DESIGN AND STANDARDISATION OF A DEVELOPMENTAL TEST FOR INDIAN CHILDREN
THE INDIAN PICTURE PUZZLE TEST

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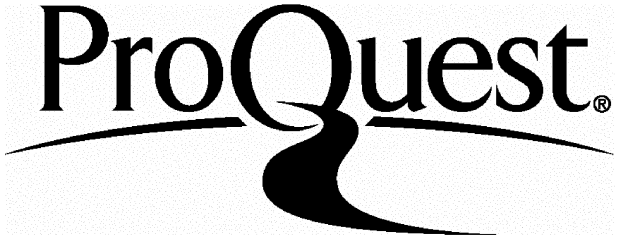

ABSTRACT

DESIGN AND STANDARDISATION OF A DEVELOPMENTAL TEST FOR INDIAN CHILDREN: THE INDIAN PICTURE PUZZLE TEST

Almost fifty percent of India's population are children. More than two thirds belong to the lower socioeconomic strata. Yet there are few indigenously constructed developmental tests for surveillance, clinical practice or research. The need for such tests is clear.

A multifaceted developmental test of cognitive skills was constructed, modelled on the Bus Puzzle Test (Egan 1984) for its ease of administration and appeal. Each stage in the design was piloted in Rajasthan in all socioeconomic groups. Stages included simple ethnic modification of the original test, development of more socioculturally appropriate scenes, a detailed statistical procedure of item analysis and reliability studies. The picture was converted into a wooden insert puzzle, called The Indian Picture Puzzle Test (IPPT) and standardised on a random sample of 616 children to construct norms. The IPPT assesses aspects of early language, picture interpretation, performance skills and conceptual development in children aged 2 to 5 years.

Analysis of the standardised data highlighted the need for separate norms for each socioeconomic group. Verbal abilities were significantly different between advantaged and disadvantaged (slum and rural) groups though performance skills were comparable. Competence in picture perception did not, as it appears to do in English children, parallel that of language and was influenced by both age and social class.

The Indian Picture Puzzle Test has been developed for clinical practice and research. Its forseen uses are as a tool with which to identify and compare high and low functioning populations and to monitor intervention programmes in the latter. Similarly, it may be useful within sociocultural groups to identify individuals with disordered development. Further studies are required to substantiate these proposed uses of the IPPT.

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SECTION I

INTRODUCTION

AIM OF THE STUDY

Main

To design a test that explores multiple facets of cognition including aspects of language for the developmental examination of Indian preschool children.

Subsidiary

To establish norms so that individual children can be evaluated in the context of their socioeconomic background and also for comparison of the development of these cognitive skills in rural, urban upper, middle and slum populations

Foreseen usage

Primarily as a tool for the preliminary evaluation of the cognitive profile of young children for use by professionals, including paediatricians in clinical practice. Further psychometric studies will be needed to establish the status of the test for research purposes and its potential for modification for use by field workers in child surveillance.

BACKGROUND :

Almost 50 percent of India's population are children. More than two-thirds belong to the lower socioeconomic strata. The importance of early years on later development has been noted (Woodhead 1976, Reichman and Healey 1983). Deprivation in early childhood can lead to profound long term effects particularly on development and future functioning.

The concept of total population screening of young children for developmental disabilities was laid down in 1966 by a World Health Organisation working group (1967). Since then screening and surveillance programmes are conducted worldwide - the most comprehensive ones in Scandinavia and Israel. When tests are used in the Western world in screening programmes the aim is to identify preschool, the 10 to 15 percent of children who are most likely to show later educational and behavioural problems. The

Dundee Development Screening programme demonstrated that children with 'suspect' results on developmental screening were nearly three times as likely to have significant school problems at age six and seven years when matched with controls (Drillien et al 1988).

One of the values of early identification is to provide a window of opportunity for intervention. The effects of intervention are still debated; studies of Berrueta-Clement et al (1984), Lazar and Darlington (1982), Huntley et al (1988) provide positive evidence of benefit.

In the UK, General Practitioners, Community and Developmental Paediatricians use developmental tests to screen the cognitive profile of young children; the profile then acts as the first stage analysis of a child's problem upon which to plan further action and investigation (Egan and Brown 1984).

There are few indigenously constructed developmental tests for surveillance, clinical practice and research in India. In the following paragraphs a case is built up for their construction.

PREVALENCE OF EARLY LEARNING AND LANGUAGE DELAY AND DISORDER

The prevalence of neurodevelopmental disorder (NDD) in the Western world amongst preschool children is between 12 and 16 percent (Drillien and Drummond 1983, Chazan et al, 1980). The former authors graded the disorder as severe in nine per cent of affected children and most subgroups of NDD had higher prevalence amongst the lower social classes. Speech and language problems were the most prevalent occurring in 7.5 percent of the 4245 two to five year olds in Dundee; 42 percent of these had minor articulation problems only. Speech and language difficulties defined as 'inability to string together three or more words to make some sort of sense' were identified by Fundudis et al (1979) in four percent of 3300 three year olds in Newcastle. Studies in other parts of the Western world have shown a similar range of prevalence (Tuomi and Ivanhoff 1977, Marge 1972, Sylva et al 1983).

The significance of this prevalence increases when reviewed in context of the wide influence of language impairment on other developmental and educational processes.

IMPORTANCE OF EARLY LANGUAGE AND OTHER COGNITIVE SKILLS TO LATER FUNCTIONING

Development And Environment :

Longitudinal research is beginning to provide an understanding of the pattern of human growth. The

period of most rapid growth and development takes place in the first six years of life (Pringle 1974, Bayley 1964). Available evidence suggests that environmental influences have the greatest effect during this phase (Reichman and Healey 1983, Curtiss1977, Cravioto and DeLicardie 1972, Stein and Susser 1992). Experiences and opportunities during the early years of life are vital to later development. They are formative years, during which children acquire the basic skills that shape them for later life. Preschool children are particularly susceptible to adverse environmental circumstances. Studies suggest that social class differences in language development emerge during the first year of life and become unequivocal by about the age of three (Kagan 1971, Farran 1982).

The importance of early language to later development including literacy needs to be recognised. Language is dependent on symbolic representation and so are reading and writing. Though most children who are late in talking eventually learn to speak well, many are left with subtle disorders of language that impede their educational progress (Howlin and Rutter 1987). Language is the fundamental of education and education allows greater assimilation of new information and communication and acts as a catalyst for human development (WCEFA 1990). The link between early language skills and later literacy was emphasized by Whitehead (1990). Aram and Nation (1980) found that language delayed preschoolers had reading problems (40 per cent), spelling difficulties (24 per cent) and maths problems (28 per cent) at follow up four to five years later. Similar findings have been noted by other large longitudinal studies (Silva et al 1983, Richman et al 1982, Fundudis et al 1979, Drillien and Drummond 1983).

Language is intrinsically linked with cognitive development. Although thought processes can proceed without the development of spoken language (Furth 1966), there is evidence that thinking depends on symbolic processing. Reynell (1978) pointed out that language is an intellectual process that becomes integrated with other developing intellectual processes well before school age, to form the basis of further intellectual development. Words can influence cognitive processes, and even the individual's perception of the world (Whorf 1956). Children build up a better representation of objects if they are exposed to a richer language experience (Razran 1961).

A high rate of behaviour and psychiatric disorders has been demonstrated in children with developmental language delays (Rutter and Lord 1987). These authors emphasized the complexity and strength of the relationship. Social deprivation in large poor families (Cantwell and Baker 1977) and reduced or absent symbolic play that serves important psychosocial functions (Rosenblatt 1980) were two influencing factors.

Early adaptive behaviour screened between the ages 39 weeks to 3 years was shown by Drillien et al (1988) to be associated with later reading and number achievement and with later behaviour in school. Similarly, early neurological screening had a high level of association with behaviour, reading, mathematics and, most notably, writing difficulties in school.

Thus, early development, especially language, has an influence on later functioning which is greatest in the areas of educational performance and behaviour.

Intervention :

Intervention programmes, to prevent and maybe reverse the effects of early deprivation or damage, are promising despite original pessimism (Mierer 1978, Sylva 1994). Headstart early intervention programmes for preschool children in the USA showed significant benefits to both mother and child in areas of child rearing, cognitive development including language and social and emotional development. For example, Baruetta-Clement et al (1984) followed up children involved in the Perry Preschool Project - High\Scope for 19 years. The children with preschool experience when compared to matched controls had significantly higher monthly earnings, home ownership, levels of schooling and college education and fewer teen pregnancies and delinquency.

In Britain Drillien et al (1988) noted a striking reduction in school problems among children in Dundee who were involved in preschool intervention programmes. Reynell (1978) reported an increased rate of progress in 80 to 90 per cent of language-impaired children attending the language training programme. She postulated that gains from intervention during the preschool years when language naturally becomes internalised and established as an intellectual function, should not be lost once help is withdrawn. Follow-up studies five years later showed continued increase in language progress although at a rate lower than during the actual programme (Huntley et al 1988).

INDIAN FRAMEWORK :

Demographics :

Environment plays an important role in terms of the stimulation and opportunities a child receives. India faces major challenges characterised by the threat of economic stagnation, terrorism and civil strife, widespread environmental degradation and rapid population growth. The GNP per capita is 310$ and the GDP only 5.3%. India has a foreign debt of 73.5 billion dollars. Her current deficit is around 5000 million dollars and inflation is 11.8% (Census 1991). Unemployment has worsened. Despite a burgeoning middle class many persons still live in dire poverty.

Economic disparities have widened within and between various sectors of society. Inequitable access to formal education and other learning opportunities has further enlarged this gap. Armed conflicts and civil disorder continue to command public attention and resources. Terrorism, human right abuses, and natural disasters have uprooted and displaced many people. Increased urbanisation and unemployment, with the concomitant problems of crime have added to the problem. In addition, historical conditions of ethnic, tribal and linguistic minorities have created many disadvantaged groups.

Population growth continues to exacerbate economic, social and environmental problems. India has a population of 857.1 million with the growth rate of 2.1% (Census 1991). The harsh reality of absolute poverty guarantees high mortality and a precarious livelihood for the sick and the aged. This encourages high rates of reproduction that further entrench a life style of poverty among the growing numbers of the poor. Infant mortality is 88 per 1000 with higher rates among rural and tribal populations (Census 1991).

Developmental problems :

An Indian preschooler is fragile and vulnerable to neglect, the girl child more so than her male peer. Bevli (1978) studied 6,997 two and a half to five year old Indian children from seven cities and found that almost all lagged behind their western counterparts, rural children more so than urban. Srinivasan (1969) reported that middle class children had superior language to the poor. Advantaged children spoke better than disadvantaged ones even if they did not attend nursery schools (Tamjane 1965). Prevalence studies have not been conducted in India to date. However, Helander (1993) estimated that currently 85 per cent of the world's disabled children under 15 years of age live in developing countries. Khan and Durkin (in press) estimate that nearly 7 per cent of 2 to 9 year old children in Bangladesh have developmental disabilities of all types and severity.

Intervention :

India has an early intervention programme for children from zero to six years - The Integrated Child Development Scheme (ICDS) - in some parts of the country. It is the largest programme of its kind in the world. Beginning in 1975 with 33 experimental projects, it has grown to almost 2000 projects in 1989, reaching 11.2 million children under six years of age. The general goals of the programme are to provide a comprehensive range of basic services to children and mothers of low-income groups. The emphasis is on immunisation, nutrition and early education. Although the programme often operates at a minimum level of quality, it has nevertheless had important effects on the under six population. Advantages, more so in the sphere of physical health, have been reported by over 30 studies. Children with an ICDS background had a higher primary school enrollment rate (89 per cent versus 78 per cent), were more regular in primary school attendance, performed better academically, and scored significantly higher on a psychological test than non-ICDS children (WCEFA 1990). Preschool education seemed to facilitate language development in rural preschool children (Pankajam 1990). Children attending nurseries used complete sentences; had a larger vocabulary and were more expressive than those not attending school.

Yet, literacy rates in India remain low - 51 per cent (Census 1991). School dropout is high and is around 60 per cent (Census 1991). Educational intervention during the preschool period could be a crucial step towards literacy.

Early intervention programmes with strategies to enhance children's development may be one answer to the Indian problem. Well researched and standardised tools to identify high risk groups and evaluate the effectiveness of intervention projects are essential and a key component for success.

(Source of statistics on India - Census 1991 in Gupta 1992)

PAUCITY OF STANDARDISED COGNITIVE AND LANGUAGE ASSESSMENT SCALES IN INDIA

Psychological studies in India have tended to use tests standardised abroad, sometimes decades earlier or standardised only on the educated upper classes (Anandalakshmy 1982). The relevance of many test items to the subjects under study is questionable. Mittler and Serpell (1985) and Bevli (1990a) have pointed to the danger of importing Western tests for use in other socio-cultural settings. Several authors have noted the problems of using tests developed for children from advantaged backgrounds on respondents who are unfamiliar with the test situation (Edwards 1989, Tripathi, 1982).

The number of developmental tests standardized on Indian children is small and the number assessing language even smaller. Currently, very few tests are available for use by professionals in clinical practice. The 3D - Language Acquisition Test (Herleker 1986) is not published for professional use and like the REEL test (Bzoch and League 1971) which has been standardized on Indian children is based on information given by the parent. In many parts of the country the REEL test is the only test used in clinical practice. In her review of developmental test instruments in India, Murlidharan (1992) pointed to inadequate psychometric status of most and particularly, lack of standardisation on representative samples of all socioeconomic groups.

The case for development of standardised tools in the field of Developmental Medicine in India is overwhelming.

SECTION II

REVIEW OF LITERATURE

The areas of literature reviewed reflect the aims of the research and the foreseen future development and uses of the test (p. 27).

II 1. Review of existing tests

II 2. Early cognitive development, the factors influencing it and its assessment.

II.2.1 Early cognitive development
A brief resume of early language and of early non-verbal skills (spatial and picture perception).

II.2.2 Impact of social factors on development

II.2.3 The impact of multilingual background on language development.

II.2.4 The influence of social factors on the test situation.

II.2.5 The influence of multilingual background on the test situation.

II.2.6 Influence of other factors on the test situation.

II.2.7 Methods of eliciting language in children.

II.3 Review of Test Construction

II.4 Sociocultural Background of the target population.

