientation and detail? The Ordnance Survey map and local maps of the area are available for comparison. Again, could you sort the maps in to 5 categories along the lines suggested below. Of course there may be no maps for some of the categories described.

I. Unco-ordinated Representation. (An inaccurate map, poor co-ordination of detail, or placing of information; the detail itself is very limited and there is an omission of important features or information. e.g. road names, directions, and elements not correctly positioned. As a map it will serve no useful purpose.)

2. Intermediate. (Some improvement on category I, but still poorly co-ordinated. Increased detail, but this is still lacking in organisation. e.g. some useful locational detail included, but still involves difficulty in orienting to reality. Not easy to interpret or use.

3. Reasonable degree of Organisation. (Increased detail, now more carefully arranged, it might include the local road network appropriately named and increased locational information. Some consideration is given to the scale of the map, but it is still not fully accurate and as a result orientation of the map to the local map proves difficult.)

4. Intermediate. (Now a much more carefully co-ordinated and detailed document which is clearly presented and well organised, but contains some minor errors of omission, orientation or scale.)

5. An Accurate and well Organised Map. (Maps in this category will demonstrate a clear consideration of distance, direction, location and scale. Elements are located with a good degree of precision and there is a close correspondence with reality.)

Example maps for each of the above categories are included in the following pages. The tabulation below provides details of the percentages of the sample achieving each of the categorisations, by age and sex.

THE ACCURACY OF THE MAPS.

MAP I. THE AREA MAP

SAMPLE.					
IO - II year olds	20%	35.2%	42.4%	2.4%	-
II - I2 " "	28.2%	32.I%	37.I%	I.3%	I.3%
I2 - I3 " "	9.7%	28%	49.7%	9.2%	3.4%
TOTAL	I8.9%	31.4%	43.4%	4.6%	I.7%
BOYS					
IO - II year olds	I8.I%	40.9%	36.I%	4.9%	-
II - I2 " "	26.4%	32.9%	35.5%	2.6%	2.6%
I2 - I3 " "	I2.9%	30.I%	43%	8.6%	5.4%
TOTAL	I8.7%	33.9%	38.7%	5.6%	3.I%

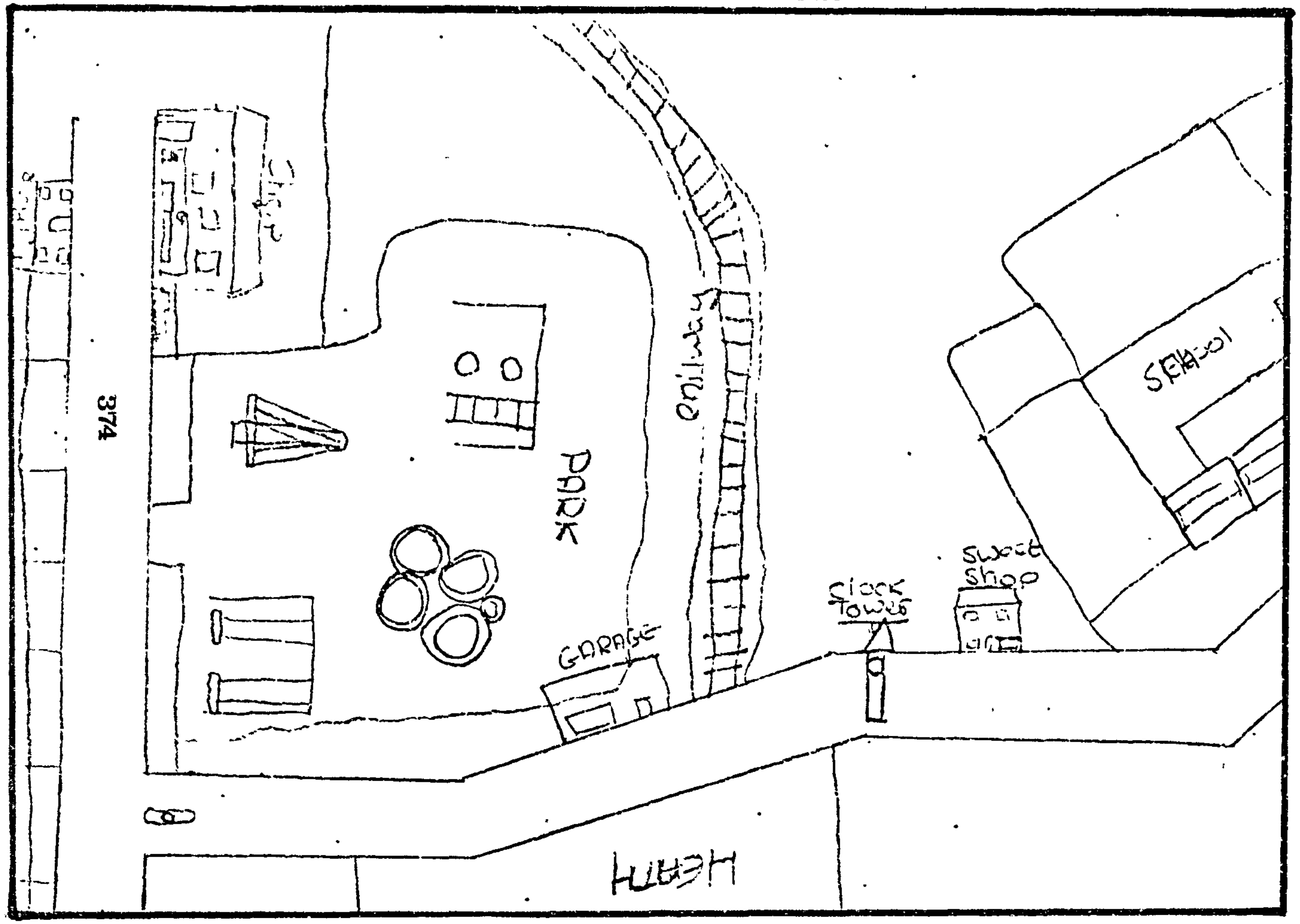
THE AREA MAP cont.

GIRLS.	I	2	3	4	5
IO - II year olds	2I.9%	29.7%	48.4%	-	-
II - I2 " "	30%	3I.3%	38.7%	-	-
I2 - I3 " "	6.I%	25.6%	57.3%	9.8%	I.2%
TOTAL	I9%	28.8%	48.2%	3.5%	0.5%

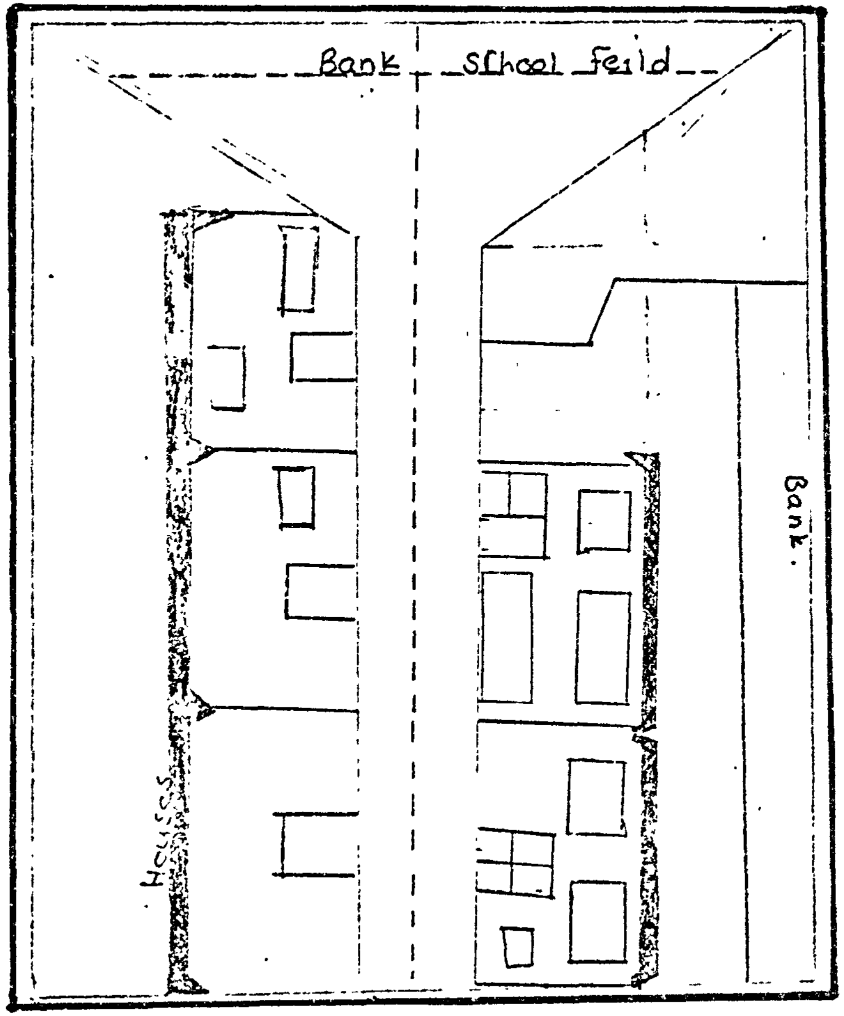
MAP 2. THE ROUTE MAP.

SAMPLE.	I	2	3	4	5
IO - II year olds	3I.9%	33.6%	3I.9%	2.6%	-
II - I2 " "	26.9%	37.8%	3I.I%	2.I%	2.I%
I2 - I3 " "	8.I%	32.I%	40.I%	I4.8%	4.9%
TOTAL	2I.2%	34.5%	34.7%	6.0%	2.6%
BOYS					
IO - II year olds	32.2%	28.8%	33.9%	5.I%	-
II - I2 " "	I9.6%	33.3%	40.9%	3.I%	3.I%
I2 - I3 " "	I3.3%	27.7%	38.5%	I5.7%	4.8%
TOTAL	20.7%	29.8%	37.9%	8.7%	2.9%
GIRLS					
IO - II year olds	3I.7%	38.I%	30.2%	-	-
II - I2 " "	32.9%	4I.7%	22.8%	I.3%	I.3%
I2 - I3 " "	2.6%	36.7%	4I.7%	I3.9%	5.I%
TOTAL	2I.7%	38.9%	3I.7%	5.4%	2.3%

CATEGORY 2. – 11 Year Old GIRL

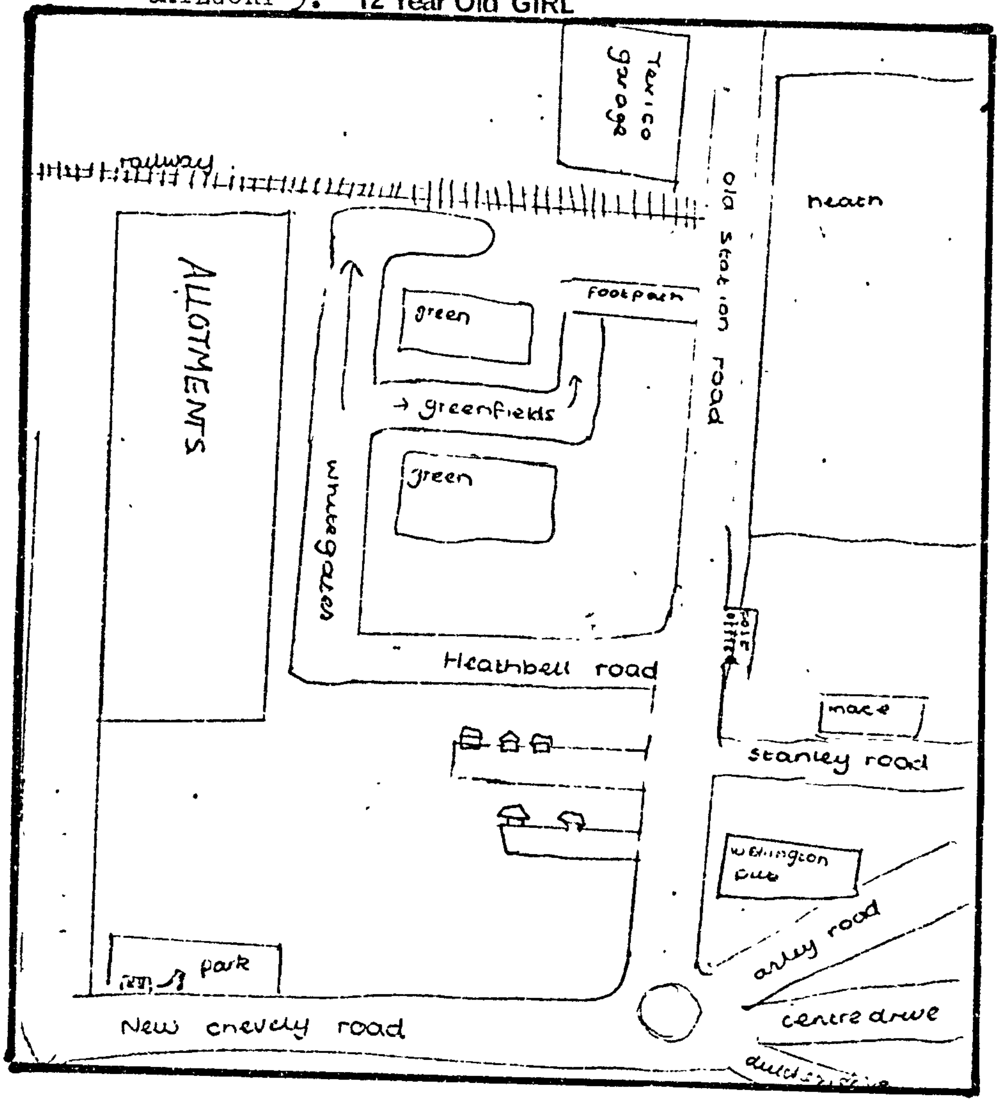


CATEGORY 1.- 11 Year Old BOY

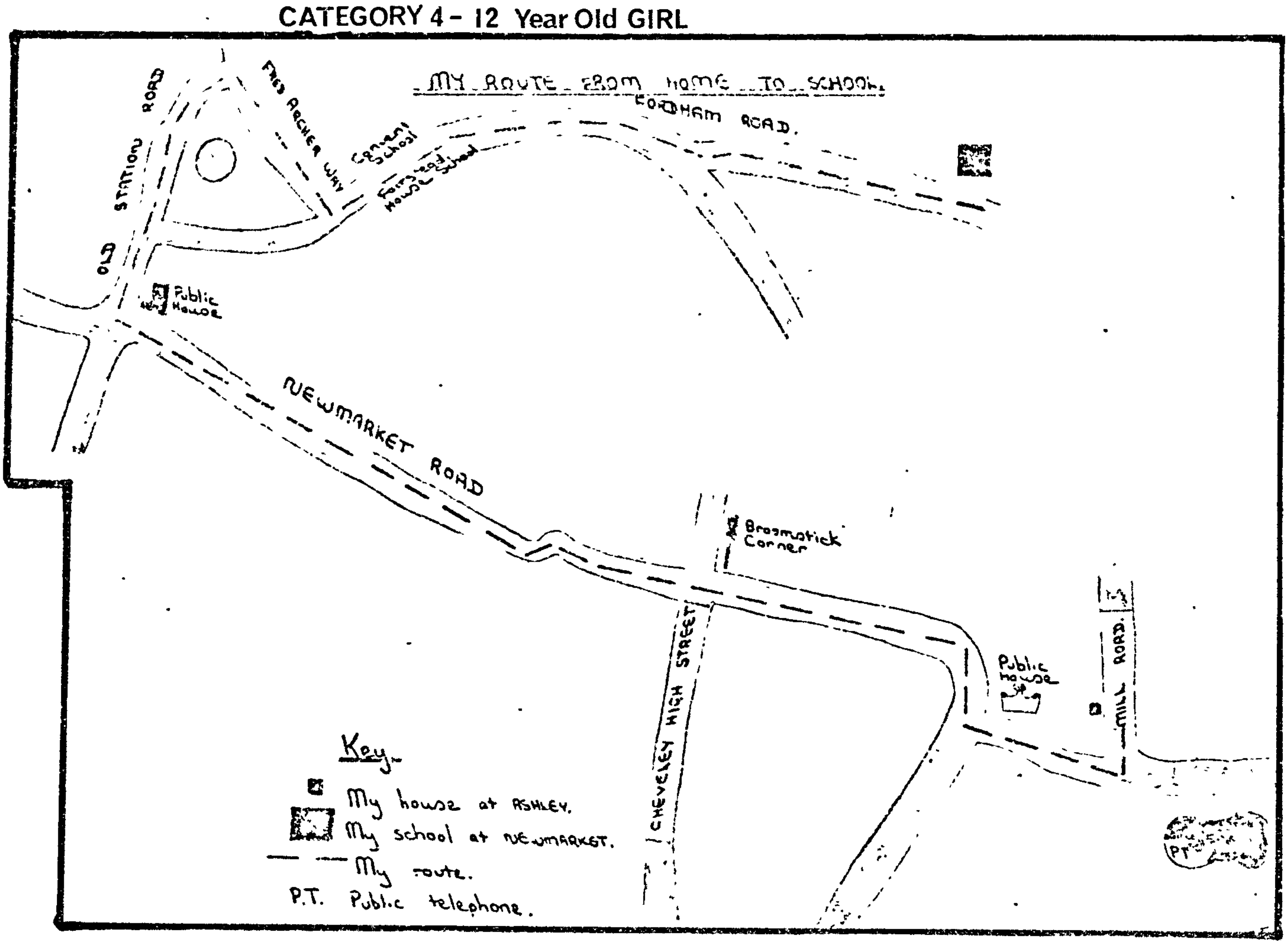


THE QUALITY OR ACCURACY OF THE MAPS.