SECTION II

REVIEW OF EXISTING TESTS

The intention of this review is to find a tool upon which to model the test to be developed for Indian children and one suitable to be used as a criterion reference for its validation.

The areas of cognition to be explored by the new test are early language and early non-verbal skills. The test needs to be of interest to children from a wide variety of backgrounds and to have an administration time of 10 to 15 minutes or less as its primary use will be as a tool for preliminary examination by professionals.

The current status of both Indian and Western tests including language for children aged 2 to 5 years was reviewed.

TESTS IN INDIA :

An interest has emerged in the last decade in tests for early child development in India and has resulted in the construction of a number of tests. In a recent review of instruments for assessment of early child development by Murlidharan (1992), 14 of the 19 tests were constructed after 1985. Only four of these specifically assessed language skills. Most tests have not yet been standardised. Murlidharan noted that most tests had poor psychometric properties. The tests are not published and are not available for professional use.

1. NCERT Language and Cognitive Tests for Preschoolers: (Murlidharan, R. and Kaur, B. 1982 - cited in Murlidharan 1992): The test was created to evaluate the impact of preschool intervention programmes - particularly the use of education materials developed by Children's Media Laboratory. So far the test has been used only for research. It assesses cognition and language of children 3 to 6 years of age with the help of pictures, familiar objects and charts. The time taken to assess a child is 1.1/2 to 2 hours.

2. Word Meaning Test : (A. Singh 1987 - cited in Murlidharan 1992): The Word Meaning Test is a research instrument which is used to measure vocabulary development in young children aged 2 to 3 years using a word list and pictures of familiar objects. Administration of the test takes 45 minutes to 1 hour. Reliability coefficient is 0.86 and Validity coefficient is 0.73.

3. Grammar Comprehension Test: (A. Singh 1987 - cited in Murlidharan 1992): The Belugi Klima's Grammatical Comprehension Test by White and Walts has been adapted to Hindi for use in 2 to 3 year

old children by Singh. Test-Retest coefficient is 0.56. Information on the material used and the time taken to administer it is not available.

4. Expressive Skill Test: (A. Singh 1987- cited in Murlidharan 1992): Expressive skills of 2 to 3 year old children is assessed with the help of a set of 9 photographs. They show children in different situations which the child has to identify. The test takes 30 to 45 minutes. The reliability coefficient is 0.77.

5. ICMR Developmental test battery: (Vazir 1990 - cited in Murlidharan 1992) The instrument tests development of motor, cognitive, language, and social skills and self-help abilities in children from 0 to 6 years. Administration time is 15 to 20 minutes and consists of simple culturally appropriate milestones in five developmental areas - motor, language, cognition, social life skills and self-help skills. The target population is low income groups. The test which requires multiple administrations, can be used by parents, caregivers and health workers to detect developmental delay. It can be used to evaluate intervention programmes. The test is still under the process of standardisation on a large low income population nationwide.and is not available for commercial use.

6. NIMH Development screening schedules: (Arya 1989 - cited in Murlidharan 1992) The screening schedules are part of a manual development by the National Institute for the Mentally Handicapped for use of community workers. They screen development of motor, sensory, cognition, language, emotional and social life skills in rural children aged 0 to 6 years old. Administration time is 10 to 15 minutes. They are intended to provide guidance in the early detection and treatment of mentally handicapped children. The sensitivity is 0.79 and specificity is 0.99. The test is not standardised.

7. NIHM Developmental Assessment Schedule (Arya 1989 - cited in Murlidharan 1992): The test evaluates motor, sensory, cognitive, language and social skills in children from 0 to 6 years. The purpose of the test is to assess and monitor the development of preschool rural children. Training in child development is necessary to administer the test and takes 30 to 40 minutes. It has been standardised and test-retest reliability is 0.97.

8. Cognitive Development Test for Preschoolers: (Pandey and Devadas 1988 - cited in Murlidharan 1992) The test assesses cognition and language in children aged 3 to 5 years. It was developed to measure the impact of preschool education upon the cognition of young children. Administration time is 1.5 to 2 hours. The test-retest reliability is 0.95 and validity is 0.8. The test is not standardised. It is not a screening tool.

9. Assessment Checklist for Preschool Children (Misra and Roy 1985 - cited in Murlidharan 1992) The assessment checklist was originally developed for research purposes. It evaluates motor, cognition, language and social life skills in children aged 2,6 to 5,6 years. The administration time is 1.5 to 2 hours. The test-retest reliability is 0.96 and validity is 0.81.The test is not standardised. Qualified testers are required.

10. NIPCCD Tools for Non-formal Preschool Education Component in ICDS (Sharma et al 1985 - cited in Murlidharan 1992): The instrument assesses the impact of preschool education in relation to the goals of ICDS programmes. The test looks at various skills in 3 to 5 year-olds and their family and school environment. The instrument is very broad based and taps motor, cognition, language and social life skills as well as aspects of school performance, family environment, child\care giver interaction and qualities of school environment. The administration time is not provided. The test has reliability, validity coefficients, norms and is criteria referenced but is not standardised.

None of the above tests provide an ideal model for the new Indian test bearing in mind its stated purposes (p....). Nor is any ideally suited to act as a criterion measure for validity studies of the new test. The major criticism is that none are standardised and none are published or available for commercial use. The areas of skill covered are either too wide e.g. NIPCCD Tools for Non-formal Preschool Education Component in ICDS, NIMH Developmental Screening Schedules and NIMH Developmental Assessment Schedule; or too narrow e.g. The Word Meaning Test, Grammar Comprehension Test and Expressive Skill Test which also encompass too narrow an age range; the socioeconomic range is too narrow e.g. The ICMR Developmental Test Battery, NIPCCD Tools for Non-formal Preschool Education Component in ICDS, NIHM Developmental Screening and Assessment Schedules; the administration time of tests covering verbal and non-verbal skills is in most cases too long e.g. Assessment Checklist for Preschool Children, NCERT Language and Cognitive Tests for Preschoolers, Word Meaning Test and Cognitive Developmental Test for Preschoolers.

The ICMR Developmental Test Battery (Vazir 1990) will probably be the most appropriate test to use as a criterion measure for future validity studies for the new Indian test because it is validated and is currently being standardised (unfortunately only on low income groups).

TESTS FROM THE WESTERN WORLD

Western tools for screening cognitive development of preschool (2 to 5 years) children which involve direct testing, are quick, include language and explore some aspects of non-verbal cognition are reviewed.

1. The British Picture Vocabulary Test (BPVT) (Dunn et al. 1982) The British Picture Vocabulary Test (BPVT) explores receptive vocabulary through a child's selection of one out of four pictures in response to a verbal stimulus. There are two versions; 32 items for the short version and 150 items for the long version. Test scores can be converted to standardised scores, to age equivalents or to percentile ranks.

Age group: 2 to 17.11 years; sample size = 1,401 subjects (long version); 3,334 children (short version). Both internal and external reliability provided; Content, construct and concurrent validity provided.

2. Reynell Developmental Language Scales (Reynell 1969, 1977) The Reynell Developmental Language Scales (RDLS) provides separate measures of language comprehension and language production. It covers normal stages of development between the ages of 1 and 5 years. It is based on an explicit model of the processes thought to be involved in verbal communication. Conceptual development and problem solving skills are seen to be increasingly concerned with increasing mastery of language. The different items are specially selected to reflect a child's progressive command of an abstract symbol system which can be used for manipulating abstract concepts and relations. The comprehension scales begin with items concerned with the extent to which a child associates a word or phrase with affective or situational meaning and proceed to when she can use ideas beyond concrete evidence.

The majority of comprehension items require a child to respond to a question or an instruction by pointing to, or manipulating a variety of household objects and models. For example, 'Put the pigs behind the man'. Expression is tested through picture naming, requests for definitions and for describing pictures. Test scores in each section can be converted to an age equivalent for comparison with the chronological or the mental age of the child.

Age group: 6 months to 6 years; Sample size: 636; Internal reliability, content, predictive and concurrent validity provided (correlated with WISC, Stanford and Binet); Administration time 40 to 50 minutes.

The test can be administered by trained examiners only and is designed for diagnostic rather than surveillance practice.

3. Early Language Milestone: (Coplan 1983, Walker 1989) The Early Language Milestone (ELM) is a standardised language screening instrument designed to provide physicians and other health professionals with a rapid means of screening the language development of children less than three years of age. It was originally validated by Coplan et al (1982) on a population of 119 children considered to be at risk for developmental disability. A sensitivity of 97% and a specificity of 93% were reported. The test is focused on expressive, receptive and visual language, primarily through parent report with occasional direct testing of the child. Each child's profile is scored as 'pass' or 'fail'. Administration time is one to four minutes.

Direct testing of children is minimal and there is no section assessing non-verbal skills.

4. The Denver Developmental Screening Test (Frankenburg, Dodds 1967) The Denver Developmental Screening Test (DDST) is one of the most widely employed developmental screening tests. The test looks at gross motor, fine motor, hearing and language and social development in children from 0 to 6 years. Pass\fail\ questionable scores are produced for each of the four sub-tests and the test as whole. Items rely on direct elicitation, observation, and parent interview and take approximately 20 to 25 minutes to administer and score. The initial standardising sample was of 1036 children. The test has been

validated with the Stanford Binet or the revised Bayley Scale of Infant Tests and has specificity of 0.73 and sensitivity of 0.92. Inter-rater reliability and test-retest reliability studies are not thoroughly assessed (Glascoe et al 1990). Many suggest that the DDST fails to detect an unacceptably large number of children with handicapping conditions (Meisels 1989). Borowitz and Glascoe (1986) reported that by using only the language sector of the DDST, 47 per cent of language delayed children were missed.

5. Developmental Indicators for Assessment of Learning - Revised (Mardell-Czudnoswki, Goldenberg 1983): The Developmental Indicators for Assessment of Learning (DIAL) screens children between 2 and 6 years of age. There are three subtests tapping gross and fine motor skills, expressive and receptive language and articulation, and cognitive-academic skills. Percentiles are produced for the total test and each subtest. Items are elicited directly and the total test takes approximately 30 minutes to administer and score. The test material is appealing and portable. There is a one page protocol accompanied by manuals which provide clear guidelines for interpreting behavioural observations. The DIAL is well standardised and can be used for individual or mass screening. For the latter an inservice package for training is available with the publishers. How to explain results and make specific referrals is adequately described. Suggestions for follow-up and intervention are also provided.

6. Screening Children for Related Early Educational Needs (SCREEN) (Hresko et al 1988): The Screening Children for Related Early Educational Needs (SCREEN) samples a range of language, preacademic and academic skills to detect 3- to 7-year-old children with current or potential school problems. Four subtests produce percentile and other standard scores. It is well standardised with excellent validity and reliability studies but no sensitivity or specificity indices. Paraprofessionals are expected to test under supervision of experienced examiners. The test takes 30 minutes to administer and score. The test stimuli are largely black and white pictures and not very appealing to children.

7. The Bus Puzzle Test (Egan and Brown 1984): The Bus Puzzle Test (BPT) is designed as a screening test of early cognition for use by primary care teams with 21 month to 4 year olds. The test is standardised but not validated or subjected to reliability studies. It explores 3 areas of development - comprehension and expressive language and recognition of shapes. The latter, being a non-verbal parameter, is particularly useful as it acts as a guide to the language-delayed child's intellectual profile. The manual provides precise instructions for administration, a simple record sheet, guidelines to interpretation with graphs and tables for scores in each subsection. The administration time is 5 to 10 minutes. The wooden insert puzzle is attractive and appealing to children.

The BPVT, RDLS, ELM and the DDST explore some aspects of language but not performance. The Denver Development Scale depends mostly on Information given by parents. The RDLS , SCREEN and DIAL tests are rather long for preliminary assessment tools. These tests were thus unsuitable as models for the Indian test. The Bus Puzzle Test is a quick, appealing developmental tool exploring language and some nonverbal skills. It seemed the most appropriate model for the Indian test and was selected. The BPT is described more fully below

THE BUS PUZZLE TEST

The (BPT) assesses early language and some performance skills (Egan and Brown 1984). It is a screening test for children between eighteen months and four and a half years. It provides levels of achievement in comprehension by age. Expressive language assessment takes account of the strategies employed by young children to express meaning. The early stages of form perception are also examined.

Description of the Test :

The Bus Puzzle Test is constructed of plywood (45 x 29 x 1.2 cm) and depicts a colourful English street scene (photo II.1, p. 43). There are nine lift - out pieces: dog, car, bus, postbox, pushchair with baby, mummy, boy on bike, boy with letter and 'lollipop' man. The pieces are easily removed or replaced by a small knob at the centre of each.

Administration of the Test

The test explores:

A : Developing language skills

i.	Comprehension	-	verbal labels.
ii.	Expression	-	verbal labels.
iii.	Comprehension	-	six questions on illustrated situations.
iv.	Expressive language	-	responses to six questions.

B. Performance skills

i. Recognition of shape.
ii. Orientation of pieces.

The child, after being seated comfortably with the puzzle in front of him, is encouraged to talk early in the test. **The expressive verbal labels** section is introduced first. The child is asked 'What is it? ' beginning with the dog, car and bus, proceeding on through the remaining six pieces. As the child names the piece he is asked to lift it out and put it on the table to the left-hand side. This is indicated by pointing.

Scoring depends on the form of the response i.e. whether the child uses the Generic, Functional or the Proper term for the objects and persons depicted.

Comprehension of verbal labels is then tested. The assessor names each piece in turn, giving its proper name not the child's version of it, and asks the child to replace it in the tray. The total number of pieces selected correctly is recorded.

A **performance skill - recognition of shape** is then evaluated. The child's choice of recess for each piece is observed. Correct responses are recorded if the choice is immediate, after talking to himself, or after trial and error.

The assessor observes the way the child orientates the piece to the recess once the right selection has been made. Correct orientation is recorded if immediately accurate or after trial and error.

To assess comprehension further, six questions on illustrated situations are asked. They are given in the order in which they are listed below. The assessor points to the part of the picture as each question is given:

Q.1	Why do we have steps on the bus?	(To go up.)
Q.2	What is mummy doing?	(Pushing the pushchair.)
Q.3	What is he going to do with it?	(Put it in the postbox.)
Q.4	What is he doing with his other hand?	(Taking the dog for a walk.)
Q.5	What is this boy doing?	(riding his bike.)
Q.6	What is the 'lollipop' man doing?	(Stopping the cars to let children cross the road.)