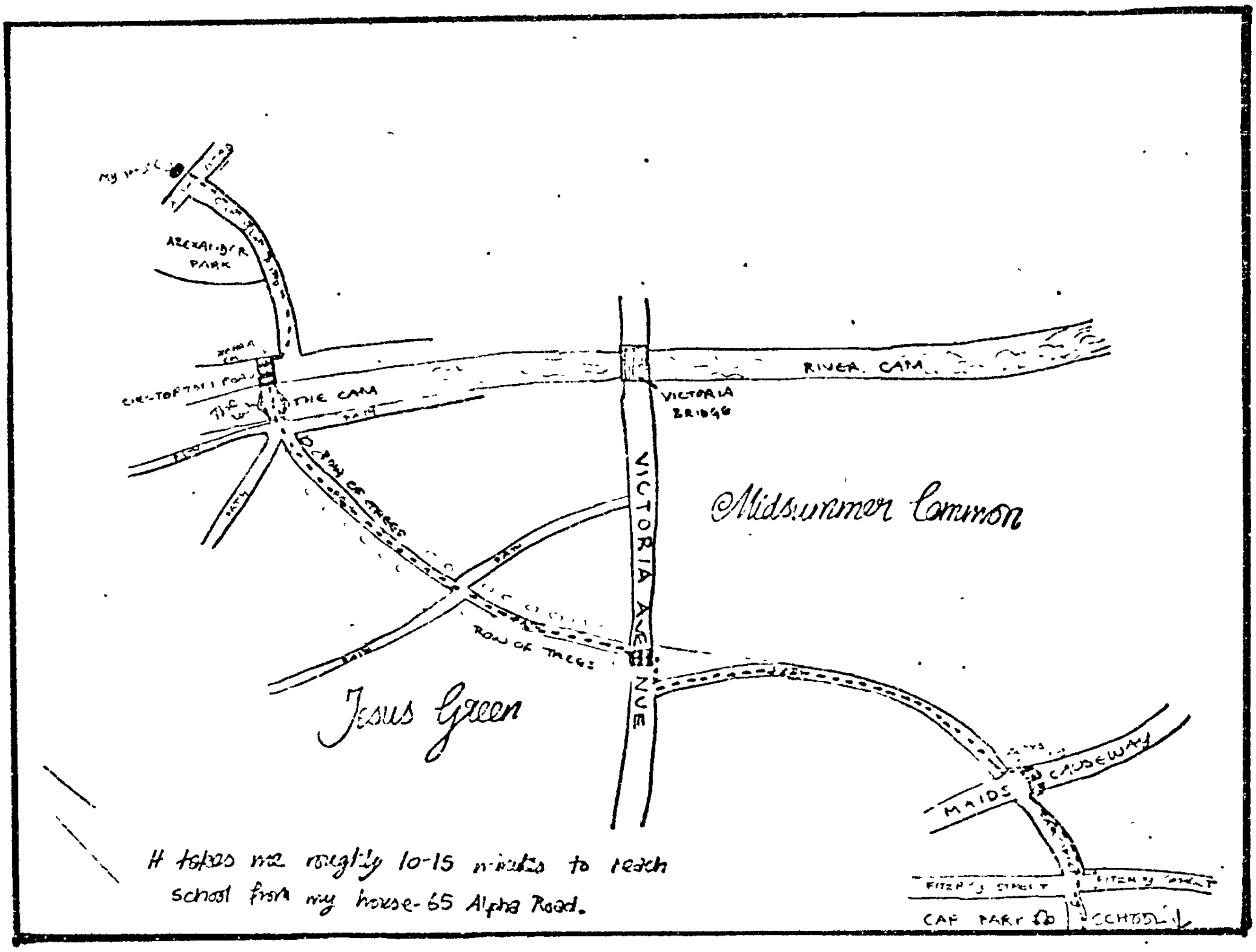
CATEGORY 3. - 12 Year Old GIRL



CATEGORY 4 - 12 Year Old GIRL

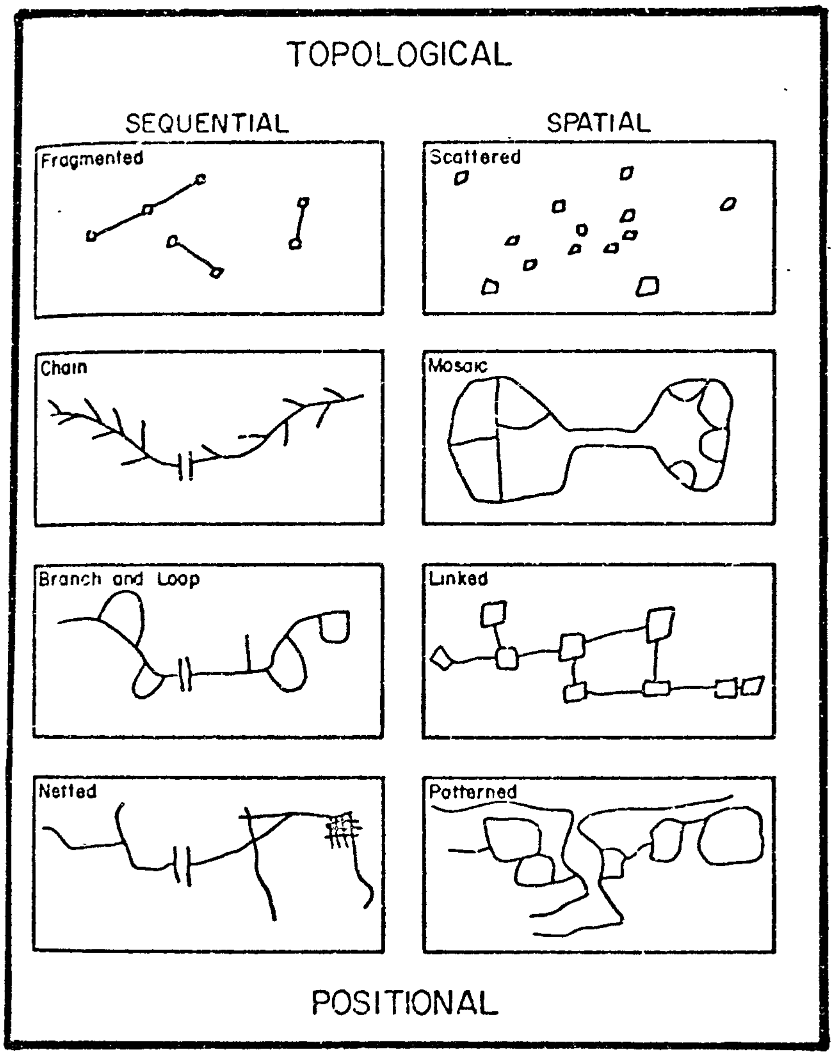


CATEGORY 5.- 13 Year Old GIRL



5. The Map Structure or Style.

The final element of the map analysis to be discussed here attempted to consider the style and structure of the maps produced by the children in the sample. Similar analyses have been undertaken by other cognitive mapping studies (e.g. Bycroft 1974 and Pocock 1975) and tend to be derived from the original work of Appleyard (1969). In his study of Ciudad Guayana, Appleyard considered the structure of his samples' maps in terms of the type of element included and the level of accuracy. As can be seen in the diagram below he distinguishes between 'Spatially' and 'Sequentially' organised maps. In sequential maps the parts are more obviously connected and the connections are dominant. In spatial maps connections appear to be incidental between the parts, which as a result are scattered over the map. These criteria are then sub-divided in to four categories according to the level of accuracy or sophistication of the map. This particular form of analysis was employed by Spencer and Lloyd (1974) in their study of Small Heath in Birmingham, by Goodchild(1974) in his study of Market Drayton and by Pocock (1975), in his study of Durham.



MAP STYLES TYPOLOGY, BASED ON TYPE OF ELEMENT AND LEVEL OF ACCURACY. (Appleyard 1969.)

Appleyard's criteria were modified by Bycroft (1974) and reduced to a series of 4 continua which represented varying degrees of structure included in the maps of his sample : Scattered -------Fragmented

Schematic -------Mosaic

Linked ----------Loop

Netted ----------Map

After initial attempts at applying the techniques described here , it was found that many of the categories did not seem to fit the maps of this study. It was also felt that these analyses were looking at more than the structure of the maps. (Appleyard's for example included accuracy, which had been considered separately for the maps in this exercise.) Map structure was interpreted as the style of the map, the way in which it had been constructed and drawn. So an attempt was made to simplify the categorisation and the following four categories resulted, which represents a progressive increase in the structural organisation of the maps in association with variations in style, suggesting that a specific style is more suitable for the production of an effective map. The high correlation achieved by the two judges on this task (0.94) suggests that it is possible to analyse the maps in these terms and seems to justify the simplification of the criteria, although the varied results of the inter-correlational analysis do seem to raise some questions about its appropriateness. In relation to the association with cognitive style , it is suggested that structure is closely allied to accuracy and precision and as such it was anticipated that the structural organisation, and thus a more appropriate map style, would be identified in the maps of more Field Independent individuals

MAP STRUCTURE OR MAP STYLE.

The following instructions were given to the judges for the preliminary analysis of this category.

Could you please consider the 'type' of maps produced. This form of analysis distinguishes between the maps in terms of the structure, the way that they have been drawn, and the four categories listed below represent a progressive improvement in the structure of the maps. Can you please use the criteria listed here to differentiate between the maps.

1. Line-Link Maps. (These maps are composed primarily of single lines to link all the locational information portrayed on the map. They tend to be very rough with little or no apparent structure.)
2. Irregular Maps. (Maps in this category tend to be Rough sketch like maps employing a high degree of wavy lines, bends and curves. Roads are shown as two lines varyingly separated, twisting haphazardly.)

3. Regular Maps. (These maps tend to be much more highly structured. Considerable use is made of straight lines probably drawn with a ruler. Such maps as a result are very angular in their appearance. Roads tend to be shown as parallel lines meeting at right angles. Houses are drawn as accurate squares or rectangles.)

4. True Maps.(Maps in this category are structurally well organised and employ an appropriate balance of straight and curved lines. As a result they are more likely to approximate reality.)

Example maps for each of the categories described above are included in the following pages. The results tabulated below indicate the percentages of the sample achieving each of the categories by age and by sex.

THE STYLE OF THE MAPS.

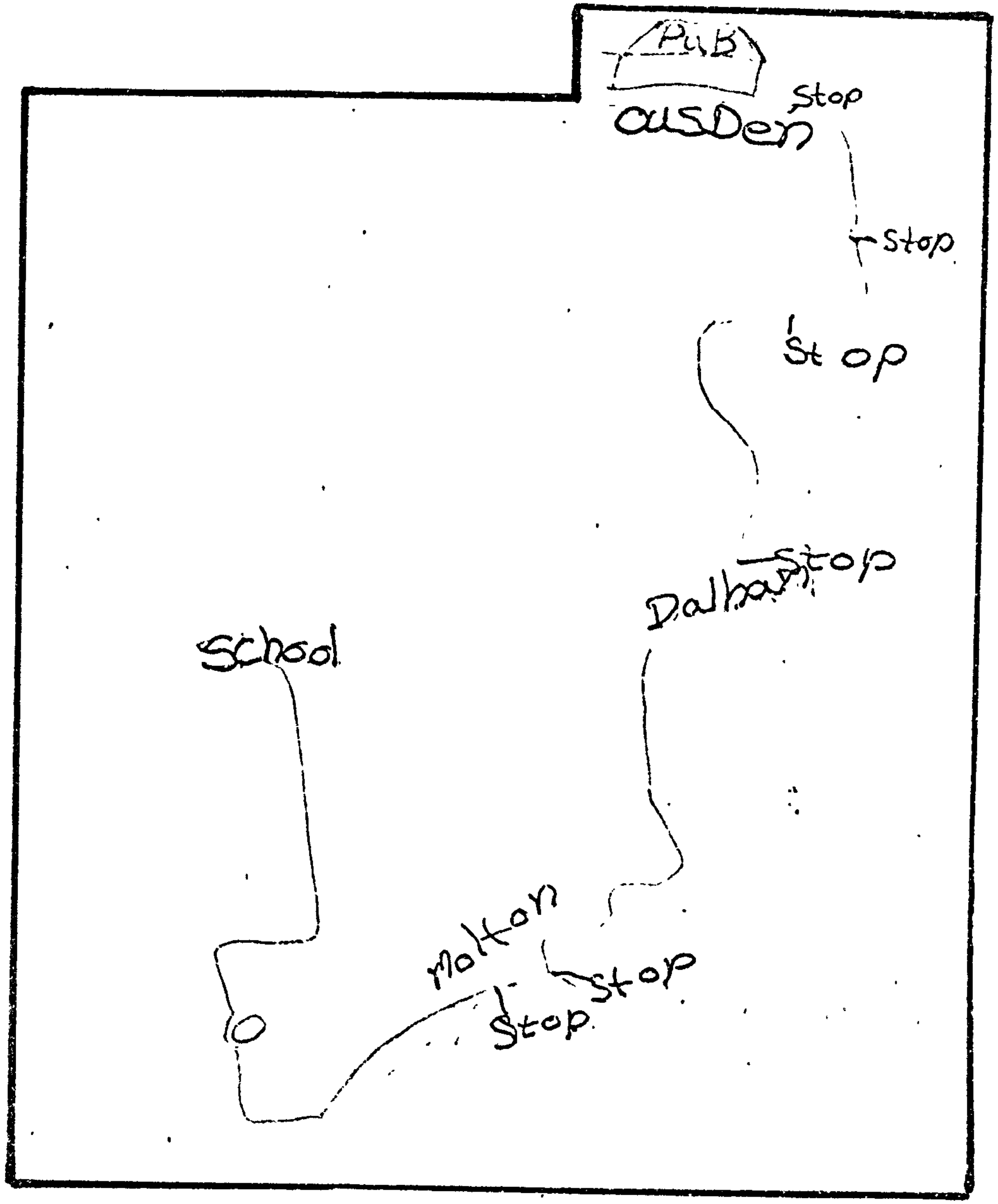
MAP I. THE AREA MAP.

SAMPLE.	I	2	3	4
IO - II year olds	-	40%	57.6%	2.4%
II - I2 " "	I.3%	35.3%	62.2%	I.2%
I2 - I3 " "	I.7%	26.9%	57.I%	I4.3%
TOTAL	I.I%	33.3%	58.9%	6.7%
BOYS				
IO - II year olds	-	37.7%	59.I%	3.2%
II - I2 " "	I.3%	40.6%	56.6%	I.3%
I2 - I3 " "	2.2%	27.9%	52.7%	I7.2%
TOTAL	I.3%	34.8%	55.7%	8.2%
GIRLS				
IO - II year olds	-	42.4%	56.3%	I.5%
II - I2 " "	I.3%	30.0%	67.4%	I.3%
I2 - I3 " "	I.3%	25.6%	62.2%	IO.9%
TOTAL	0.9%	3I.9%	62.4%	4.8%

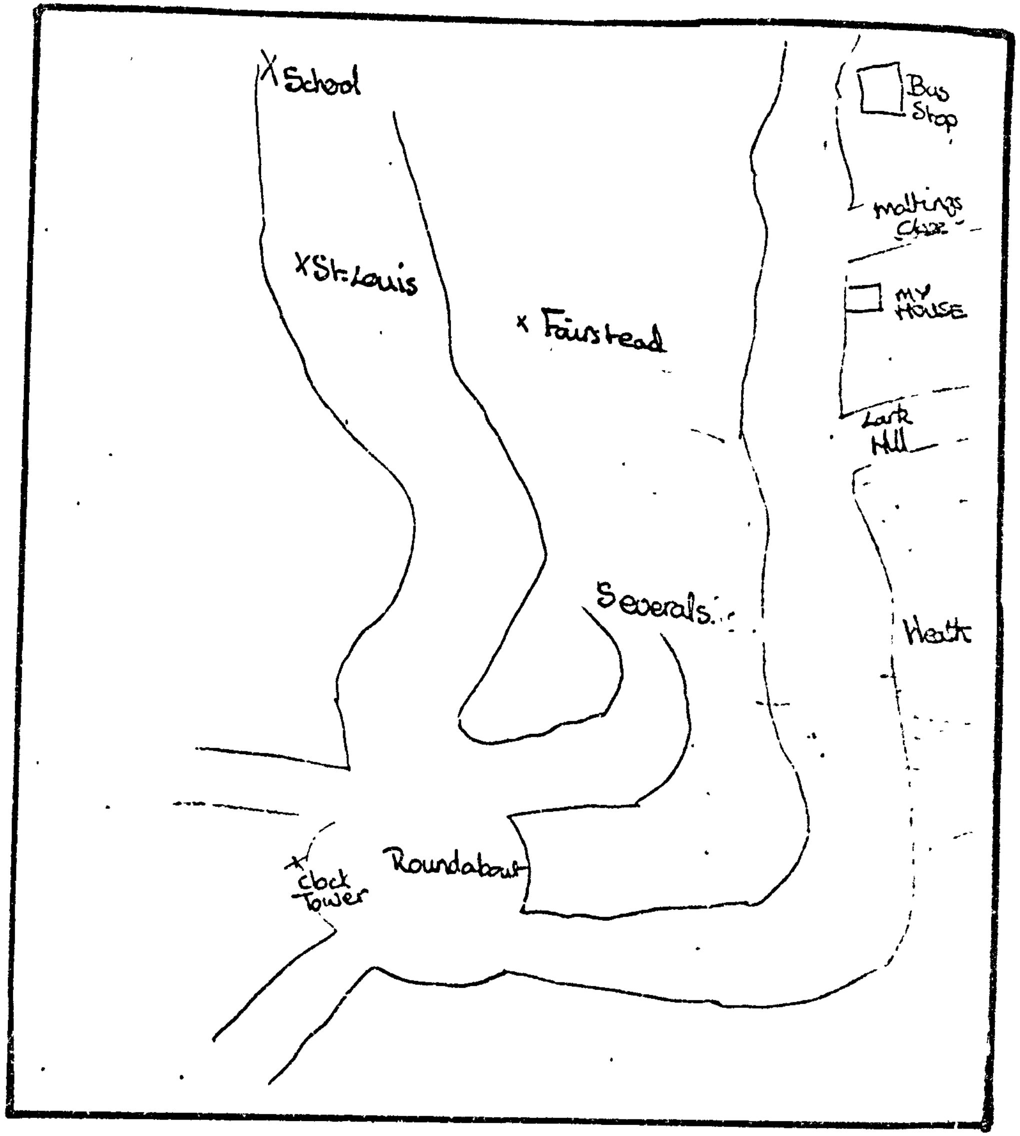
MAP 2. THE ROUTE MAP.

SAMPLE	I	2	3	4
I0 - II year olds	I4.8%	35.2%	45.9%	4.I%
II - I2 " "	I0.3%	33.I%	5I.7%	4.9%
I2 - I3 " "	7.4%	I9.I%	55.6%	I7.9%
TOTAL	I0.5%	28.4%	5I.5%	9.6%
BOYS.				
I0 - II year olds	I8.6%	25.4%	52.5%	3.5%
II - I2 " "	I0.6%	33.3%	50%	6.I%
I2 - I3 " "	9.6%	26.5%	55.4%	8.5%
TOTAL	I2.5%	28.4%	52.9%	6.2%
GIRLS.				
I0 - II year olds	II.I%	44.4%	39.7%	4.8%
II - I2 " "	I0.I%	32.9%	53.2%	3.8%
I2 - I3 " "	5.I%	II.4%	55.7%	27.8%
TOTAL	8.6%	28.5%	50.2%	I2.7%