Q. 1 and Q. 3 are introduced by asking 'What is it?' ' pointing to the steps or letter These replies are not scored as they are not essential to the test.

Any type of response, either by gesture or in words, which indicate that the question on the situation illustrated is understood, is scored as correct, but it must give or indicate the idea in the parenthesis.

The child's replies to each of the six questions on the situations illustrated are scored at three levels:

1. Gesture or word/gesture;

2. Two or three words without a verb (a phrase) or a verb alone, usually the present participle, and

3. Three or more words including a verb (verb-object sentence or better)

The score for expressive language is the sum of those for each item.A final question explores intuitive thinking. The assessor points to Mummy's shoulder bag and asks 'What is it?' If the child is unable to name it the assessor does so himself and continues with the question. 'What do you think Mummy has in her handbag? ' The number of appropriate objects named by the child is recorded.

Scoring

Scores in each section are readily translated into age/level equivalents by graphs or by variation from average by graphs andtables.

Statistical Profile:

The BPT has been standardised on 425 English children living in an inner city area and a rural market town. The sample included children of other racial origins provided English was a language used in the family. The proportion of these children in the sample was representative of the percentage present in the country.

THE BUS PUZZLE TEST AS AN ASSESSMENT TOOL

The BPT has been extensively used in the UK as a screening tool. The several advantages contributing to its appeal are discussed below.

Interest

The test is a brightly coloured puzzle presenting familiar persons, objects and situations. This makes it attractive to young children. Active involvement from the beginning promotes communication and effectively disguises the real intention of assessment. It excites and holds the child's interest making its administration easy. This is of particular significance while assessing young deprived children who are not used to the testing situation.

Structured :

The test is sufficiently structured to prevent the child from becoming too absorbed in play to pay attention to the examiner's questions or instructions as cautioned by Mittler (1972). It is compact and portable.

Objective :

Unlike many other early language screening tests it does not depend on historical information given by parents. As the results are quantitative, interpretation is not ambiguous.

Judging comprehension for verbal labels is more definitive in the BPT than in many other language tests because the child needs to pick up the piece she has selected from the table and not simply point to it. There is no element of subjective observation by the assessor, like describing type of play.

Ease of Administration

The BPT is quick, and easy to administer. The whole test takes no more than five to ten minutes. The assessor requires basic but not specialist knowledge in child development. The scoring system is straightforward and interpretation clear.

General Development Test:

The Bus Puzzle Test evaluates not just early language skills but also a visual perceptual performance skill. This aspect of the test helps differentiate specific language problems from a more global delay.

Natural Situation:

The BPT explores early language development in a structured but natural situation. Young English children are accustomed to interacting with adults through picture books. The objects, people and situations depicted in the puzzle have been picked out from familiar settings.

Attention control:

Reynell (1980) described the development of attention control in normal children. The ability to attend to a task matures with age so that by five to six years a child can absorb instructions while performing a task. Stage two is a stage of rigid, single channeled attention. Reynell opined that children at this stage enjoyed form boards and picture puzzles ' where the directions are implicit in the task, and success is self-evident'. The picture puzzle format of the BPT makes it easier than toys for the tester to control the focus of attention of preschool children.

Certain aspects of the test have come under some criticism. The depth of assessment of verbal comprehension is one . Evaluation of comprehension does not consider assimilation of the number of operative words in a sentence and ability to assimilate pictorial representations is entwined. Insufficient picture assimilation in a child might interfere with evaluating both comprehension and expression. As speech is used to judge a child's comprehension of questions there maybe a problem in distinguishing true delay in the former.

Another criticism concerns the adequacy of the psychometric status. Psychometric and statistical demands in test construction have greatly increased and become more refined in recent times. The Bus Puzzle Test was constructed based on the author's many years of clinical experience. There was no Item Analysis. This would have aided item selection discarding those items that show a bias between urban and rural populations. Reliability tests which examine the internal consistency of a test were not carried

out. The test retest and reliability coefficients were not calculated. These would have clarified the dependability of the test for assessment of children. The Bus Puzzle Test was not validated with an existing standard test. Children who failed were not followed up to discover what happened to their language - predictor validity.

It will be necessary to apply these newer scientific principles to the development of the Indian Test.

The Bus Puzzle Test was selected for its developmental spectrum, ease of administration, appeal and technique of language elicitation as a basis on which a test for Indian children could be scientifically developed.

PHOTO II.1

THE BUS PUZZLE TEST

II.2.1 EARLY COGNITIVE DEVELOPMENT

Early cognitive development and its assessment is a vast field, so the review will be confined to the aspects of the two traditional foci, verbal (language) and non-verbal (performance or perceptual) development relevant to the design of the new Indian test.

II.2.1.A VERBAL SKILLS

Language is not a single entity. Various component skills, social and conceptual knowledge underlie language. Real concerns and needs determine the way children use language. Definite patterns of growth and change characterise a child's increasing mastery of language as they become more adept at using it to influence their environment.

EARLY LANGUAGE DEVELOPMENT :

Cognitive basis-

Understanding of the way interactions between a child and the environment creates privileged opportunities for language learning is increasing. A cognitive link exists between the stages of language development and the linguistic environment provided by the child's more linguistically competent caretakers (Harris 1990) .

Conceptual levels of understanding are necessary precursors to the emergence of spoken language, since language is, in effect, the linguistic realization of those conceptual distinctions already established at a non-verbal level. Bloom(1973) said that one motivation for children to speak is to communicate ideas to other people.

Piaget (1970) best described the kind of understanding present in young children by the time they begin to use language. He viewed the emergence of intelligent thought as a process of construction, in which the infant actively seeks to make sense of her surroundings and, more particularly, the relationship between it and her own actions. The child's action on the material world provides a stimulus for conceptual development. By 18 months she also can establish mental goals and organize a linked sequence of actions designed to achieve a particular objective.

Perhaps the most significant achievement at this stage is a child's ability to let one aspect of experience to stand for, or represent, another. This kind of representational ability is thought to be very important to language acquisition since the essence of early language is the child's ability to use speech sounds to

represent or refer to objects, actions and locations. This ability to use gestures and to engage in symbolic play is considered a necessary precursor to the child's understanding of the way in which meanings are represented in words and sentences. As the sequences of pretend play becomes more complex so does syntactic development and lexical repertoire. A child relates these conceptual categories established during the sensorimotor stage to the semantic categories that are expressed in adult speech (Edwards 1973).

The meaning and content of early words and protowords encode the child's existing knowledge of the world. It seems then that language development is built, at least in part, on cognitive development. That is, on the child's knowledge about objects and entities and the relationship between them.

Sociolinguistic basis-

Many authors including Lock (1980) have emphasised the social context of all development. Language, recognised as a major tool of communication, depends on the social environment for its development.

Goldbart (1988) pointed out that the functional use of communication and language was crucial to its acquisition. Martlew (1983) noted that infants must express their basic needs to survive and that these were achieved initially through affective behaviour and later through language. A baby becomes an increasingly active and directive partner in dynamic social interactions with adults (Goldbart 1988). In the initial stages adults 'richly interpret' by imposing meaning on an infant's actions. This gradually reduces as the child's communicating skills become more sophisticated.

Besides establishing prerequisite cognitive and social skills, a child must have access to several environmental support systems (Bruner 1983). These support systems arise principally from maintenance and elaboration of social routines and the special characteristics of adult speech addressed to infants and young children. Social routines provide opportunity to jointly refer to objects and events that later become 'topics' for further exchanges (Bruner 1975). In this way a child not only learns to talk with other people, but also to express her ideas. This form of communication presents a highly supportive context for the child to interpret adult speech and actively test her own hypothesis on how words can be used to help communication (Harris 1990). The action sequences of social routines provide a child with a basis for making some initial hypotheses about relation between syntax and meaning (McNamara 1972). Shared understanding about routines also helps the adult decipher the child's utterances and enables the adult to maintain a constant check on the child's verbalisations. Their assessment of the child's comprehension allows them to tailor the demands they place upon linguistic communication (Bruner 1983).

Social interactions and play routines create conditions within which children become enthusiastic conversational partners, and, in doing so, actively promote their own language development (Harris 1990, Goldbart 1988).

Language is part of a larger social process broadly concerned with establishing interpersonal interaction. Symbols such as words and gestures are initially learned as a device to mediate this interaction. Meanings of words get gradually apprehended as they continue to produce certain effects. Use of words and symbols require a child to represent mentally the relationship between a symbol (word or gesture), the meaning for which it stands and the intended effect on the other person. In learning to communicate a child is also learning to represent experience and, what is most important, learning to think (Mead G. 1934; Vygotsky L. 1978).

ASPECTS OF EARLY LANGUAGE

Language comprises of language comprehension and language expression i.e. structure (Phonology, Grammar and Semantics), meaning (pragmatics), functional characteristics, i.e., language uses (Crystal 1987). In non handicapped children, these aspects of language are coordinated to a considerable degree, so that changes in one are paralleled with changes in others (Sommers et al 1978).

This section deals with development of language comprehension, of syntax and concepts and meaning in early language.

A) DEVELOPMENT OF COMPREHENSION

Mittler (1972) pointed out that research studies have been more concerned with what children say than what they understand. The development of comprehension precedes production of language by quite a considerable period and is more difficult to investigate. He notes that understanding what another person says involves a 'guessing strategy' which combines linguistic cues, pre existing expectations and visual and situational prompts such as facial expression, eye contact, gestures and so forth. Children, particularly, employ considerable assumptions.They understand single words in a sentence within a situational context rather than decoding long and syntactically complex sentences. This is particularly so in 18 to 24 month olds. Reynell (1980) calls it the period of 'situational understanding' which appears several months before the development of symbolic understanding in the preverbal stage. The child, at this point, comprehends the whole situation more than each word in a sentence. These start with understanding of familiar phrases that have been learnt as a part of a regularly occurring sequence of events. Such phrases usually have a clear intonation pattern, and are used by a familiar person in a familiar situation. For example repetitive simple situations and sentences - 'Say bye-bye' or "dinner is ready." Later comprehension of more complex situations occurs with increasing development of comprehension of language.

B) DEVELOPMENT OF SYNTAX

Ability to encode and decode meanings in a sound sequence suggests knowledge of the rules by which meanings are translated into sounds. Meaning is expressed by organising and structuring sound and

concerns grammar. Acquisition of grammatical knowledge helps productivity. The speaker, with the help of the grammar of a language can produce and understand an infinite range of novel but grammatically correct and meaningful sentences.

Grammatical rules can be thought of as comprising three interrelated components or subsystems that operate at different levels (Harris 1990). These are **phonemes** - which are rules for generating strings of sounds that are permissible in a given language. This is the first level of grammatical description.

Recognisable words are organized string of sounds. **Morphemes** are based on rules for combining and modifying individual words. It is the intermediate level of analysis of grammar.

Finally, the third subsystem is concerned with the way in which words can be ordered in sequences to express more complex meanings. Descriptions at this level are concerned with the rules of **syntax**.

Syntactical rules in children: -

The first overt sign of grammatical structure, and therefore a knowledge of primitive syntactical rules, is the emergence of two-word utterances within a single intonational contour (Harris 1990). Primitive sentence structures are not organized by the knowledge of grammar or lexical categories (Bowerman 1973, Braine 1976, Brown 1973). There is little justification for crediting such young children with knowledge of lexical categories such as 'noun' and 'verb' (Harris 1990, Bowerman 1973, Maratsos 1983).

Another aspect of grammar in children is pivot-open grammar. Rather than learning adult grammatical rules, children construct their own rules for producing ordered sequences of words. Pivot-open grammar theory suggests that three structurally based categories decide early two word combinations. Words were classified as belonging to one of the three categories. 'Pivot words' (Braine 1963) forms a small set and can occur only in combination with a word from the larger class of 'open words'. Pivot words are further classified into those that can occur only in the first position in a two-word sentence and those that can occur only in the second position. Also the 'open words' could combine freely with both categories of pivot words and with one another.

Further studies (Bloom 1971) shows that many two-word utterances did not conform to the rules of pivot-open grammar and it seems that pivot-open grammar is unsuccessful in explaining fully the development of early utterances (Harris 1990).

Rules that govern structure in early language are separate from those of adult speech. These rules are closely bound to but are independent of semantic, conceptual and social development of a child. Environmental information plays a significant role. The three subsystems of structure - phonology, morphology

and syntax are closely linked and follow similar stages of development cross culturally but within the properties of a particular language and confines of a sociocultural milieu.

C) CONCEPTS AND MEANING IN CHILDREN'S LANGUAGE

Semantic approaches to language description are based on the idea that, for young children, language structure is subordinate to the child's efforts to talk (Bloom 1973). Language is used to convey meaning (Clark 1983). Children's understanding of meaning and use of concepts is therefore of utmost significance in language development. The social and physical context of their utterances greatly influence the inferred meaning.

The ability to categorize and group objects appears early - from nine months or so onwards. However, children's meanings are different from those of adults. At first there may be **underextensions** so that for example, the word 'dog' may be used to refer to only a particular dog. A bit later, usually between 12 and 30 months, **overextensions** become quite common. Thus 'dog' may be used to refer to all types of animals (Rescorla 1980). Overextensions tend to be based on the appearance or perceptual similarity of relevant objects (in terms of size, shape etc.) rather than function (Clark 1973; Bowerman 1978). The proportion of words overextended generally decreases as children's vocabulary increases.

The phenomenon of overextension is strikingly similar in all languages, suggesting that overextension they may offer clues to the concepts that children use (Clark 1983). The ability to make similarity judgments seems crucial for word usage and cognitive representations (Rutter 1987). It appears that children get meanings by working out what category each word picks out (the reference) and how adjacent word meanings contrast with each other (the sense). The complexity of children's initial word uses suggests that the overextensions derive from their desire to talk (Braunwald 1978). Children are producing words to try to make themselves understood while talking about a much wider range of objects, situations and states than they have the vocabulary for.