THE STYLE OR STRUCTURE OF THE MAPS

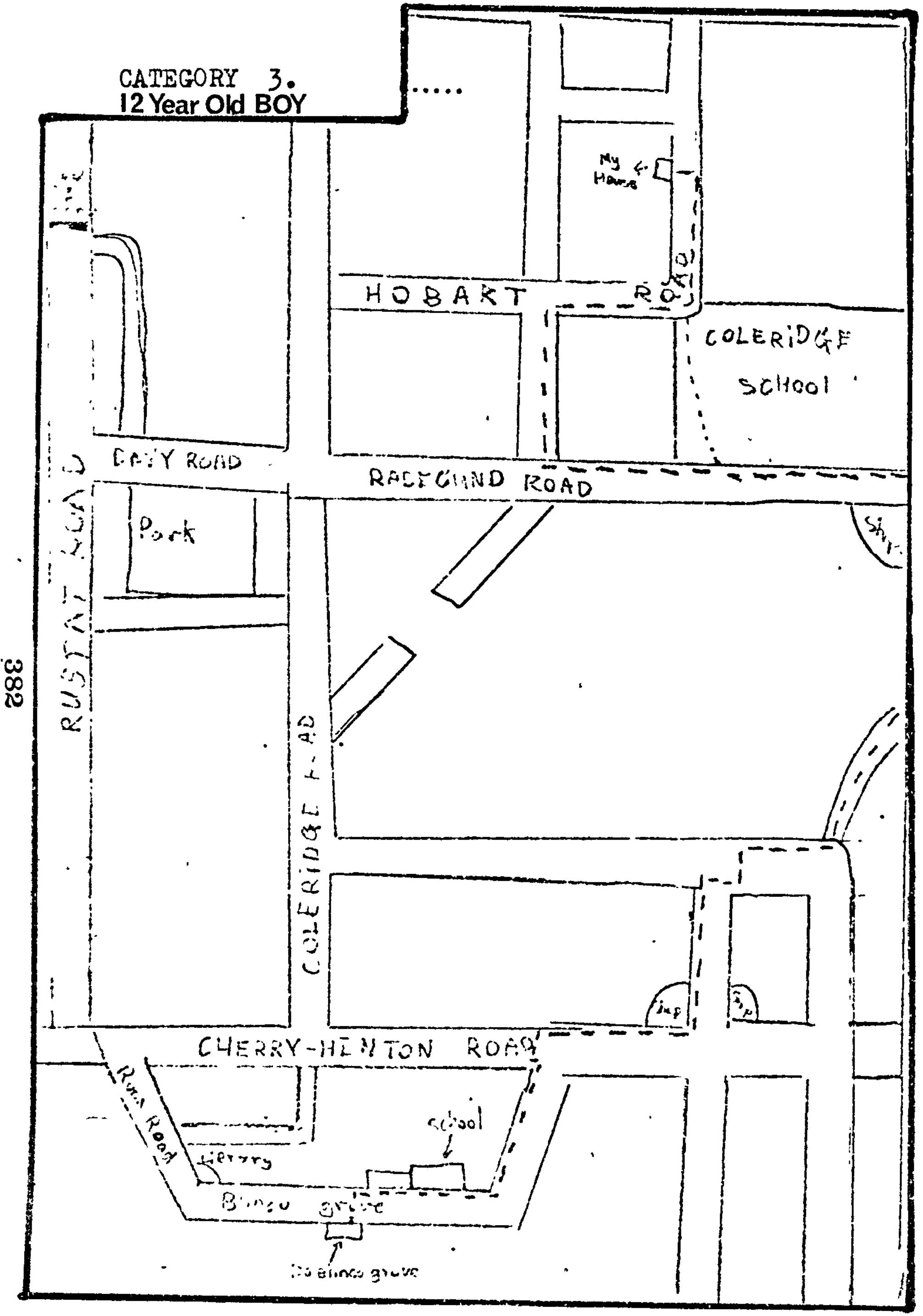


CATEGORY I - 10 Year Old BOY

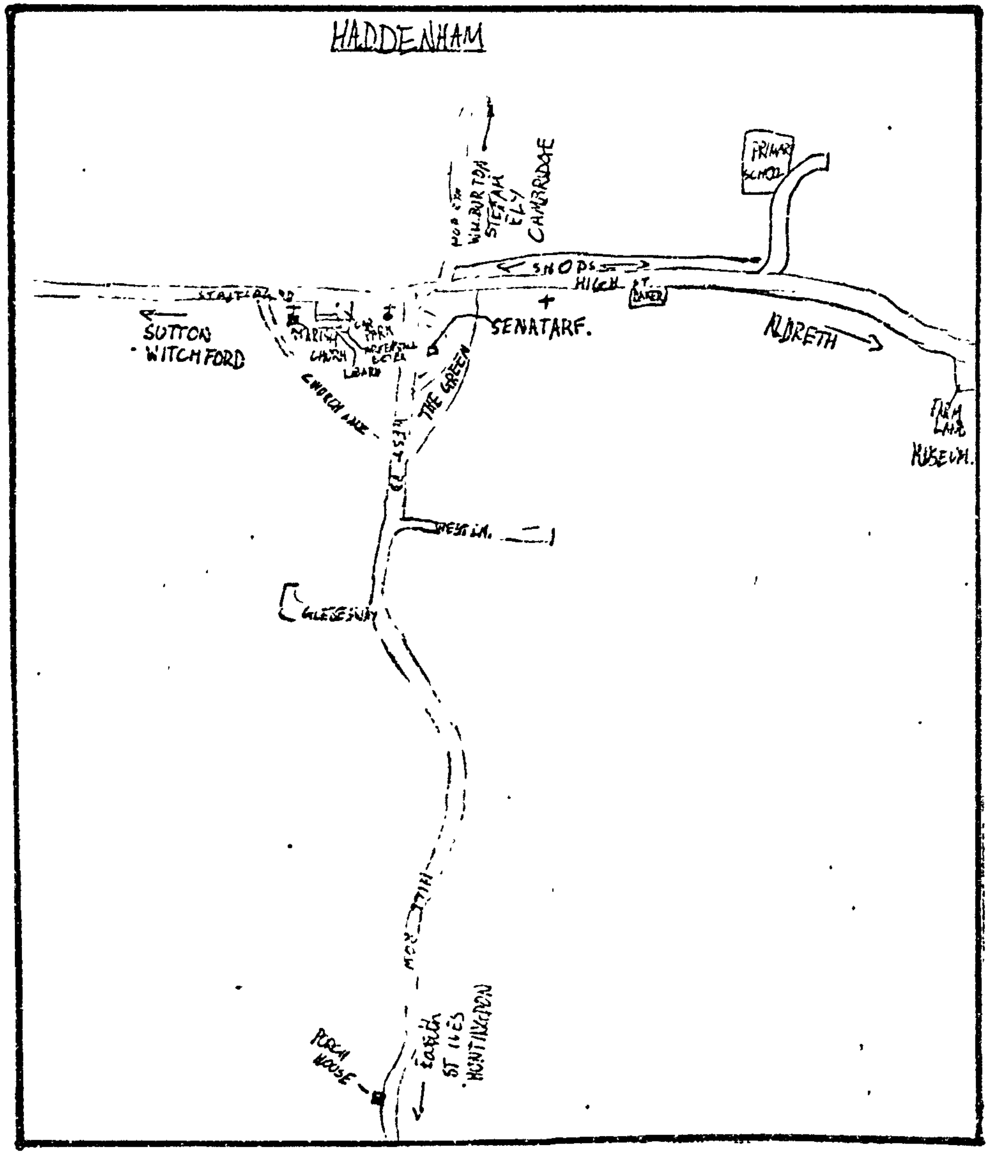


CATEGORY 2 - 11 Year Old GIRL

CATEGORY 3.
12 Year Old BOY



CATEGORY 4



13 Year Old BOY

APPENDIX 4.

THE FOLLOW UP STUDY.

I. Interview schedule.

2. Standardised Instructions for the Field Exercise.

3. Examples of the maps produced on the Field Exercise.

4. Tabulated Analyses:
   - (i) Of the Features noted and the features mapped whilst on the Field Exercise.
   - (ii) Of the Questionnaire responses of the Follow up sample.
   - (iii) Of the Route and Area Maps of the Follow up Sample.

I. The Interview Schedule.

These sessions were tape-recorded with the permission of the children concerned. The tapes are available.

The following questions formed the basis of the interview with each of the children in the follow up sample. As was explained in the text, the questions were derived from research into both Cognitive Style and Environmental Perception.

Key Questions.

The following questions formed the basis of the interviews, but if anything of special interest was said, it was followed up before returning to the prescribed questions.

I. What are your main interests, what do you most like doing in your spare time?
2. What are your favourite school subjects and why do you especially like them?
3. What subjects do you dislike in school, and why?
4. When you go out to play, are you allowed to play wherever you wish?
5. How far away from home are you allowed to go on your own? Can you tell me some of the places you go to (a) With permission, and (b) Without permission.
6. Does it make any difference if you go with others? Who might these others be? Where might you go then?
7. Are there any places where your parents are not happy for you to go to ? Why don't they like you going there?
8. Who do you ask for permission to go out?
9. How has the area where you live changed during the time that you have lived there?
IO. What changes would you like to see in the future?

....

The last part of the interview focussed on the Questionnaire responses and the maps produced by the group of their home area and their route from home to school.

(i) Specific individual questions or queries , by reference to their completed questionnaires and maps.
(ii) "Look at your maps again, what would you have added or taken away? What changes would you make to your map on reflection?
(iii)"When faced with a task like drawing a map, How do you start? Use your maps to help you explain.

2. <u>The Standardised Instructions used on the Field Exercise</u>.

"We are going on a short walk. What I would like you to do is to imagine that you are going on this walk on your own. The area is new to you and you are not sure where you are . On the piece of paper provided could you please note down anything that YOU think would be helpful to you in finding your way back to this car park. You will probably end up with a list of things. Some of you might note a lot of details and some only a few. This doesn't matter. It is what <u>You</u> think is important that interests me. Can you please do this on your own, and make sure your name is in the space provided at the top of the sheet. Perhaps it is best that you do that now before we start."

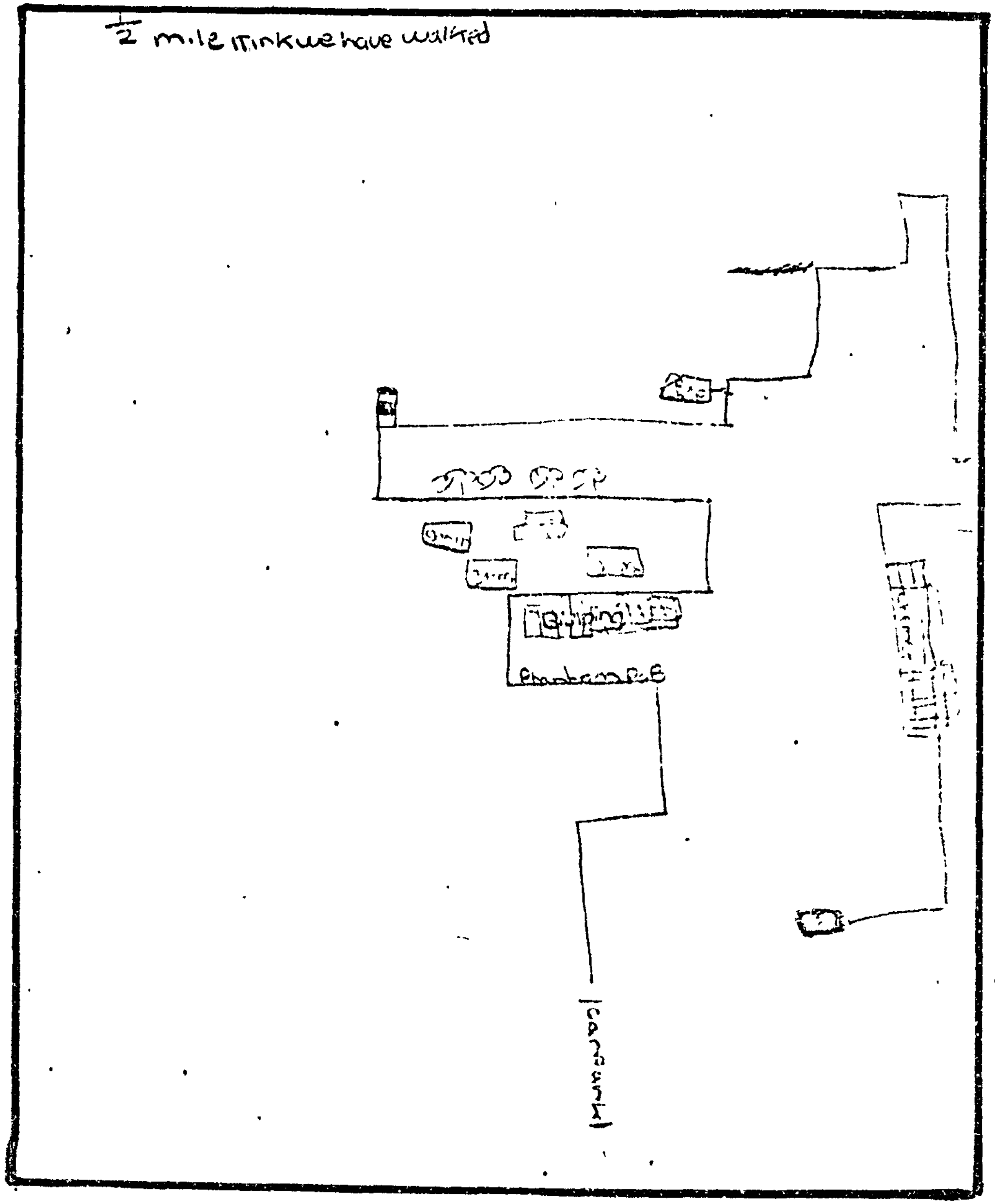
After completing this exercise, the children were transported to a local college where they were asked:

<u>Distance Estimation</u>. "We have all completed a short walk which took us about 25-35 minutes. How far do you think we walked? Could you note the distance you think we walked on the new sheet of paper."

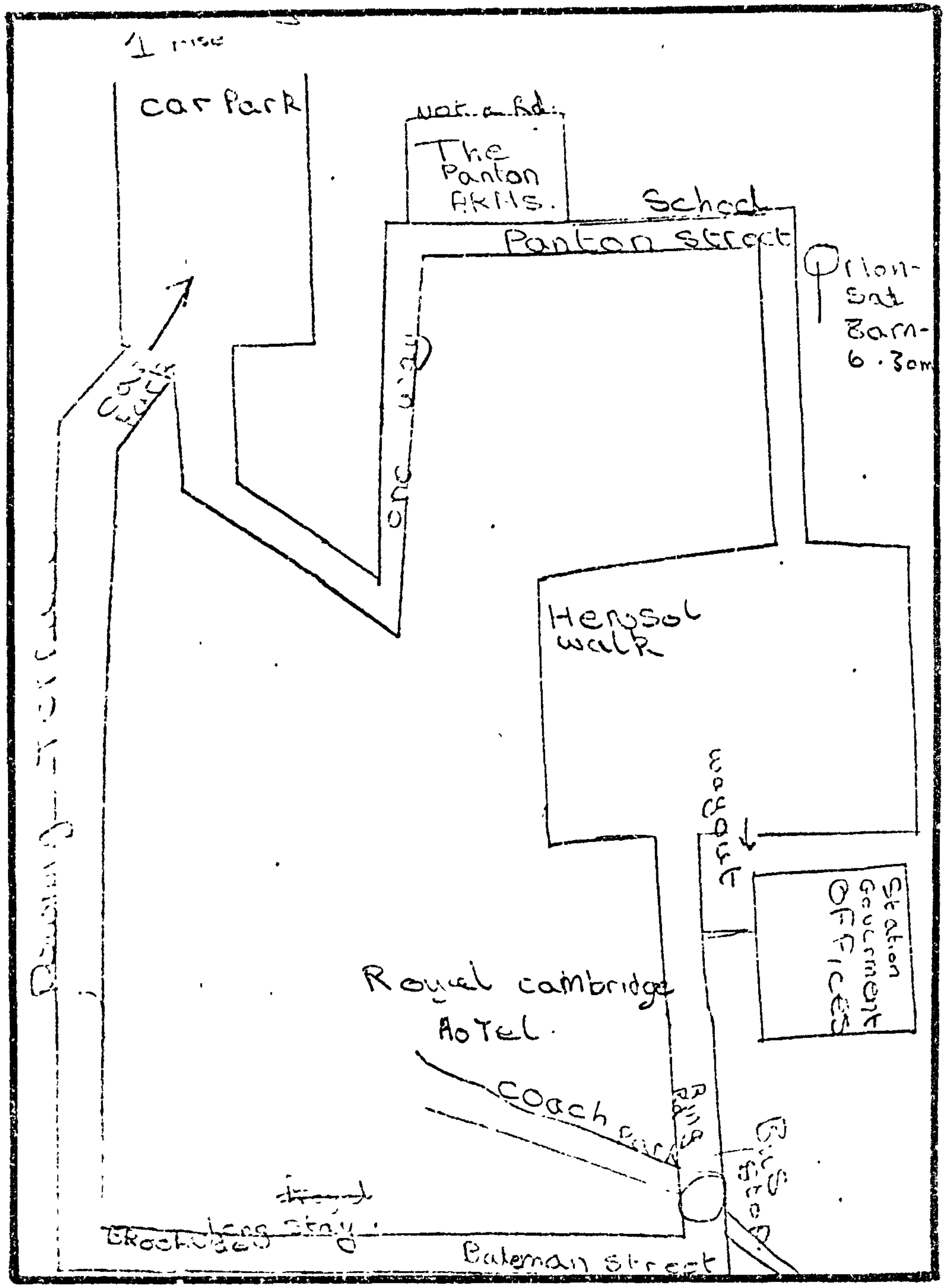
<u>Map of the Route Walked</u>. "You have all produced a record of the things that you felt were important on the walk. Could you now please draw me a map of the route that we have just walked. You can use your notes to help you. Add anything else that you remember, but that you hadn't included on your list. Do not add anything to your list though."

(The children were well spaced out whilst they drew their maps.)

FIELD EXERCISE: SAMPLE MAPS (FIELD DEPENDENT GROUP.)

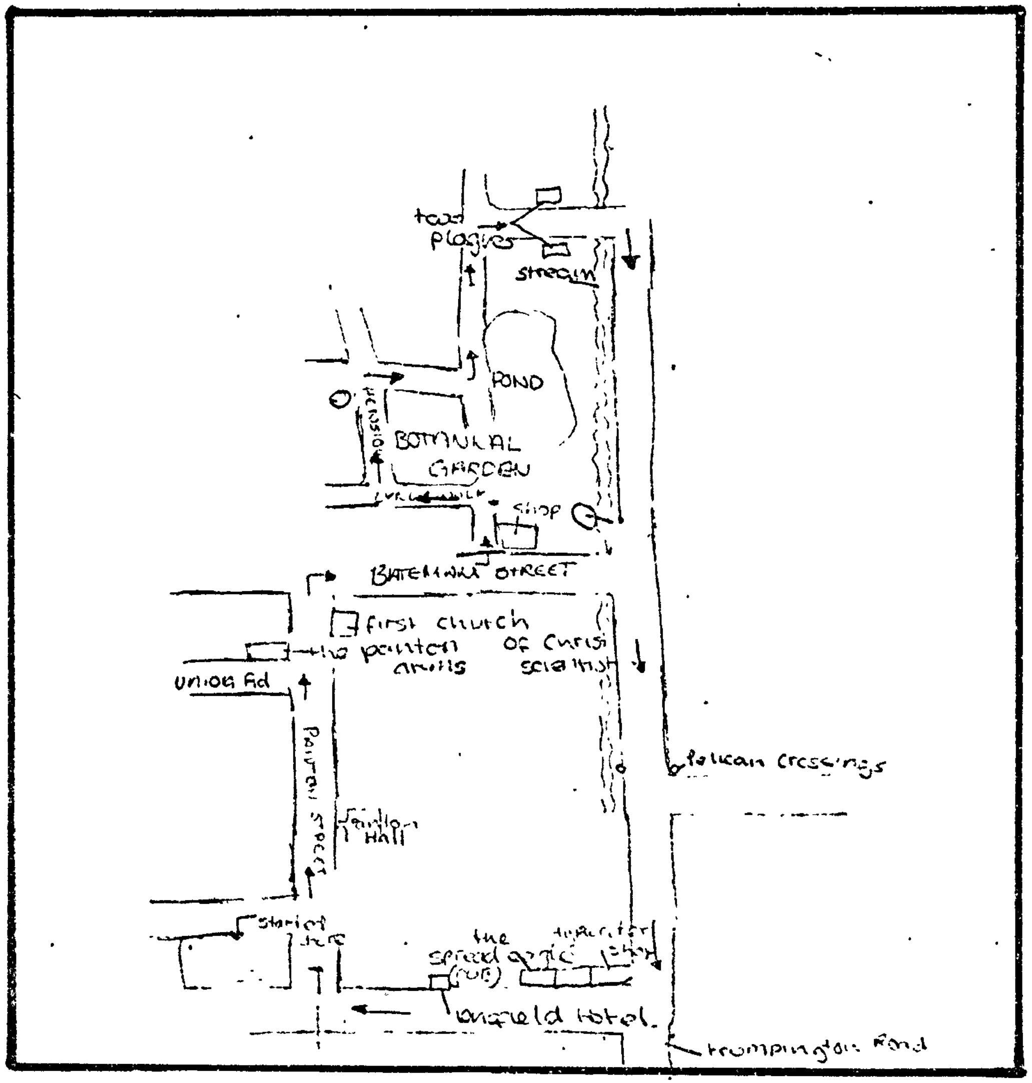


10 Year old Girl

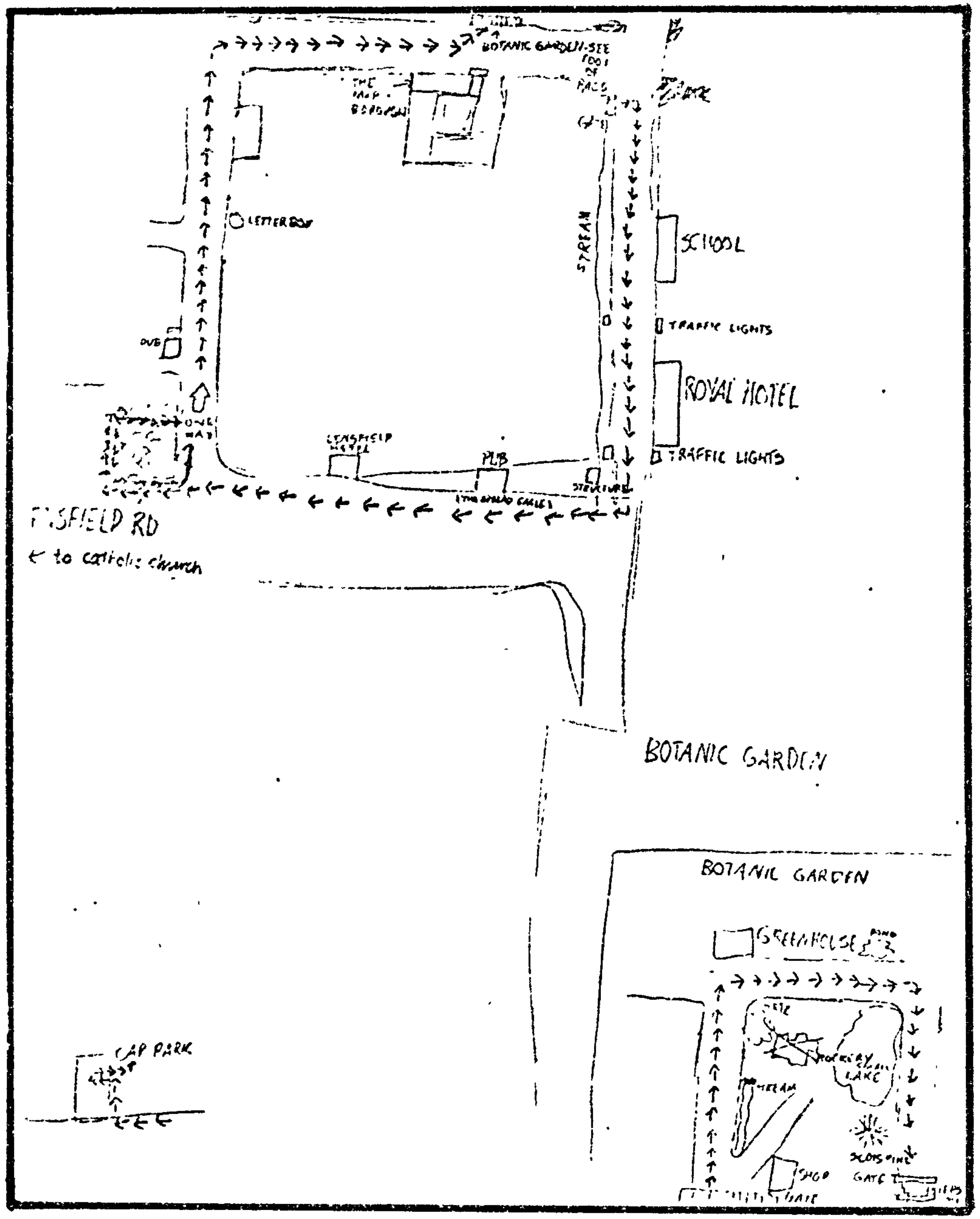


12 Year old Boy

FIELD EXERCISE: SAMPLE MAPS (FIELD INDEPENDENT GROUP)



13 Year old Girl



10 Year old Girl

FOLLOW UP STUDY: ANALYSIS OF FEATURES NOTED AND FEATURES MAPPED WHILST ON THE FIELD EXERCISE.