Overlap and **Mismatches** are other ways in which children's meanings depart from adult meanings. Overlaps involve simultaneous over- and under-extensions so that, for example, a child might use 'dog' for large dogs and calves but not for small dogs or cows (Clark 1983). Alternatively, words may be acquired first as part of particular routines or formular expressions without the child realizing that the word has a more general usage. Mismatches are those instances when the child is using a word to refer to a totally different conceptual category compared to adult usage. Bowerman (1976) describes how her daughter began to use 'hi' as if it referred to something resting on or covering hands or feet. This idiosyncratic use of 'hi' seems to have arisen from the occasion when Bowerman showed her daughter finger puppets that nodded and said, 'Hi'. Ordinarily if children's misuse of words is met with incomprehension on the adult's part, the word is dropped from the repertoire.

The **semantic feature hypothesis** was proposed to account for children's acquisition of meaning (Clark 1973). It assumed that meanings break down into combinations of units. Children start with partial meanings to which they add elements until gradually the meaning matches that of adults - moving from the most general to the most specific characteristics. This suggestion seemed in keeping with the data on over-extensions. However, overextensions in comprehension are less than those in production. Therefore evidence suggests that the acquisition of meaning must rely on conceptual and semantic features, on non-linguistic constructs, and on patterns of usage and experience with the objects/situations concerned (Clark 1983).

Clark (1983) argued that in finding meanings children use two basic principles of lexical organization - **contrast** and **conventionality**. In other words, the meaning of words depends on contrasts with other paired words (e.g., children learn the meaning of 'dog' through contrasts with 'cat', 'lamb' etc.). The second principle is that in every language community, there are conventions regarding what words are most appropriate for referring to objects, events and relationships. Brown (1958) remarked that children learn words that are maximally useful, given the conventions of the speech community. Children's knowledge of meaning builds up through their testing of hypotheses about what words can be used for. Initially non-linguistic and later linguistic knowledge influences such hypotheses. The process, however, is essentially social. Children look for new words to fill gaps in their communication systems and, also when they hear new words they must contrast with ones with which they are already familiar. This filling of lexical gaps leads to overextensions, to the use of general purpose words like 'that', and to the coinage of new words. Lexical contrast theories emphasize that conceptual categories and word meanings, although linked, are not synonymous and that communication is very important in language acquisition.

Conversational skills: -

Children may not be explicit or clear in what they say. Skills in talking or conversing with other people is integral to language development. Conversation entails the ability to take turns, to know how to change the topic, to understand how to show misunderstandings and how to correct them (Ochs 1983). Conversations are also based on a set of mutual understandings or assumptions regarding the form and content of speakers contributions (Grice 1975).

McTear (1985) in a study of children's conversation, categorised their various skills to grade their conversational maturity. These were turn taking, initiations of conversation, responses to adult communication and use of linguistic devices for establishing and linking conversational topics. Ellipses, a type of linguistic device, are some short-form answers to a question. For example, when in response to a question such as 'What did you have for lunch?" the child replies, 'Sausages' rather than 'I had sausages for lunch.' The elliptical answer is more natural and sophisticated than the long form. Ellipses should be considered whilst scoring test responses particularly when lower scores are given to single word responses.

Children's conversational styles would reflect the sociocultural use of language, the nature and amount of conversation in the community and particularly the family. As Mittler and Serpell (1985) pointed out that children in some cultures seldom engage in prolonged, intensive dyadic play with an adult. Minturn and Hitchcock (1963) noted that adults spoke to children only occasionally in a village in India, and that too, only to reprimand.

II.2.1.B NON-VERBAL SKILLS

The nonverbal skills explored by a picture formboard are visuo-perceptual and spatial abilities. Their development is discussed below.

A) SPATIAL ABILITIES

Thurstone (1938) was first to report a space factor in his studies of mental abilities. Spatial ability is a special function of the right hemisphere and diverse systems like sensory abilities, memory or attention processes and motor behaviours are concerned with it.

Some features of spatial ability :-

Three characteristics are of particular relevance to formboard tasks. They are **spatial orientation, spatial visualisation and mental rotation.**

Spatial orientation is the ability to appreciate spatial relations about the body of the observer. It is also the ability to remain unconfused by the changing orientation of a presented form (Kolb and Whishaw 1990). They defined **Spatial visualization**, as the ability to imagine movements, transformations and other changes in visual objects and to manipulate or rotate two- and three-dimensional pictorially presented stimulus objects. Object location, object identification and determination of the relations between objects also form part of these spatial behaviours. Shephard et al (1971) introduced **mental rotation** to cognitive psychology. It is assessed by some sub tests of the Frostig Developmental Test for Visual Perception and include *form constancy* - the ability to recognise a shape no matter what context it is seen in, *position in space* - the ability to recognise differences in the position of objects or forms in space, and *spatial relationship* - the ability to recognise the relationship between two and more objects in space. Information from the standardisation of the test shows that the age span from three to six years is a time of both rapid and significant changes in these abilities (Frostig et al 1966).

Kail et al (1980) looked at mental rotation in children in the 3rd, 4th, 6th grades and college students. He concluded that this ability increases with age and with familiarity of the object or character being manipu-

lated. Some explanations suggested by the authors are that younger children may rotate the entire stimulus, whereas older children rotate only part of it; older children rotate stimuli in a more analytical way and are not just simply quicker at processing than younger ones.

Spatial ability depends on information processing and is a good indicator of intelligence (Sternberg and Powell 1983). This makes it an useful skill to be evaluated in a multifaceted cognitive test.

Factors influencing spatial abilities : -

The effect of age on spatial behaviour has been shown adequately by Kail et al (1980) and Acredolo (1976). A familiar object is easier to manipulate and locate (Kail et al 1980, Kolb and Whishaw 1990). The innate intellectual nature of the ability was pointed out as early as 1938 by Thurstone. Newcombe (1982) interpreted the controversial evidence on effect of sex on spatial ability by suggesting that small sex differences are present in childhood and increase with age. The genetic component in spatial tests has been shown in several twin studies by Vandenberg (1975) and this seems largely independent from the genetic component in other ability test scores.

Interestingly performance on spatial tests is less correlated with social class differences than is performance on vocabulary tests. The explanation may be that a spatial ability is more universal and can be adequately experienced even by lower social classes (Vandenberg 1975).

Cognitive representations of space are dependent on and change with experience (Kolb and Whishaw 1990). Further, perception of spatial orientation in preschool children contribute to cognitive development (Belka and Williams 1979). These two factors may make development of spatial abilities an important contributing factor to early education.

B) VISUAL PERCEPTION:

Nonverbal tasks such as form boards and picture puzzles utilise visual perceptual skills that include visual discrimination, visual attention and visual memory.

Children show a rapid development in visual perceptual skills from three to six years (Williams 1983). Most aspects attain maturity by the age of eight to 12 years. Of all the various visual perceptual skills, picture perception is most significant to performance on a picture puzzle and will be discussed in some detail below.

PICTURE PERCEPTION

Picture perception in children will play a significant role in test interpretations when the assessment tool uses an illustrated scene. Most tests employ pictures to generate language (Reynell 1969,1977, Dunn et al 1982, Bishop 1982). Competent picture perception in children is subsumed. As Mittler (1972) pointed out relevant psychological processes involved in picture assimilation influence test results and need to be considered. As various social groups have been shown to respond to pictures differently it was decided to review research on picture perception (Misra and Shukla 1984, Sinha 1977, Hudson 1967) .

Pictures represent real objects, scenes and events and emulate the visual and perceptual cues given by them. Like language, picture perception involves symbolic representation. Normally both skills develop alongside each other and may interact. Reynell (1980) described the development of symbolisation, which occurs after internalisation of the concept of an object, and implies understanding various levels of representation of objects. The perceptual clues gradually reduce and a child moves from recognition of real objects, to miniature objects, to understanding more arbitrary symbols such as a picture of the object and later its verbal label.

Pictures form an integral part of children's world and are linked with recreation, testing material and education. Formal education, even in the Third World countries, uses pictures. The development of picture perception has only recently attracted research.

Research on picture perception was reviewed to answer some questions. Was experience or training needed to perceive pictures? At what age did children perceive pictures? Was picture perception different in different cultures and socioeconomic groups? What aspects of development of picture perception needs consideration whilst designing a picture puzzle.

Need for training and intelligence in picture perception:

A crucial study conducted by Hochberg and Brooks (1962) contributed largely to the view that recognition of pictures did not require instruction or training. Hochberg and his wife raised their child with restricted exposure to any kind of pictures. Even labels from cans were removed. He was then tested in naming pictures at the age of two when he had a reasonable vocabulary. The child recognized and labeled almost all photographs and line drawings correctly.

Neither advanced age nor schooling is necessary for picture perception to be successful. Nor is a specially high level of intelligence (Kennedy 1974). O'Conner & Hermelin (1961) tested 72 subjects with a mean IQ of less than 50. The majority identified line drawings of objects.

Zimmerman & Hochberg (1965) showed that monkeys are as sensitive to some aspects of pictures as humans. Hayes & Hayes (1953) showed that a chimpanzee tried to pick up drawn objects and put her ear close to a picture of a watch as though listening for ticking.

Pigeons may have accurate picture perception. Hernstein & Loveland (1964) trained pigeons to peck when they saw a photograph containing human beings and to refrain from pecking when confronted with a photograph not containing human beings. The trained pigeons responded correctly even if the human figures varied in terms of dress, size, age and being partly obscured by intervening objects like trees or cars.

Age at which children start to perceive pictures:

De Loache et al (1979) have shown that five month old infants can recognise pictures of real objects even those varying in degrees of fidelity to the original. They are also able to transfer from one two-dimensional representation to another, less realistic one. Their 5-month old subjects could recognise line drawings and realistic photographs equally though preferred looking at the latter. Rose (1977) in her study of 6-month-olds noted that babies could detect change in dimensions and transfer information across dimensions.

Picture perception across cultures

Studies on perception are fraught with difficulties. Trying to decipher a response, particularly with the aid of a foreign language or no language, is bound to cause controversy. Research literature on picture perception across cultures is full of conflicting reports.

Initial studies of the Bantu and Bush Negro tribes reported that perception of pictures was difficult in culturally conditioned people (Hudson 1967, Herskovits 1948, Kidd 1904).

More controlled studies have shown that identification of depicted objects gave no problem to the naive observers. In contrast interpretation of scenes seems more culturally dependent. Nadel (1937)in a careful study, showed that Nigerian people, with very different kinds of cultures had very little difficulty with photographs. His Yosuba subjects enjoyed a culture that was rich in handmade pictures. The Nubes' art was 'imageless' in the sense it was decorative and not depictive. Yet both peoples identified familiar animals in photographs.

Deregowski (1968b) in another study, found that Zambian subjects who misperceived pictures in the Hudson's test by his criteria, perceived them on other tests. Page (1970) confirms Deregowski's results. They concluded that the drawings used by Hudson are ambiguous. This was corroborated by Kennedy

(1974) when he used the Hudson pictures to test students, informally, in his class at Harvard. He said, '. . . Casual observations suggest training in a (picture) convention is not necessary for (picture) comprehension . . .'

Developmental aspects of picture perception

a) Influence of the format of a picture:

Gibson (1971) and Bernheimer (1961) noted that subjects deal with the object or event depicted, not the particular slant or design of the picture. Hence realistic pictures are not more easy to perceive than line drawings.

Ryan and Schwartz (1956) investigated the effects of different media on the rapid pickup of pictorial information. The order of difficulty (easiest to hardest) was as follows (1) cartoons (2) photographs and shaded drawings (3) line drawings. For rapid pickup of information it seems that pictures capturing the least amount of information are the easiest.

Cartoon pictures over line drawings or realistic pictures seem more appropriate for use for the picture puzzle.

b) Whole-part relationships :-

Understanding parts of a picture in context of the whole scene would depend on development of whole-part relationships. Lowe (1973) notes that early in development children focused on the 'whole' and later 'parts' that made up the 'whole'. Visual perception changes from 'diffuse perceptual organisation' where the 'whole' is undifferentiated, to a level of refinement in which the 'parts' that comprise the 'whole' become better defined and are ultimately integrated into a precise or 'articulated whole' (Williams 1983). Part-whole integration matures to adult levels by nine years (Elkind et al 1964).

Niessen et al (1935) reported that tribal children in French Guinea had difficulties in appreciation of part-whole relationships on the Mankin & Feature Profile Test.

Figure-Ground Perception:

Another aspect of whole-part perception has to do with the ability of a child to extract relevant or pertinent detail from contexts that contain irrelevant or distracting information (Williams 1983). Embedded figures have been used to assess this ability. Williams et al (1979) found that six- and eight-year-olds were more mature in discerning relevant figures from a distracting background than five-year-olds. Familiar items were more easily perceived than unfamiliar or abstract items like geometric shapes. A steady state of asymptote was reached by eight to 10 years of age.

Adults seem more able than children to deal with conflicts between pictorial information and the flat surface of the picture (Elkind 1970). Elkind showed, for example, a 'car' made of 'vegetables', the many items used to compose the main subject of a picture are at one and the same time a part of it and

complete objects in their own right. Such pictures posed greater problems for younger subjects. They had difficulty in identifying both, focusing in on one or the other. It seemed as though either the pattern or its parts have to be handled separately or confusion arises. Elkind's study highlighted a fascinating problem created by conflict between the elements of a picture and the totality depicted.

Ghent (1956) studied 4-13 years old on overlapping and embedded figures. The younger children exhibited some difficulty in analyzing overlapping figures, no matter whether they were realistic or geometric but had greater difficulty in analyzing embedded figures. Children see only one contour at a time and thus have difficulty distinguishing embedded figures. Ghent suggested that the improvement with age reflects the capacity to discern a border as belonging to more than one figure.

c) Completeness of a picture:

A series of studies by Gollin (1960, 1961) showed that children need much more thorough information before they correctly identify the object depicted. Gollin gradually erased segments of outline drawings of familiar objects until bare hints of the original shape were present. Children needed much more outlines than adults to recognize the objects and the amount of outline necessary decreased gradually from 5-year olds to adults.

Mooney (1957) studied closure ability in children aged seven to 13 years. Strongly lit high contrast photographs of heads and faces showing only salient shadows and highlights were used as stimuli. He found an increasing ability with age to recognize and classify the faces by age and sex. This reflects an improved ability to recognize higher order relations of shadows and highlights specifying objects.

After children note objects in a picture they can relocate them spontaneously in their next exposure to the picture (Hoffman 1971).

SUMMARY STATEMENT

It seems that pictures can provide accurate information. Children can identify some pictures without training in a convention and these skills mature spontaneously with age. It has been shown that infants as young as five to six months can visually differentiate three- dimensional stimuli from their representations, i.e., two dimensional ones.

Anecdote and systematic investigations show that people from a variety of cultures identify line drawings and photographs of objects similarly and even see comparable ambiguities in pictures. Different cultures favour different interpretations of ambiguous drawings or comment in different ways on the significance of frozen postures.

The hypothesis that picture perception requires training is less likely with evidence showing pigeons and monkeys perceiving pictures with no or minimum training.

The developmental aspects of picture perception need to be considered in designing a scene for a picture puzzle for children. Cartoon figures seem preferable to realistic ones; overlapping of figures or partially visible contours should be avoided; shadows and highlights in a picture could confuse a young child; the scene should not be cluttered or too distracting. Development of whole-part relationships need consideration in assessments using pictures. However, with these aspects acknowledged, it does seem appropriate to proceed with development of a picture based test for Indian children.

II.2.2 IMPACT OF SOCIAL FACTORS ON DEVELOPMENT

II.2.2A SOCIAL FACTORS AND LANGUAGE DEVELOPMENT

Several studies have shown that language development is strongly related to social class (Douglas 1964, Davie et al 1972, Bernstein 1975). In order to analyse the effect of social class on language, the genetic influence needs to be separated from that of environment (Puckering and Rutter 1987).

Wohlwill (1973) describes environment as a broad complex of forces operating in a child's familial, social and cultural milieu. Environmental influences are multifaceted and the need to identify the specific aspects that influence development was highlighted by Misra and Tiwari (1990). The relationship between language, cognition and environment is complex. Environment affects language and cognition separately (Puckering and Rutter 1987). Further more, cognition is also directly influenced by language development (Reynell 1978). The structure of language and the way it is used is also influenced by social environment (Goldbart 1988, Shatz 1983, Maratsos 1983, Halliday 1973).

Various social and psychological influences need to be considered while testing language. Understanding the range of skills possessed and valued by different social groups is important while assessing their language (Edwards 1989, Blank 1982).

ENVIRONMENTAL DEFICIT:

Most young Indian children, particularly from the disadvantaged social group have limited language experience. Children who have very restricted language learning experiences will be vulnerable to language delay (Harris 1990 and Farran 1982). The most likely disability resulting from social deprivation in young children is language delay (Tough 1977) . A child she said, needed someone to talk to her, to listen to her, and to elaborate her verbal attempts. In the absence of sensory deficit and abnormal intelligence, a healthy child who lacks these opportunities may have limited expression and understanding which are below average. In contrast, Houston (1970) rejects the theory of deficient language in disadvantaged children and believes that environment has some formative influence upon the way a language develops to suit the immediate needs of their speakers.

Bernstein observed differences between working class and middle class children's use of language and termed them 'restricted' and 'elaborated' codes (1958, 1960, 1962a, 1962b). An elaborated code is one in which the meaning of the communication is clear and specific foreknowledge of the surroundings and circumstances of the conversation is not necessary. Restricted language comprised of short, simple, often unfinished sentences with poor syntax, simple and repetitive use of conjunctions, rigid and limited

use of adjectives and adverbs and statements as implicit questions (Bernstein 1959). He suggested that these characteristics reflect difficulty in delaying immediate gratification, of planning for the future and of 'more' volatile expressive behaviour in lower class children.

Many language researchers pointed out that these codes refer to styles of language usage and not to language capacities (Halliday 1973, Bernstein 1972). Robinson (1965) stressed that working class children can and do use elaborated codes when it is made explicit to them that a formal explanation is needed but they use it less than middle class children especially in the school setting. Similarly, Tizard et al (1983) showed that working-class nursery school girls used little complex language - comparisons, explanations, reminiscences and plans - in conversation with teachers despite their use at home. This home school difference in language use was less evident in children from more privileged backgrounds. Nevertheless, the same data showed that less complex language was used at home to address working-class children than middle-class children and that there was a significant difference in language usage between lower and middle class children at school.

Other authors have emphasised other cognitive factors that contribute to language delay in deprived populations. A report of a Canadian preschool intervention programme (Wright 1980, 1983) found that disadvantaged children were deficient in symbolic processing. They concluded that the children received insufficient cognitive stimulation from parents, whose own cognitive abilities may have been underdeveloped. Snow (1982), felt that the problem was knowledge deficiency more than a linguistic one which lead to reduced vocabularies. Tough (1982) noted that advantaged children used language for more complex activities that resulted in more elaborate speech. Wider experiences and knowledge enhanced language. Gullo (1981) said that poor children's language was linked to the concrete present and was less used for abstract reasoning. Tough (1977) reported that advantaged children used language for analysis, reflection, and other higher order thinking. She further noted that these children had a richer imaginative play that involved renaming represented objects and events.

It seems that children from socially disadvantaged background have substantial language differences that may reflect use of language or other cognitive skills.

SPECIFIC ENVIRONMENTAL FACTORS INFLUENCING LANGUAGE

Environment is not monolithic and a variety of psychosocial factors influence language and development to different degrees. The works of Majoriebanks (1979) and Caldwell and Bradley (1978) have shown that environmental influences are specific and require separate analysis.

HOME ENVIRONMENT

Several studies have been done on home environment and its effect on language and cognitive ability (Elardo & Bradley 1981, Jones 1972, Bradley & Caldwell 1984, Rutter 1985).

Jones (1972) examined variables of the home environment in two groups of boys aged 10 to 12 years, matched for general intelligence but discrepant with verbal ability. High verbal boys tended to come from homes where parents had the following attributes. A higher **'mothers' interaction index'.** which included an 'avoidance index' measuring the mother's disposition to answer or avoid answering difficult questions from the child, and a 'chatter index' measuring the mother's disposition to continue a verbal interaction initiated by the child; the mother's view on the use of toys was also included. A high interaction index indicates a disposition to encourage the child to interact with his home environment on a verbal cognitive level (Brandis & Henderson 1970). Higher academic and vocational aspirations for their children. They provided more opportunities for use and development of language e.g. meal time conversation, news papers, word games. There was a conscious awareness in the home of the value of verbal facility in the future. Higher occupational status. The opportunity for the use and development of language was the best predictor of verbal ability. It accounted for 51 per cent of the variance.

Daily inter actions with children, appropriate play materials and maternal responsiveness were key features in language development. This is seen across socioeconomic strata suggesting that the mother child relationship be a more powerful factor than social class in relation to language delay (Bradley & Caldwell 1984, Murlidharan 1990, Pushpa 1990, Bevli 1990, Gottfried et al 1984).

A mother's vocal responsiveness to the infant's vocalisations and her imitations of them, are important factors in linguistic development which varied in mothers from social classes (Brown 1980, Snow et al 1976, Tough 1977).

Active social interaction promote language development even more than corrective remodeling of a child's grammatical errors (Nelson et al 1973, Murlidharan 1990).

Maratsos (1983) surmised that children were active and creative language learners and did not require training or practice. Environment acts by providing a broad language or communication model from which a child intuitively draws generalisations.

BIRTH ORDER AND FAMILY SIZE

Many studies show the slight advantage first born and only children have in intellectual ability and school achievement (Rutter and Madge 1976). Douglas et al (1968) found this advantage more conspicuously in

boys, and with respect to verbal intelligence. Davie et al (1972) also noted it in reading attainment. The greater interaction of parents with their firstborn child results in the slight difference noticed between first and later born children.

Bradley and Caldwell (1984) reported the highest scores on Home Observation for the Measurement of the Environment (HOME) for only children. Birth order and overcrowding were major influencing factors in a child's environment.

Language development is enhanced by early contact with mature language users more than, as Wachs and Gruen (1982) put it, ' . . . with undifferentiated noisiness of a large family or other small children... '

PARENTAL EDUCATION

Education influence the ability of parents to get jobs and hence family income. Maternal education is very important to child rearing. Awareness of both health and education in children seems to increase with maternal education.

Many Indian studies have shown children's scholastic achievement and performance on cognitive tasks relate significantly to maternal education (Murlidharan 1990, Bevli 1990, Pushpa 1990). The correlation was higher in younger children.

Tough (1977) in her longitudinal study of language development in three to 7.5 year olds found that the educational status of parent contributed significantly to the complexity of the children's linguistic structures. Educated mothers were more democratic in their interactions with children, used negotiating strategies to influence children's behaviour and read more story books to them (Tough 1982, Teale 1992). The language they used with children was more diverse in structure and content. Uneducated mothers, on the other hand were more autocratic and used categorical statements when talking to their children.

Different factors operate within a social milieu to enhance growth of language in young children. However they provide a mere springboard to reinforce language learning which as Houston (1970) said is innate.

A common tool is required for an evaluation test to compare varying range of populations. Therefore test design must consider the effect of disadvantage on a child's performance.

STUDIES OF SOCIAL CLASS AND DEVELOPMENT IN YOUNG INDIAN CHILDREN

LANGUAGE DEVELOPMENT AND SOCIAL CLASS:

I) BEVLI'S STUDY (1978):

The longest study of the development of young children in India in the different socioeconomic groups was carried out as part of the National Council of Education and Research and Training (N.C.E.R.T.) by Bevli et al (1978). The study was carried out at seven centres in India Calcutta, Bombay, Delhi, Madras, Ahmedabad, Hyderabad and Allahabad.

The **sample** consisted of urban, rural and industrial (workers) population. It was confined to five age groups - 2,6 to 2,11; 3 to 3,6; 3,7 to 3,11; 4 to 4,6; 4,7 to 5; which were equally distributed with respect to age and sex. The total sample examined consisted of **6997 children**. At each age, for each population subgroup, at each centre there were approximately 30 boys and 30 girls.

Test - Early language was assessed in children between 2,6 and 5 years of age using a culturally modified Gesell Scale (Gesell 1954). The original materials were used except picture cards and picture book subscales which were culturally modified.

Results and Conclusions

The language development of rural children was delayed by 12 to 18 months in comparison to urban children. Industrial children were more advanced than the rural but were still behind the urban.
Some subsections that are shown below displayed the differences in test results clearly.

Section 4: Naming and identification of pictures of object

Pictures	Urban	Industrial	Rural	Maximum variation
Rose	2.5 yrs	2.5 yrs	4.0 yrs.	18 months
Book	3.0 yrs	4.5 yrs	4.5 yrs	18 months
Clock	2.5 yrs.	2.5 yrs.	4.0 yrs.	18 months
Needle	NR	NR	NR	NR
Cow	2.5 yrs.	2.5 yrs.	3.0 yrs.	6 months

NR = No Response

The minimum variation was seen with the object most familiar for all subgroups, the picture of the cow.

Section 3: Naming and use of real objects

Object	Urban	Industrial	Rural	Maximum variation
Paper	2.5 yrs	3.0 yrs.	3.5 yrs.	12 months
Key	2.5 yrs	3.0 yrs.	3.0 yrs.	18 months
Knife	2.5 yrs.	3.0 yrs.	3.5 yrs.	18 months
Bag	2.5 yrs.	3.0 yrs.	3.5 yrs.	18 months

Section 7 : What is your name? demographic details given by age and social status:

	Urban	Industrial	Rural
Name	2.5 yrs.	2.5 yrs.	2.5 yrs.
+ Sex	2.5 yrs.	2.5 yrs.	3.0 yrs.
+ Father's name	3.5 yrs.	3.5 yrs.	4.0 yrs.
+ Address	4.0 yrs.	5.0 yrs.	-
+ Age	5.0 yrs.	-	-

* Rural children were unable to give their address. Neither rural nor industrial children know their age at least until 5 yrs.

It is pertinent to note here that most rural and slum homes do not have a postal address nor receive letters routinely.

Section 5: Action Item

One section involved answering 'who' or ' what' framework questions for example 'who sleeps', 'who speaks', 'who bites', 'what grows', and 'what blooms'. Urban children could answer 8 out of 10 questions by 2,6 years. At this age rural children could answer one question. In all groups verbs describing immediate experience like sleep, speak, walk came earliest. These were followed by bark, fly, swim and then grows and blooms. The rural children never achieved the more abstract higher order ideas such as growing and blooming.

Urban children spoke clearly and coherently, without unnecessary pauses using complete sentences at 2.5 years as compared to rural children who were coherent only at 3 years. The rural children stopped taking unnecessary pauses at 3.5 years and started to use complete sentences at 4 years.

Urban children comprehended most of the prepositions by 3.5 years. on, in, under appeared earlier at 2.5

years., behind and in front at 3 years. and besides at 3.5 years. Rural children comprehended all prepositions by 4 years. except besides which was not seen in the age group studied.

Generally the subpopulation trends were similar in all the centres though less marked in areas like Calcutta where greater emphasis on education is reflected in child rearing practices.

II PANKAJAM G (1990)

Pankajam studied the impact of preschool education on language development of children. The sample consisted of 411 children from 2,6 to 5 years in Madurai District of South India. 255 children were drawn from the rural sector and 256 from the urban sector.

The children were observed in three different situations:

(1) While playing with a peer group
(2) In the company of adults at home and
(3) In response to a set of pictures and toys. A set of 45 photographs and pictures and 25 toys were prepared based on 'Illinois Test of Psycholinguistic Abilities, ' Vakia Bath,' and "Chitra Vakia Jodna" (N.C.E.R.T.). These included common animals, insects, birds, vegetables, flowers, vehicles, play equipment, household appliances, writing material, pictures of a shopping centre, railway station, doctor and patient and common activities found at home and school.

The responses were recorded on tape and various aspects of language were analysed.

Results and analysis

The language abilities of children from urban areas were significantly (< 0.05) higher than of children from the rural sector. In the latter sector children attending preschools scored better than those not doing so. The difference was significant in all age groups. Mean scores for total number of nouns and verbs used were significantly (0.05) higher in urban as compared to rural children. Children from the urban areas were more egocentric in their speech than rural children. Urban children used more complete-sentences than rural children. They also had a larger vocabulary.

III OTHER INDIAN STUDIES

* Srinivasan R (1969) showed that secondary school children from middle class families had a significantly better language ability than those from lower social groups.