FEATURE.	NOTED						MAPPED					
	A	B	TOT	C	D	TOT	A	B	TOT	C	D	TOTAL
Car/Coach Park	5	7	I2	-	4	4	6	9	I5	6	7	I2
Pub(2 on the route	I2	I5	27	8	IO	I8	6	IO	I6	7	8	I4
Road/Street Names	9	29	38	3	I7	20	I3	24	37	-	8	8
Road Signs	4	7	II	2	8	IO	5	3	8	-	5	5
Mini Roundabout	2	2	4	-	I	I	I	3	4	I	-	I
Post Box	2	2	4	-	6	6	-	I	I	-	4	4
Bus Stop	I	3	4	-	I	I	I	-	I	I	3	4
Traffic Lights	2	6	8	2	5	7	-	5	5	2	5	7
Pelican Crossing	I	3	4	-	-	-	I	3	4	-	-	-
Telephone Box	I	2	3	-	-	-	-	I	I	I	-	I
Hotel(3 possible)	I4	I6	30	9	8	I7	6	5	II	3	4	7
Gardens	5	7	I2	5	4	9	6	8	I4	3	4	7
Main Gate	2	7	9	I	2	3	2	3	5	2	3	5
Hot House	5	6	II	4	4	8	3	6	9	3	2	5
Pond/Lake	5	7	I2	5	5	IO	4	7	II	2	3	5
River	4	9	I3	3	5	8	4	8	I2	3	2	5
Rockery	2	2	4	-	2	2	I	2	3	-	I	I
Vegetable Gardens	2	2	-	-	-	-	-	-	-	-	-	-
Steps	-	3	3	-	I	I	I	I	2	-	-	-
Paths	6	7	I3	I	2	3	6	7	I3	I	I	2
Bridges	2	7	9	3	4	7	3	6	9	3	-	3
Fences	I	I	2	-	I	I	I	-	I	-	-	-
Trees/Vegetation	I	7	8	I	I	2	I	3	4	2	I	3
Field (with Ponies)	-	I	I	-	-	-	-	2	2	-	-	-
Buildings(General)	-	-	-	I	I	2	-	-	-	-	-	-
Convent	5	6	II	6	5	II	5	7	I2	5	6	II
Church	3	7	IO	5	5	IO	2	5	7	3	3	6
Masonic Hall	I	-	I	-	I	I	I	I	2	-	I	I
School	2	I	3	-	I	I	I	I	2	-	I	I
School Gate	-	2	2	-	-	-	-	I	I	-	-	-
Church Hall	I	3	4	2	2	4	-	3	3	I	I	2
Laboratories	2	-	2	-	-	-	-	3	3	I	I	2
Memorial	5	5	IO	4	2	6	3	4	7	2	2	4
Shop	I	I	2	I	I	2	-	I	I	-	I	I
Brewery	I	I	2	I	I	2	-	-	-	-	-	-
Cafe	-	I	I	-	-	-	-	-	-	-	-	-
Named Buildings	I	I	2	2	3	5	-	I	I	I	I	2
Hire Shop	-	2	2	-	2	2	-	3	3	-	I	I
House Detail	-	4	4	-	-	-	-	-	-	-	-	-
Front Garden	-	I	I	-	2	2	I	I	2	I	3	4
Dustbins	-	-	-	2	3	5	-	-	-	2	2	4
Log Piles	-	-	-	2	I	3	-	-	-	I	I	2
Bike Sheds	I	2	3	-	2	2	-	I	I	-	2	2
Bicycles	-	-	-	2	3	5	-	-	-	I	I	2
Benches	-	-	-	2	3	5	-	-	-	-	2	2
Tennis Courts	2	2	4	-	-	-	-	-	-	-	2	2
Ducks	-	-	-	2	2	4	-	-	-	-	I	I
Directional Detail	7	6	I3	I	I	2	-	-	-	-	-	-
ON MAPS ONLY												
Houses	-	-	-	-	-	-	-	I	I	-	2	2
Architects	-	-	-	-	-	-	-	-	-	-	I	I
Cross Keys Pub	-	-	-	-	-	-	-	-	-	-	I	I
Chemist.	-	-	-	-	-	-	-	-	-	-	I	I
(The Last 2 did not exist inthe area)												

A: Field Independent Boys.

B: Field Independent Girls.

C: Field Dependent Boys.

D: Field Dependent Girls.

TOTAL indicates total number of separate individuals of each sub-group refering to the category.

FOLLOW UP STUDY: ANALYSIS OF QUESTIONNAIRE RESPONSES.

Favourite Places.	A	B	TOT	C	D	TOT
Sweet Shop	I	2	3	I	-	I
Own House	3	6	9	I	I	2
Own Area	-	I	I	I	-	I
Own Road	-	I	I	I	3	4
River/Brook	I	2	3	-	-	-
Common/Green	I	2	3	I	I	2
Rec	2	I	3	I	-	I
Playing Field	2	I	3	I	I	2
Garages	-	I	I	-	-	-
Youth Centre	-	I	I	I	-	I
Cemetry	-	I	I	-	-	-
Stud	-	I	I	-	I	I
Library	I	I	2	-	-	-
Orchard	-	I	I	-	-	-
N'd Places	-	I	I	-	-	-
N'd Areas	-	I	I	-	-	-
Colleges	-	I	I	-	-	-
Other Shops	2	-	2	-	2	2
Roads	I	-	I	-	-	-
Trees	I	-	I	-	-	-
Own Garden	I	-	I	-	2	2
Friends	I	-	I	-	-	-
Playground	I	-	I	-	-	-
Bus Shelter	I	-	I	I	-	I
Fields	-	-	-	-	3	3
View	-	-	-	-	I	I
Swings	-	-	-	-	I	I
Pond	-	-	-	-	I	I
Track	-	-	-	-	2	2
Heath	-	-	-	I	-	I
N'd Buildings	-	-	-	I	-	I
Pub	-	-	-	2	-	2
Chip Shop	-	-	-	I	-	I
Primary School	-	-	-	I	-	I

Disliked Places	A	B	TOT	C	D	TOT
None	5	2	7	-	I	I
Building Site	-	I	I	-	-	-
Rec	-	I	I	-	-	-
Church Hall	-	I	I	-	-	-
Neighbour's	-	I	I	-	I	I
Subway	-	I	I	-	-	-
Church	-	I	I	-	-	-
Factory	-	I	I	-	-	-
Flats	I	-	I	-	-	-
Garages	I	-	I	-	I	I
Play Area	I	-	I	-	I	I
Station	-	-	-	-	I	I
Pool	-	-	-	-	I	I
N'd Roads	-	-	-	2	2	4
Wood	-	-	-	-	I	I
Sand Pit	-	-	-	-	I	I
Restaurant	-	-	-	I	-	I
Hairdresser	-	-	-	I	-	I
Health Centre	-	-	-	I	-	I
Other Houses	-	-	-	I	-	I
School	-	2	2	-	I	I
TOTAL (2I)	4	9	I2	6	I0	I4

Beautiful Places	A	B	TOT	C	D	TOT
None	2	I	3	5	3	8
Church	-	2	2	-	-	-
N'd Gardens	I	I	2	-	-	-
River	-	2	2	-	-	-
Churchyard	-	I	I	-	-	-
Stud	-	I	I	-	I	I
Stables	-	I	I	-	-	-
Fields	-	I	I	-	2	2
Station	-	I	I	-	-	-
Colleges	2	-	2	-	-	-
Pl'g Fields	I	-	I	-	-	-
Own Garden	I	-	I	-	-	-
Own Area	I	-	I	-	-	-
Brook	I	-	I	-	-	-
'The Village'	I	-	I	-	-	-
Paths	I	-	I	-	-	-
Heath	-	-	-	-	2	2
Park	-	-	-	2	I	3
Swings	-	-	-	-	I	I
Bowling Gn.	-	-	-	I	-	I
Grass	-	-	-	I	-	I
TOTAL (2I)	9	9	I6	4	6	8

Dangerous Places	A	B	TOT	C	D	TOT
Main Roads	4	4	8	3	4	7
N'd Area	-	I	I	-	-	-
Station/Rlwy	I	I	2	-	I	I
Playground	-	I	I	-	I	I
Swings	-	I	I	-	-	-
Drunks	-	I	I	-	-	-
River	-	I	I	-	-	-
Sandpit	-	-	-	-	I	I
Heath	-	-	-	-	I	I
Sheds	-	-	-	-	I	I
Horses	-	-	-	-	I	I
Pubs	-	-	-	I	-	I
Level X'ing	-	-	-	I	-	I
Building Site	-	-	-	I	-	I
Sub Station	-	-	-	I	-	I
NONE	3	I	4	2	I	3
TOTAL (I6)	3	8	8	5	9	I2

Uncomfortable Places	A	B	TOT	C	D	TOT
NONE	7	2	9	2	I	3
N'd Roads	-	2	2	I	I	2
At Night	-	3	3	2	I	3
Cemetry	-	I	I	-	-	-
Unlit Roads	-	I	I	-	-	-
Garages	-	I	I	-	-	-
Shops	-	I	I	-	-	-
Stud	-	I	I	-	-	-
Passages	I	-	I	-	-	-
Woods/trees	-	-	-	-	3	3
Outside Area	-	-	-	-	2	2
Park	-	-	-	I	-	I
N'd Buildings	-	-	-	I	-	I
TOTAL (I3)	2	8	9	5	7	7

Comfortable Places	A	B	TOT	C	D	TOT
Own House	7	8	I5	7	3	I0
Local Green	I	I	2	I	-	I
Own Road	I	-	I	-	I	I
Own Garden	I	-	I	I	2	3
In Bed	-	-	-	I	I	2
Own Area	-	-	-	-	3	3
Friends	-	-	-	-	I	I
TOTAL (7)	4	2	4	4	6	7

Smells	A	B	TOT	C	D	TOT
NONE	2	5	7	4	3	7
Cooking	-	I	I	-	2	2
Horses	I	I	2	-	3	3
Factories	-	I	I	-	-	-
Baking Bread	-	I	I	-	-	-
Chips	I	-	I	-	-	-
Petrol	I	-	I	-	-	-
Cut Grass	I	-	I	-	-	-
Sewage	I	-	I	-	-	-
Toilets	I	-	I	-	-	-
Fires	-	-	-	-	I	I
Restaurant	-	-	-	I	-	I
Pond	-	-	-	I	-	I
Refuse	-	-	-	I	-	I
TOTAL (I4)	7	5	I0	4	4	7

Noises	A	B	TOT	C	D	TOT
None	2	2	4	2	2	4
Ambulances	-	I	I	-	-	-
Traffic	I	5	6	-	-	-
Voices	-	3	3	-	-	-
Children Playing	-	I	I	-	-	-
Trains	-	2	2	-	I	I
Horses	-	I	I	I	I	2
Animals	2	-	2	2	-	2
Planes	I	-	I	-	-	-
Wind	I	-	I	-	-	-
Neighbour's	I	-	I	-	-	-
Farm Equipment	I	-	I	-	-	-
Building Site	I	-	I	I	-	I
Football Crowd	-	-	-	I	I	2
School Bell	-	-	-	I	-	I
Telephone	-	-	-	-	I	I
Dry Leaves	-	-	-	-	I	I
Trees	-	-	-	-	I	I
Siren (Factory)	-	-	-	-	I	I
TOTAL (I9)	8	7	I3	6	8	I3