* Tamjane (1965) showed that children from better families, even if they do not attend preschools, could speak better than children from "non - enabling" homes.

SPECIFIC ENVIRONMENTAL FACTORS AND EARLY COGNITIVE DEVELOPMENT

Many Indian studies have looked at different social factors affecting performance on cognitive tests and scholastic achievement. Four studies are reviewed - Murlidharan 1990, Bevli (1990), Misra and Tiwari (1990), Pushpa (1990).

* Murlidharan investigated relevant environmental factors that may affect scholastic achievement, in 664 children aged 5,6 to 11 years. Higher mother-child interaction influenced the younger children positively while high maternal aspirations and a positive attitude toward play related significantly ($p<0.05$) with better school performance in all age groups. Children doing well at school, possessed better play facilities, toys, space and encouraging adults at home. Reading-scores were higher in children of all ages whose homes provided greater opportunity for language development, like availability of books, newspapers and more social outings.

* Pushpa examined the relation of cognitive styles measured by the Children's Embedded Figures Test (CEFT) to specific factors in social deprivation in 265 primary school children. Physical characteristics like type of house, food, clothing, and physical environment correlated significantly with cognitive performance on the CEFT. Again mother-child interaction and higher parental education played a significant positive role in judging cognitive styles.

* Interestingly, both Pushpa and Murlidharan reported that type of school and school experiences did not influence children's performance. This was contrary to findings of Bevli and Misra et al who found children in superior schools did better in most types of cognitive tasks.

Though none of the studies looked at early language development, clearly children from 5 years to 11 years performed better on cognitive tasks and in school when exposed to a more stimulating and caring home environment. This was also true in rural and poor urban children. Economic status with its influence on physical environment, health and food was significant to children's level of performance on cognitive tasks.

II.2.2B NON-VERBAL SKILLS AND SOCIAL DISADVANTAGE

1) PICTURE PERCEPTION AND SOCIAL CLASS:

There are few and conflicting reports on social class and picture perception.

Deregowski (1968a) in remote rural Zambia, among people with little graphic art, asked adults and children to match an array of 3-dimensional toy animals to their photographs. Adults showed some difficulty with unfamiliar animals. Children had no difficulty and all groups identified photographs of familiar animals.

Elkind (1970) studied the abilities of preschool and school entrants from economically poor homes in the United States to see if the rarity of pictures in the home adversely affected the children's ability. The poor rural Siouk children were initially reluctant to perform but then did as well as children from homes rich in pictures. This observation was also seen in American black children from poor urban homes.

Misra and Shukla (1984) found that deprived Indian children had some difficulty in identifying pictures. Four hundred children from the ages of 4 to 8 years from high deprived and low deprived socioeconomic groups were studied on pictorial recognition tasks. The children were first exposed to a coloured scene following which the same scene with 4 elements missing was shown. The children were asked to remember the missing objects. The tasks, thus, involved memory besides picture recognition. The more deprived children performed worse at all ages.

2) SPATIAL ABILITY AND SOCIAL CLASS

Vandernberg (1975) noted that social class differences did not correlate well with performance on spatial tests.

3) COGNITIVE DEVELOPMENT AND SOCIAL CLASS:

Bevli (1990) studied cognitive performance on Piagetian type conservation tasks in children and related social variables to the level of performance. Cognitive scores in the 5,6 to 7,6 year-olds related with facilities for play and language development provided at home. Mother-child interaction was significant ($p<0.05$) to cognitive performance, but only in the younger age groups. Socioeconomic status and maternal education significantly ($p<0.05$) correlated with all children's proficiency in school and Piagetian tasks.

Misra and Tiwari (1990) assessed cognitive development in three hundred 8- to 10-year old rural and urban children. They used Ravens Progressive Matrices (RPM), Draw-A-Man Test (DAT), Bender-Gestalt Test (BGT), and Story Pictorial Embedded Figure Test (EFT). The environmental variables were measured with a scale dealing with 40 proximal, objective and perceived factors. The urban children did better than the rural on all except on the visuomotor test - BGT. Physical factors like sound health, economic sufficiency and physical environment were significant (<0.05). A stimulating home environment with higher verbal interaction showed a positive correlation with most of the cognitive tasks.

SUMMARY:

Social class and their associated environmental variables influence acquisition of early verbal rather than non-verbal skills in children. This influence assumes great importance in the design of the new Indian test. Separate norms may also be required if the test is to be suitable for children from the various very disparate social classes in India.

II.2.3 THE IMPACT OF MULTILINGUAL BACKGROUND ON LANGUAGE DEVELOPMENT

India has more than 300 languages and dialects with most Indians speaking at least three (Table II.I & II.2 - p. 213 - 214). There are 1652 mother tongues, 67 educational languages and 10 major writing systems. No state in India has fewer than 12 mother tongues and range from 12 to 410 (Shrivastav 1984). In the Kota district, where the new test will be developed Hadoti and Hindi are the most widely spoken. Hindi forms the most important contact language. Due to the cosmopolitan nature of this industrial area many other Indian languages are also spoken.

Eighty nine mother tongues are spoken in Rajasthan (Table II.2 p. 214). Though the exact proportion of young children exposed to more than one language is not available it can be reasonably assumed to be quite high. Rural children would be least exposed to two languages as they live in stable unilingual environment of Hadoti. Urban children, besides their own mother tongue (MT), are exposed to MTs of their neighbours, the contact language and the medium of instruction at preschool.

Bilingual children show vocabulary deficit which differs from that due to low IQ (Ben-Zeev 1984, de Villiers 1979). Reduced experience of hearing a particular word in their environment is one reason. Interlingual interference is another. A delay in acquisition of morphology and then syntax has also been observed in the bilingual child (Kessler 1984).

EARLY BILINGUAL DEVELOPMENT :

Young bilinguals in the first stage of language acquisition do not possess separate sets of norms for each language and their languages develop together as single-language system. In the second stage differentiation into two distinct systems occurs at around 2,6 years of age (Kessler 1984). More recent studies have shown that bilingual children develop differentiated language systems from the beginning and can use their language in contextually sensitive ways (Genesee 1989).

Mixing :

Nearly all studies on bilingual development report that bilingual children mix elements from their two languages. These elements include phonological, lexical, phrasal, morphological, syntactic, semantic and pragmatic.

Phonological mixing as loan blends has been reported by Murrell (1966) and Oksaar (1971). Loan blends are words made up of phonemic segments from two languages, e.g.., pfeifting (whistling) said by a German - English bilingual child. Examples of phonological mixing in Indian languages are - Hindi-En-

glish 'Khau ing' which means 'eating' and in Gujrati- Hindi 'Mang ta' which means 'want'.

By far the most frequent type of mixing to be reported involves whole lexical items, both content and function words (Swain & Wesche 1975, Leopold 1978, Vihman 1982, 1985). The most frequently mixed are content words especially nouns. The others were adverbs, articles, pronouns, prepositions and conjunctions in descending order of frequency. (Redlinger & Park 1980).

Mixing at the level of the phrase has also been found (Redlinger & Park 1980). Here, there are no lexical redundancies or syntactic errors and the structural consistency of the utterances is maintained. Thus there was no linguistic confusion, e.g., I ask him QUE YO YOU A CASA that I go home (Spanish English). A Hindi-English example would be, 'MAINE USKO BOLA, why are you afraid ?'

Swain & Wesche (1975) have reported examples of syntactic mixing or structural interactions. e.g., in French, colour adjectives follow the noun 'Une maison rose' : in English 'A house pink'; Subject-object-verb is the correct syntactic structure in Hindi and ' Mein English bolta hoon': in English 'I English speak.'

Semantic mixing has also been reported by Swain & Wesche e.g., 'You want to open the lights?' In French the word 'open' is used for turning on lights; 'You want to drink a cigarette?' in Hindi 'drinking' is used for smoking.

Rates of mixing vary considerably. They are reported in early stages of bilingual development and diminish with age (Fantini 1978, Redlinger & Park 1980, Vihman 1982). Redlinger & Park found 20 to 30% mixing in the initial stage, 12% to 20% later which reduced to 2% to 6% with acquisition of both languages.

Linguistic differentiation follows the period of language mixing. This seems to occur during the third year of life (Murrell 1966, Vihman 1982). At this stage the child seems to have overcome the linguistic confusion characteristic of the earlier stage. Some believe that at this point the child is now developing two (or more) separate representations of her language systems. From this stage onwards the child begins to switch systematically between languages as a function of the participants, the setting, the function of the message and to a lesser extent the topic of conversation (Genesee 1989).

A gradual process of language differentiation and divergence from common to separate storage systems is thought to occur (Swain 1977). Three stages were defined by Volterra & Taeschner (1978) - Stage (1) - Initial unification of both lexical and syntactic subsystems; Stage (2) - differentiation of the lexicon but continued unification of syntax; Stage (3) - finally differentiation of both the lexicon and syntax.

Cross linguistic studies and the search for languages universals have demonstrated many common properties of languages (Slobin 1982, Slobin & Bowerman 1986). They provide an insight into children's

strategies for organising language(s) which could prove to be useful 'anchors' in assessment and therapy for children trying to cope with several communication systems. For instance, all children during the second year of life prefer consonant vowel (CV) and occasional vowel - consonant (VC) sequences at the phonological level (Ingram 1976).

At the syntactic level, at the earliest stage of development, children of different backgrounds seem to work on the expression of subject - verb - object (SVO) relationships, in the combination subject verb (SV), verb object (VO) and, less commonly, subject - object (SO) (Bowerman 1973).

As a child's linguistic forms are a reflection of his perception of relationships and an expression of underlying concepts, it is perhaps not surprising that there are similarities across languages. Nevertheless, the linguistic device to mark a particular notion maybe more complex in one language than another and this may affect the order of its acquisition (Mikes and Vlahovic 1966, Raghavendra & Leonard 1989).

Thus, both likenesses and the specific differences between languages must be considered in the assessment of early language of children exposed to more than one.

II.2.4 THE INFLUENCE OF SOCIAL FACTORS ON THE TEST SITUATION

Social factors need to be considered in the design of a test that includes children from every sector of the population. Moore (1982) pointed out that children from different socio-economic groups varied in their learning experiences, behavioural styles, language usage and achievement orientation because of the socialisation provided by their group. Test content and procedures need to fit these differences to be meaningful.

Shuy and Staton (1982) noted that the context in which oral language was elicited influenced a child's ability, desire and strategy of talking. The context was complex and encompassed many aspects like the event itself (the tester-child interaction), the conversational structure and topic and individual participants involved. The particular language used in the test situation could also play a crucial role in a multilingual society.

Most tests of oral language require children to produce utterances that are not self-initiated and nonfunctional and therefore not wholly reflecting a child's potential. Moreover, the variability in language performance and the communicative value of language is also not always considered. The focus is normally on linguistic competence such as grammar and articulation.
Massey et al (1982) noted that tests made many implicit assumptions, for example, test items had the same meaning for all children. Yet Donaldson (1978) reported that intelligent children varied in their interpretation of the same question. Consequently, outcomes on fixed answer tests may be faulty.
Most test measurements assume that all children are equally motivated to do well and will behave similarly in a test situation. Moore (1982) investigated test-taking behaviour in transracially adopted African American children and compared them to those adopted by black families of equivalent socioeconomic status. The transracially adopted children were more confident and focused in the test situation. They used language to help their performance by using it to generate and test hypotheses, to alleviate tension and to positively interact with the tester. Moore attributed these results to the transracially adopted children's socialisation of problem-solving skills. The white mothers encouraged their children verbally to explore various hypotheses and praised their attempts on task performance. On the other hand black adoptive mothers expressed more disapproval and did not applaud their children's efforts.
Other factors that may contribute to lower test scores in disadvantaged children include a willingness to settle for lower levels of success, fearfulness of being tested and wariness of the adult tester (Zigler et al 1973).
Clearly, deprived children are at a disadvantage in a testing situation. Social circumstances influence children's responses and need to be considered in test design. For populations with vastly disparate socioeconomic groups there will be a need to establish separate norms.

II.2.5 THE INFLUENCE ON MULTILINGUAL BACKGROUND ON THE TEST SITUATION

The problems associated with testing bilingual children concern the child, the assessor the test selected and the language used.

A. The Child

The difficulties encountered reflect the characteristics of early bilingual development. 'Mixing' or 'interference' poses a big problem. Mixing is a rule and not the exception in early bilingual development. That is not to say that any amount of interference is acceptable; Without norms for bilingual development one can only speculate about the quality and quantity permissible at each developmental stage. However, if one recognises it as a characteristic of the norm, then mixing, like other aspects of language behaviour, becomes a potential means of measuring delayed development. The phenomenon of lexical borrowing is not such a problem as say phonological or syntactic mixing.

Children often use nouns from their first language. Structurally many Indian languages resemble each other so syntactic mixing is not very evident. It is seen occasionally with English and Hindi.

In sequential bilingual children a certain amount of 'mixing' is natural but dependence on the first language structures may become more prevalent in children with basic problems of language differentiation and formulation. Bearing in mind that sequential bilinguals tend to show patterns typical of younger monolingual children, it can be hard to decide whether a response is an immature form or an example of mixing.

One peculiarity of bilingual speech is code alteration that involves the use of successive stretches of two languages often giving the impression that the speaker lacks control of the structural system of the languages. Code alteration or switching is common in bilinguals and obeys strict structural rules beyond the grammatical rules of each of the component languages (Dulay, Hernandez-Chavez and Burt 1978). These rules ensure alteration of codes at specific, definable syntactic junctures, each unilingual section retaining an internal consistency characteristic of monolingual grammar and phonology (Lindholm & Padilla 1978, Pfaff 1979). There is necessity for establishing ages at which different types of bilinguals achieve well differentiated code alteration/switching.

Bilingual children are especially sensitive to their interlocutor. Initially, they tend to rigidly use the language they associate with the speaker although she expresses a willingness to use the other language (Fantini 1978, Volterra & Taeschner 1978).

B. The Test

In bilingual areas, variations in type and degree of exposure to target languages make it difficult to obtain meaningful norms in the traditional sense. Thus there is a paucity of standardised tests for bilinguals (Miller 1984).

Most often evaluation is done from a monolingual standpoint. Special characteristics like 'mixing' and 'code switching' are not considered in most tests. Relying on monolingual tests is unlikely to produce a realistic profile that is useful (Miller 1978). Miller advocates study of a child's sociolinguistic background to select the language that can be used for testing. The test is then administered in that language. If the subject fails to respond, the item is repeated in the other language, by that gaining some impression of 'collective competence'. Of course, it must be ensured that the response given to the repeated item is equivalent to that expected for the original term. This can be difficult as structural or semantic equivalence between languages need not be synonymous with equivalent order of acquisition of those structures or meanings. For instance, a word in one language may develop later than its semantic equivalent in the other language, depending on the relative importance of that word in the culture of each linguistic group. Whether one is assessing the two languages separately or together, this lack of correspondence affects the suitability of items that are merely translations from techniques devised in other languages. Direct translation also fails to take account of the fact that some ideas common in language 'A' may be unfamiliar to the culture of language 'B'.

C. The Assessor :

Interpretation and analysis of the responses of bilingual children place considerable demand on time and skill of the assessor. This is further complicated in a multilingual society where the assessor may need to have a working knowledge of more than two languages.

A single assessor may not have the expertise required to analyse the separate languages and the various ways in which they interact. Creation of a community based assessment team may provide a solution. The members, between them, can provide detailed information about the structure and development of the languages occurring simultaneously in that area.

Even if provided with details of the language, the assessor is faced with the problem of pronouncing test items in a language foreign to him. Also, decisions have to be made on the acceptability of the responses that are neither completely right nor wrong. Many assessors resort to using interpreters but it is not easy to obtain objective individuals who also have some working knowledge of development.

There is the question of the attitude of an assessor towards children speaking a local dialect or another language. If the child's proficiency in the local dominant language is not equal to his peers, she is likely to give a poor impression of verbal ability. This attitude may also extend to children of deprived communities.

II.2.6 INFLUENCE OF OTHER FACTORS ON THE TEST SITUATION

BEHAVIOURAL ISSUES

To capture the attention of young children and elicit a response requires insight into some of their developing social skills. These include development of attention control, listening ability and communication. Boykin (1977) noted that the role the situational-interactional factors in the test session have not received adequate scrutiny.

Test design needs to consider factors that may introduce fluctuations and by that reduce test reliability. The number of test items, the level of item difficulty and the testing procedure needs to be appropriate for the subjects.

ATTENTION CONTROL :

Attention control is crucial to all forms of learning. Many children presenting with early language delay have been found to have immature attention control (Cooper et al 1978). It also concerns method of test administration. Reynell (1977) described six developmental stages of attention control in normal children between the ages of zero to six years.

First stage:

Fleeting attention marks the first year of life. A child's attention is momentarily held by the dominant stimulus in the environment. Extreme distractibility is normal. A car horn outside, the examiner picking up a pencil or turning over a paper is enough to divert the child's attention from a task. Older children with developmental problems may be at this stage of attention control, which is then abnormal.

Second stage

During the second year a child can concentrate on a concrete task of her own choice. She does so by cutting out other stimuli. Children at this stage reject any attempts to intervene by an adult and if the reasons for this single-minded focus on tasks are not understood, the child may be labeled as 'obstinate' and uncooperative. At this stage form boards and picture puzzles are good test tools because the directions are implicit in the task, and success is self-evident. Bribes such as the promise of a sweet are not successful means of gaining cooperation because the examiner has focussed attention on a sweet and the child is likely to become fixated on it.

Third stage:

Normally seen at three years of age, attention is still single channeled though a little more flexible. The child has to focus entirely on either the task or the examiner. The attention focus is more pliable and can, with adult help, shift from task to directions and back to the task again. It is the examiner who controls the child's attention focus and must ensure that the child looks at his face while listening to each instructions.

Fourth stage:

Attention during the fourth year is still single channeled, but the transfer from task to examiner and back again is more under her own control. The examiner's job is easier.

Fifth and Sixth stages:

By now a child can assimilate verbal instructions whilst carrying out a task as this two-channeled attention matures children gradually become able to attend to instructions in a classroom setting.

Learning from adults increases as children attain stage three or four. Test administration is worse at stage two and simplifies at stage three.

OTHER BEHAVIOURAL ISSUES :

Young children when confronted with new, unfamiliar situations may not respond to test items even if able. Alien persons and surroundings tend to increase shyness at this age. The more unaccustomed children are to being questioned in a quasiformal setting the greater is their inclination to withdraw. Testing children under five years of age requires some sensitivity, flexibility and a few special techniques of handling problems if encountered (Reynell 1980). '. . . There is nothing so shy-making as a direct confrontation with an adult trying to 'establish rapport' by making conversation . . . ' (Reynell 1980). Presence of familiar adults especially mothers provides a more secure environment and can help relax a child. Familiar adults can also act as intermediaries and aid assessment. When the test is being conducted in a language other than the child's mother tongue, this point assumes more importance.

Several strategies used by adults to prolong interaction with young children, have been described. To elicit performance in young children, Kaye and Charney (1980) showed that mothers used a device called ' turnabouts ' in which the speaker both respond to the child's prior utterance and makes another request of the child to respond again. Testers can use such strategies to increase a child's responsiveness.

The development of communication has received considerable attention recently (Shatz 1983). The underlying communicative skill of a listener decides her comprehension ability. Communication is based on social and cognitive development. Semantic, idiomatic and illocutionary gaps in the child can lead to misunderstanding of the test items and questions. Shatz (1983) noted that children often see different purposes in an interaction to adults. Alertness to this possibility may prevent misinterpretation of the child's understanding and an opportunity to make the examiner's communication clearer.

Massey et al (1982) studied the behaviour of 15 black children aged two years from middle-class homes in a test situation. The behaviour of each child was analysed by a research team, the social worker and the caregiver separately and classified into four dominant styles. **The traditional-habitual style:** - The child was obedient and compliant. Responses were traditional and were most acceptable to the tester. **The Initiative-Creative style:** - The child was stimulated by the test situation, took initiative and performed the tasks in an untraditional way. Often such a child seemed disobedient The tester often viewed such children as hyperactive and difficult. **The Reticent-Observant style:** - These children did not actively participate in the test situation and spent more time observing the tester and the test items. **Mixed styles:** - These children did not display one dominant style but showed a mixture of the reticent-observant style with either the traditional-habitual or the initiative-creative style.

The authors concluded that testing was a highly interactive process with the child's behaviour influencing the tester's opinion of ability. Young children were penalised for showing initiative and creativity and were often viewed as problematic or uncooperative.

The behaviour of very young children can be unpredictable in a test situation. A reliable interpretation of results can be insured if these are accounted for in test procedures. As Mittler and Serpell (1985) pointed out children in some cultures ' . . . seldom engage in prolonged, intensive, structured dyadic play with an adult, and are not encouraged to display their intellectual competence to strangers, nor are they familiar with the experience of interaction with strangers or with the conventions of verbal elicitation of information outside the context of practical activities . . . ' These are sociocultural behaviours that influence children during test situations and are likely to operate more in Third World than Western Societies.

II.2.7 METHODS OF ELICITING LANGUAGE IN CHILDREN

The method to elicit language needs careful selection as it influences a child's behaviour, attitude to the testing situation and thus results. This is particularly true in disadvantaged children.

It is only possible to sample a child's language over a fixed period and over a few situations. Two methods have evolved to estimate the language ability of children. The first involves designing special procedures for eliciting language from a child and the second involves sampling the language produced by the child under ordinary, everyday settings.

Elicitation procedures make it possible to examine a broad spectrum of linguistic abilities systematically over a short time. Harris (1990) remarked that 'they created artificial contexts that may not provide a good basis for predicting performance in other settings'. No responses are difficult to interpret; they may indicate absence of a particular linguistic ability, or reflect influences unrelated to linguistic ability such as lapses in attention, boredom, anxiety or failure to understand instructions.

Sampling language from a range of everyday settings overcomes the problem of artificiality in elicitation procedures. However the sample obtained will only reflect activities and situations engaged in, during the period sampled. Some linguistic abilities may remain undetected as the child had no opportunity to use them.

A. ELICITATION PROCEDURES :

An elicitation procedure is designed to provide a child with the opportunity to respond to a specific set of stimuli. The relationship between the stimulus and the child's response is taken as an indication of the child's mastery of a particular aspect of language.

The stimuli could be verbal or nonverbal like pictures and miniature toys, the use of which requires symbolic understanding. The first stage of symbolic understanding is object recognition which gradually requires less perceptual and situational clues. Everyday objects like a spoon, cup or brush are recognised even if different from the ones used at home. The Common Object Test uses this principle in its assessment of early language (Sheridan 1976). Miniature toys are increasingly recognised from 18 months and used in several language tests (Reynell 1969, Sheridan 1976, Egan and Brown 1986). From 12 months, first life size pictures of real objects and then smaller two-dimensional representations are recognised and are commonly used for testing language (Dunn et al 1982, Reynell 1969, 1977). They are inexpensive, adaptable and portable and allow a wide range of stimuli with responses ranging from simple vocabulary to understanding situations of increasing complexity (Egan and Brown 1984). Symbolic understanding includes understanding increasingly 'arbitrary' symbols.

Language comprehension

Comprehension is usually explored by asking a child to carry out a series of instructions or answer a series of questions about the material (Dunn et al 1982, Carrow-Woodfolk 1985).The British Picture Vocabulary Test (Dunn et al 1982) and the Peabody Picture Vocabulary Test (Dunn 1965) are examples of tests using the former.

The following are some of the difficulties with such tests. One difficulty is finding visual referents that provide an equal amount of information to and interest a very young or very handicapped child who may point to the item which is most salient or prominent to her. Similarly, a child may point to the wrong picture because of inadequate visual scanning or inability to integrate the picture with the verbal instruction given by the examiner (Mittler 1972).

Chapman (1978) reports that many children are unable to use constituent order in active sentences as a cue to agent-of-action and object-of-action, when the task is appropriate picture selection. This problem may be emphasized in bilingual children, who are exposed to different word order sentences in each language. Bridges (1980) studied the responses of two to four year olds to active and passive sentences. The younger the child the greater was the confusion about the subject and the object in a sentence.

Some comprehension procedures involve the child manipulating simple toys. For example, during the administration of the Reynell Developmental Language Scales, the child is told, "put the spoon in the cup" and " put the doll on the chair". When using these procedures, there is a danger that the materials themselves will invite the child to perform certain actions (the spoon naturally goes in the cup), irrespective of a child's understanding of the instructions. On the other hand, instructions that require to do unusual actions may simply result in hesitation or confusion although the child may have understood the language (Harris 1990, Shatz 1978).

A child trying to understand a message is dealing not only with the language used by the speaker but also with several nonlinguistic communication cues. Thus failure on a test is no proof of inability to perform a cognitive task. It is possible that the child has not adequately understood what is required, that an irrelevant feature of the test situation was distracting, or that the child is similarly inattentive.

Expressive language :

The various methods for eliciting spoken language are imitation tasks, sentence completion tasks, use of puppets/pictures and role playing. The simplest procedure is to require a child to imitate a model provided by the adult. Though this gives a high degree of control over the target utterance, imitation makes special demands on a child's pragmatic skills (Ingram 1974) and does not invoke her own realisation rules.

Imitation is predominantly a perceptuo-motor task and is not influenced by the child's understanding of meaning (Ingram 1974, Slobin & Welsh 1973). Use of pictures, puppets or miniature toys are more natural methods of eliciting spontaneous language and encompass communicative intent and meaning.

Elicitation procedures are likely to involve a child in unusual activities with unfamiliar people and may produce anxiety or shyness. These procedures give a high degree of control over the areas of linguistic ability being assessed which makes evaluation simpler. They also allow other aspects of language to be tested simultaneously, particularly comprehension. However they do impose considerable constraints on the pragmatic and conversational aspects of the child's expressive language (Harris 1990, Fletcher 1987).

B. NATURALISTIC LANGUAGE SAMPLES :

The rationale for trying to obtain verbatim records of children's speech in naturalistic settings is that it provides the best indication of what language a child uses in ordinary, everyday settings. The child's speech recorded in a diary or with recording equipment (tape/video). The former method is cheaper and less intrusive but also less accurate. The record is subsequently transcribed and analysed by professionals.

Elicitation procedures to assess language seem more appropriate for screening early language. The assumptions and implications of using such procedures needs consideration during interpretation of results.

II.3 REVIEW OF TEST CONSTRUCTION

The literature pertinent to test construction was reviewed. In the last two decades this literature has rapidly expanded so that the principles governing test development are much more clearly defined. These rules apply to screening tools as well as more detailed analytical tests.

II.3.1 PRINCIPLES OF TEST CONSTRUCTION

Davies (1990) describes four stages of test construction - the planning stage, the prepilot stage, the pilot stage and the final validation stage. The second and third stage are concerned with evaluation of test items. The fourth stage is the stage of norm establishment. It also involves the assessment of the test through reliability and validity studies.

II.3.1A PLANNING STAGE:

In the planning stage definition of general and specific objectives of the test are the leading consideration (Henning 1987). They include the purpose of the test e.g. to screen for delay or to make a detailed analysis of the disorder as well as the range and depth of developmental skills to be explored. The end use of the test i.e. the testers and the purpose of testing will also determine the structure of the test (Davies 1990).

A specification of the target group is drawn at this point e.g. age, socioeconomic, cultural and language background. Consideration of sociocultural background of the target population is important to test design. The abilities and characteristics of the intended examinees will estimate the appropriateness and applicability of the test (Bachman 1990). If the method chosen to measure a target ability is unfamiliar to the examinee, performance will suffer (Hennings 1987).

Decisions on content and general layout are also made at this stage. This includes the type of test items, the length and time limit of the final test, the accompanying instructions and the method of scoring. Efficiency in test scoring, reporting and interpretation are an important criteria in test development (Hennings 1987). The economics of the whole enterprise and of the final test, in particular, are estimated.

II.3.1B PREPILOT STAGE :

In the **prepilot stage** palpably unsatisfactory items are identified. The general impact of the test is also considered now. At least three times as many items as will eventually be needed should be devised (Davies 1990).

II.3.1C PILOT STAGE:

The **pilot stage** involves undertaking a thorough evaluation of test items through item analysis on a large sample representative of the target population . The technique of test administration is reexamined and revised for the final form (Davies 1990).