Guide Photographs	A	B	TOT	C	D	TOT
Church(es)	3	5	8	I	-	I
Roads	2	4	6	2	2	4
Playing Fields	3	2	5	I	I	2
Own House	2	2	4	2	4	6
N'd Buildings	2	2	4	I	2	3
School(s)	I	3	4	I	2	3
Shops	I	-	I	2	2	4
Library	I	2	3	-	I	I
Own Road	I	2	3	-	I	I
Pub	2	I	3	I	-	I
River	I	2	3	-	-	-
Common/park	-	I	I	I	2	3
Horses	2	I	3	-	I	I
Woods	-	-	-	-	3	3
Swimming Pool	-	-	-	I	2	3
N'd Areas	I	I	2	-	I	I
N'd Places	I	I	2	-	-	-
Rec	2	-	2	-	-	-
Other Houses	-	I	I	I	-	I
Bridge	-	I	I	-	-	-
Cemetry	-	I	I	-	-	-
Airport	-	I	I	-	-	-
Stud	-	I	I	-	I	I
Paddock	-	I	I	-	-	-
Station	-	I	I	-	-	-
Allotments	-	I	I	-	-	-
N'd Gardens	-	I	I	-	I	I
Church Hall	-	I	I	-	-	-
A View	I	I	2	-	-	-
Aerial View	I	-	I	-	-	-
Pond	2	-	2	-	-	-
Heath	I	-	I	-	I	I
Town Centre	I	-	I	-	-	-
Fields	I	-	I	-	I	I
Paths	I	-	I	-	-	-
Physical Features	I	-	I	-	-	-
Own Garden	-	-	-	-	I	I
Railway	-	-	-	I	I	2
Playground	-	-	-	-	I	I
Tennis Cts	-	-	-	-	I	I
Adv.P'Ground	-	-	-	I	-	I
Youth C'Ntre	-	-	-	I	-	I
Own Area	-	-	-	I	-	I
TOTAL(46)	23	25	35	I5	2I	28

In each of the Tables in this section, A= Field Independent Boys
B= Field Independent Girls
C= Field Dependent Boys
D= Field Dependent Girls

FOLLOW UP STUDY: ANALYSIS OF QUESTIONNAIRE RESPONSES (Cont.)

Features to Cousin.	A	B	TOT	C	D	TOT
Own House	2	2	4	I	3	4
Own Road	-	I	I	-	I	I
Own Garden	-	I	I	I	I	2
Shops	2	2	4	I	2	3
Shopping Centre	-	2	2	I	-	I
Swimming Pool	I	2	3	I	-	I
River/Brook	I	3	4	-	-	-
Green	-	2	2	-	-	-
Church	-	I	I	-	-	-
Church Hall	-	I	I	-	-	-
Cemetry	-	I	I	-	-	-
N'd Buildings	-	3	3	-	I	I
Rec	3	-	3	2	-	2
All Round	2	-	2	-	2	2
Own Camp/Favourite places	2	-	2	I	-	I
Heath	-	-	-	I	I	2
Horses	-	-	-	-	2	2
Friends	-	I	I	-	-	-
Swings	-	I	I	-	-	-
Youth Centre	-	I	I	-	-	-
Museum	-	I	I	-	-	-
Library	-	I	I	-	-	-
N'd Gardens	-	I	I	-	-	-
Paddock	-	I	I	-	-	-
Stud	-	I	I	-	I	I
Pets	-	I	I	-	-	-
N'd Roads	I	-	I	-	-	-
Tracks	I	-	I	-	-	-
Sports Hall	I	-	I	-	-	-
Pub	-	-	-	-	-	-
Airport	-	-	-	-	I	I
Leisure Centre	-	-	-	I	-	I
Own Area	-	-	-	I		I
My Toys	-	-	-	I	-	I
Football Gnd.	-	I	I	I	-	I
TOTAL (37)	I0	22	28	I3	I2	I9

Features to Adult Rel'n	A	B	TOT	C	D	TOT
The Same	2	I	3	-	2	2
All Round	4	I	5	I	I	2
Ask them	-	I	I	-	-	-
Own House	I	I	2	4	3	7
Own Garden	-	I	I	I	-	I
Own Area	-	I	I	-	-	-
N'd Roads	2	I	3	-	I	I
Church	I	3	4	I	I	2
Fields	-	2	2	-	-	-
Sports G'nd.	-	I	I	-	I	I
Bowls Club	-	I	I	-	-	-
Pub	-	I	I	2	-	2
Sw'g Pool	-	I	I	-	-	-
Hospital	-	I	I	-	-	-
Factories	-	I	I	-	-	-
Rec/Green	-	3	3	-	-	-
N'd Builings	I	2	3	-	-	-
Cemetry	-	I	I	-	-	-
N'd Gardens	-	I	I	-	-	-
Horses	-	I	I	-	I	I
Shops	2	-	2	I	I	2
Library	I	-	I	-	-	-
A Map	I	-	I	-	-	-
Friends	I	-	I	-	-	-
Stud	-	-	-	-	I	I
Heath	-	-	-	I	I	2
Own Road	-	-	-	-	I	I
Schools	-	-	-	2	-	2
Railway	-	-	-	I	-	I
Doctors	-	-	-	I	-	I
TOTAL(30)	I0	20	24	I0	II	I6

Features to Visitor.	A	B	TOT	C	D	TOT
Same as Adult	3	3	6	-	I	I
Town Centre	-	2	2	-	-	-
School(s)	I	I	2	-	3	3
Heath	I	I	2	I	2	3
Own Garden	-	-	-	I	I	2
N'd Roads	I	2	3	I	2	3
All Round	3	I	4	I	-	I
Own House	-	I	I	2	-	2
N'd Buildings	I	3	4	-	-	-
Shops	2	I	3	-	2	2
Museums	-	-	I	-	-	-
Church	I	I	2	-	-	-
Park	-	I	I	-	-	-
Places of Interest	I	-	I	-	-	-
Town Centre	-	-	-	-	I	I
Fields	-	-	-	-	I	I
Green	-	-	-	-	I	I

Features to Visitor	A	B	TOT	C	D	TOT
River	-	I	I	-	-	-
Pub	-	I	I	-	-	-
Short Cuts	-	I	I	-	-	-
Swimming Pool	-	I	I	-	-	-
Sports G'nds.	-	I	I	-	-	-
Maternity Hospital	-	I	I	-	-	-
Marina	-	I	I	-	-	-
Houses	I	I	2	-	I	I
Bowls Club	-	I	I	-	-	-
Bus Stop	I	-	I	-	-	-
Paddock	-	I	I	-	-	-
Horses	-	I	I	-	-	-
Stud	-	-	-	-	I	I
Gardens	-	-	-	-	I	I
Friends	-	-	-	-	I	I
Farms	-	-	-	-	I	I
My Area	-	-	-	I	-	I
TOTAL(34)	II	22	25	6	I4	I7

FOLLOW UP STUDY: ANALYSIS OF THE FEATURES NOTED ON THEIR ROUTE AND AREA MAPS.

FEATURE.	A	B	TOT	C	D	TOT
Roads	8	9	I7	8	9	I7
Houses	6	3	9	5	6	II
Own House	8	8	I6	7	7	I4
School(s)	7	8	I5	7	7	I4
Park/Green	5	4	9	3	5	8
Track/Path	4	5	9	2	I	3
Shops	5	6	II	5	2	7
Roundabout	3	4	7	2	2	4
Church	2	4	6	2	-	2
Named B'dings	5	6	II	2	5	7
Pub	3	2	5	3	2	5
Bus Stop	2	3	5	3	I	4
Playing Fields	3	2	5	2	I	3
Bridge	2	3	5	I	3	4
Garage	2	2	4	I	-	I
Swings	3	I	4	I	I	2
Post Box	2	2	4	-	-	-
Woods/Trees	3	-	3	I	I	2
Heath	-	-	-	-	-	-
Fields	2	I	3	-	2	2
Railway Line	-	3	3	I	I	2
Zebra X'ing	2	I	3	I	I	2
River	2	2	4	I	I	2
Mill	-	3	3	-	-	-
Named Areas	-	3	3	-	2	2
Friends	I	I	2	-	-	-
Bus Station	2	-	2	-	-	-
Car Park	2	2	4	-	-	-
Garages	2	-	2	-	-	-
Building Site	I	I	2	-	-	-
Personal Detail	-	-	-	I	2	3
Stud	-	I	I	I	I	2
Stables	-	-	-	I	I	2
Sub Station	-	-	-	2	-	2
Swimming Pool	I	I	2	2	-	2
Own Garden	-	I	I	-	2	2
Waste Area	-	-	-	I	-	I
Traffic Islands	-	-	-	I	-	I
Cross Roads	-	-	-	-	I	I
Traffic Lights	I	I	2	-	I	I
Vehicles	I	-	I	I	-	I
Park Bench	-	-	-	-	I	I
Leisure Centre	-	-	-	I	-	I
Own Camp	-	I	I	I	I	2
Post Office	I	I	2	I	-	I
Fire Station	-	I	I	I	-	I
Youth Club	I	I	2	I	-	I
Route Indic'ed	5	8	I3	5	3	8
Other places.	I	-	I	-	-	-
Council Yard	I	I	2	-	-	-
Nursery	I	I	2	-	-	-
Gardens	I	-	I	-	-	-
Monument	I	-	I	-	-	-

FEATURE	A	B	TOT
Village Hall	I	I	2
Telephone Box	I	-	I
Pond	I	-	I
Church Yard	-	I	I
Paddock	-	I	I
Allotments	-	I	I
Shop Centre	-	I	I
Subway	-	I	I
Factories	-	I	I
Offices	-	I	I
Tech.	-	I	I
Comm'y Centre	-	I	I
Lock	-	I	I
Bowling Green	-	I	I
River Facilities	-	I	I
O.A.P's Home	-	I	I
Station	-	I	I
Police Station	-	I	I
Mat. Hospital	-	I	I
Telephone Ex.	I	-	I
Library	I	I	2
Flats	I	-	I
Lake	I	-	I
Airport	-	I	I
Market.	-	I	I

A: Field Independent Boys

B: " " Girls

C: " Dependent Boys

D: " " Girls.

TOTALS: A= 47 different Features

B= 57 " "

A+B = 72 " "

C= 34 " "

D= 4I " "

C+D = 4I " "

Overall Total= 79 " "