ITEM ANALYSIS:

Most psychological tests are concerned with the administration and analysis of appropriate items. The test is considered to be no better than the items that go into its composition (Hennings 1987). Weak items need to be identified and removed from the test. Very often, however, weak items cannot be identified and modified or removed without a pilot administration of the test. The systematic evaluation of test items is known as item analysis. Some of the statistical methods involved in item analysis are item discrimination, item difficulty and item bias (Osterlind 1987).

The methods described in Osterlind (1987) are outlined below. Each item is subjected to Item Discrimination, Item Difficulty and Item Bias analysis to test its suitability.

A. Item Discrimination : This index represents the ability of an item to distinguish the capability of each testee in a particular skill. Uniformly easy or difficult items could be rejected. The sample is divided into the age groups of the study. The number of children giving the correct answer is noted. The total scores are arranged in a descending order for each age group. The correct responses are counted in the top third and the bottom third scores; these then are converted into a percentage of their respective third (MU% and MB% - where U implies upper and B bottom). The Item Discrimination Index (IDI) is derived by deducting MB% from MU%. The IDI is expressed in a decimal form. The closer the value is to 1.0 the higher the discriminating capacity.

B. Item Difficulty : This index represents the difficulty of each item by ascertaining the percentage of children who correctly respond to it. For an item to be deemed suitable this percentage should increase with age.

The number of correct responses for each item in each age group is converted into a percentage. A graph is plotted with age groups on the X axis and the percentage of correct responses on the Y axis .

C. Item Bias : Bias is a systemic error in the measurement process and denotes the consistent distortion of a statistic. A test item is said to be unbiased when the probability of success on it is the same for equally able examinees of the same population, whatever their subgroup membership. Presence of bias is tested between socioeconomic groups for each item.

Several methods exist to assess item bias. They include Chi square analysis, Analysis of Variance, Transformed Item Difficulty and Item Characteristic Curve. The Chi square (X2) analysis is simple yet reasonably accurate (Osterlind 1987). Chi square Analysis examines the likelihood of test takers from different subgroups but of the same ability level, giving the correct response. Therefore, an item is unbiased when all test takers at a given ability level have an equal probability of answering an item correctly regardless of their group membership as to sex, socioeconomic background etc.

The method involves dividing the sample according to the subgroups, for example, according to socioeconomic status (SES) - urban upper, urban middle, urban slums and rural. The total scores in each section of the test are divided into four categories each of which represents an ability stratum for each SES groups. The total number of children and the number who correctly responded on an item are calculated for each category. Chi square tests are carried out with the null hypothesis that all children, whatever their SES subgroup membership, at any given ability level, have an equal probability of responding correctly. The level of significance is kept at 5% and the degree of freedom is (2 - 1) x (n - 1) where n denoted the number of subgroups, i.e., socioeconomic groups so n = 4. Four chi square statistics are calculated for each of the 2 x n contingency tables constructed from the above steps. Statistical Tables are used to ascertain whether the difference in the number of children responding correctly in ability stratum in each subgroup is significant and therefore biased.

II.3.1D FINAL STAGE:

The final stage deals with two main aspects; standardisation of the test to derive 'norms' for evaluation of significance of scores in the test and evaluation of the test through reliability and validity studies.

Standardisation enables meaningful interpretation of a subject's score on a test by comparing them to that of the general population or other relevant groups.

SAMPLING :

Proper sampling is crucial to standardisation. Sample size and sample representativeness are two important variables.

Sample size : Kline (1986) in reviewing this issue makes the following points. Sample size needs to be sufficiently large to reduce the standard errors of the normative data to negligible proportions. The characteristics of the target population determines sample size. More important than the size is the representativeness of the sample. A small but representative sample may be far superior to a large but biased one.

Sample size can be determined in several ways.

Kline (1986) suggests that for a simple reduction of statistical errors a sample size of 500 is adequate. Lawley D. N. (1950) describes a method using variance of the percentiles (p. 210). The method recommended by the WHO (1986) depends on the number of variables to be analysed and thus the variability of the target population. Its ease of application is its major advantage.

Representative sample:

Representativeness of a sample is crucial to test construction. Sampling procedures should produce a sample that closely resembles the distribution of the target group in the general population. Sampling should be stratified to eliminate bias. This stratification should be based on variables which are most relevant to the ability being measured e.g. social status, urban/slum distribution. Norms can be produced for these subgroups and are often more useful than a total group score (Kline 1986). Within stratifications sampling should be random. Kline argues that a properly stratified sample is more effective, size for size, than a random one but cautions that numbers should be sufficient in each subsection to form an adequate sample.

STATISTICAL CONSTRAINTS IN INDIA

With a population as diverse and disparate as in India sampling poses a formidable task. Defining representative sample is a difficulty due to many ethnic cultures and multiple languages. Industrialisation and economic upheaval has lead to social and geographic mobility. Although, a language, religion and social class may dominate a region, many different ones co-exist (Shrivastav 1980).

A clear urban rural division along with these factors, make the process of sampling complex.

Absence of birth records is a problem.In these circumstances age has to be calculated with the help of clues given by festivals, seasons, harvest-time and important events that occurred at home or at the village around the time of a child's birth; the mother's age of menarche and the number of children in the family. Developmental milestones can help estimate a child's age. Dentition is only useful when secondary teeth erupt, i.e., after 6 years of age.

Few slum and rural homes have a postal address. In the absence of birth registers, lists of census figures and ration card holders are of limited use in finding preschool children in a community.

It is difficult to define social class due to the wide variety in standards of living, quality of education and types of occupation in cities, towns and villages of India. Income of a family is hard to detect due to the

reluctance to reveal income, multiple working family members, differences in family size, and joint family systems.

CONSTRUCTION OF NORMS :

In order to compare an individual's score with the relevant normative group a transformation which reveals the individual's status relative to the group is necessary.

One of the simpler techniques is to calculate the percentile rank of each score. Kline (1986) defines percentile rank of a score as the percentage of subjects in the normative sample who score below that level; thus 15 percent of the population would score below the one which defines the fifteenth percentile.

One method of standardisation was described by Thomson (1932); for each 3-month age group the raw scores for the 5th, 16th, 50th, 84th & 95th percentiles are identified. Curves are then drawn for each of the percentiles. This technique was used for the Bus Puzzle Test (Egan and Brown 1984); 10th, 20th and 50th centile lines for each age group were drawn. These authors denoted the area above the 50th centile as 'above average', the area between the 20th and 50th as 'average' and the area below the 20th as 'below average'. Thus the status of an individual child's score could be read from the graph.

Another method of deriving centiles involves interpolation of raw scores to obtain centile points that correspond to the centile ranks selected by the designers. This could be achieved by a standard formula described by Guilford and Fruchter (1987) or by deriving the cumulative frequency percentage which gives the percentile ranks. The advantages of percentiles are that they are simple to understand, to calculate and to use - the interpretation of the scores is easy for testers who are not trained in psychological evaluation and statistics. The disadvantages are two fold. Percentiles are not readily amenable to further statistical analysis because they are ordinal scores. Secondly, small differences around the mean become exaggerated and large differences at the tails of the distribution become compressed because their distribution is rectangular.

Standard scores are another method of expressing norms. A standard score or Z score is the deviation of the raw score from the mean divided by the standard deviation of the distribution. The larger the Z score the further away from the mean it must be; positive Z scores being above, negative scores below the mean. The advantage of Z scores lies in their linear distribution which reflects the distribution of the raw scores. One disadvantage is that the value of 0 is best as it is the closest to the mean; the other is that equivalent percentiles can not be inferred. Z scores can be converted into 'Transformed Z scores' and 'Normalised standard scores' and are preferred as they can be readily translated into percentiles.

After a test has been constructed and standardised its reliability and validity need to be established.

RELIABILITY AND VALIDITY STUDIES:

Developmental tests should provide adequate statistical background before being widely applied. Two types of statistics are used - descriptive and inferential (Davies 1990). Descriptive statistics summarise a set of results, to give, for example, the average or mean and the range or standard deviation of the test sample. Inferential statistics indicate to what extent the sample tested is representative of the population from which it was drawn.

Validity concerns the veracity of the context and the purpose of a test and this forms part of descriptive statistics (Davies 1990, Henning 1987). Reliability deals with defining the adequacy of measurement of a test and its reproducibility and is thus part of inferential statistics (Henning 1987).

RELIABILITY

Reliability is concerned with accuracy of measurement. The characteristics of reliability are consistency, dependability and accuracy wherein an individual's results are consistent on repeated measure or a group is rank ordered in the same way on repeated testing. The results should be consistent even when the measurement is repeated by different personnel on different occasions (Henning 1987, Bachman 1990).

The external reliability of a test is affected by slight differences in the administration of the test even by the same practitioner on the same child. Additional variation results when different assessors test different children at different times of day and location. External reliability can be measured by comparing the test scores obtained by one tester working with the same group of children on two separate occasions not very far apart in time - **test retest reliability**. Another way of measuring external reliability is to compare the scores obtained by different testers working with the same group of children - **inter tester reliability**.

One more source of variation comes from the interaction of the test items with the child's ability. Abilities measured via different elicitation procedures vary in their proficiency to provoke a response. Reduction in this error increases what is termed as Internal Reliability. **Internal Reliability** can be measured by comparing the scores achieved on two different versions of the test and the agreement between the scores is used as a basis for an overall measure of agreement (Carmines & Zeller 1990) .

For all comparisons of scores a statistical procedure called cor relation is frequently used. Correlations are expressed in terms of a figure between -1 and +1, with -1 indicating no agreement between the scores and +1 indicating perfect agreement. The precise interpretation of coefficient correlations depends upon the size of the data set employed, but, as a rule, a correlation of 0.7 indicates that approxi-

mately half the variation in the set of test scores is due to real variations in the attribute being measured. The rest is due to unspecified error. On this basis, it may be assumed that reliability estimates ought to exceed 0.7 if a test is to be regarded as providing reliable scores (Harris 1990).

The Kuder Richardson Formulas 20 or 21 based on number of items and the standard deviation is a method of testing the internal reliability of a test. The more the number of items the more reliable is the test (Hennings 1987).

Factors influencing reliability :

Factors in the child, tester, test and environment influence reliability.

Fluctuations in a child's response may be a true variation due to maturation, further learning or forgetting. These can be minimised by ensuring that test administrations are at least two weeks apart; correcting responses during the first administration are withheld; that the number of test items is sufficient to prevent recollection by the testees. Temporary changes in a child due to fatigue, sickness or emotional disturbance may also effect results (Hennings 1987).

Tests will tend to be less reliable for testees who have had no prior exposure to the test format and also for testees who have developed a high degree of 'test wiseness'. In the former, interpretation of the task may affect response and in the latter, observed scores may overestimate true ability. Henning (1987) suggested that this form of measurement error could be minimised by providing familiarisation tasks and strategy guidelines for candidate prior to the test. Familiarity with the environment of a test situation increase co-operation in children (Mittler and Serpell 1985).

Test items that are too difficult or inappropriate result in guessing and unresponsiveness (Massey et al 1982). Conversely a practice effect occurs when items are too simple or the test is too short or there is a subsequent learning exposure. Increase in the number of items improve test reliability to a point called the asymptote, described by Henning (1987), after which adding more items contributes little to test reliability.

Appropriately selected items through a process of item analysis - which have adequate item difficulty, item discrimination and no item bias increase reliability. Homogeneity of test items, high correlations between various subsections all improve internal consistency (Carmines and Zeller 1979). A reasonable amount of time to complete the test is necessary but may vary with young children from different social classes. Both Hennings (1987) and Zigler et al (1973) suggested appropriate incentives to improve performance.

Fluctuations in scoring may result from the scorer's subjectivity or mechanical errors in the scoring process. Judgment of quality of response is liable to be inconsistent in absence of rating schedules. Fatigue, increasing experience and changing attitudes in the scorer all result in variations in the ratings. Rating schedules, 'blind' marking and marking responses twice increase intra rater reliability (Henning 1987).

Raters differ widely in their levels of experience, familiarity with the language under consideration and philosophical or personality traits. Insisting on rater experience, training and competence could reduce inter-rater errors. Standardisation of test procedures with the help of training of testers and explicit written guidelines improves reliability (Hennings 1987).

Environmental inconsistencies may also introduce errors in measurement. Interruptions, distractions, poor light and other environmental factors may affect the reliability of the test (Hennings 1987).

VALIDATION

Validity refers to the appropriateness of a given test, or any of its component parts, as a measure of that which it is purported to measure.

There are two distinct kinds of validity - empirical and non empirical. Empirical validity usually involves collection of data and use of mathematical formulae for the computation of validity coefficients and requires reference to external criteria. Common types of empirical validity are concurrent and predictive. Non empirical validity involves inspection, intuition and common sense. There are no coefficients or mathematical formulae involved. Examples of this kind include face or content validity construct validity and response validity.

Face validity concerns the appeal of the test to the lay judgment, i.e., the candidate or the family. It also reflects the extent to which the test items appear to be concerned with the abilities in question.

Construct validity is of greater significance and is concerned with the extent to which performance on test items is consistent with predictions made on a basis of a theory of abilities or constructs (Bachman 1990). 'Constructs' can be further defined as a 'postulated attribute of people, assumed to be reflected in test performance' (Cronbach and Meehl 1955 - cited in Bachman 1990). The abilities that are measured are not directly observable, but must be inferred on the basis of observed performance (Bachman 1990). Construct validity examines the relationship between test scores and ability and therefore estimates what the test actually measures.

Treatment validity is a method of establishing construct validity which is based on the classical experimental design (Bachman 1990, Hofmeister 1979). The relationship between abilities affected by the

treatment and abilities measured by the test under evaluation is the key to this application. The method involves the randomised selection of two groups of which one forms the control. The experimental group is subjected to a treatment whose effects are known and which affects the same abilities measured by the test being appraised. The test whose content relevance, acceptability and method have been examined, is then presented to both the experimental and the control groups at the end of the treatment. If the test results indicate significant differences between the two groups, the construct validity of the test is supported.

Content validity is concerned with the content of a test - that is the way in which the items both singly and together, provide information which is relevant to the abilities in question. A good test would be one in which each item has a high correlation with the overall test score, since this would indicate that all the items tap into the ability which the test purports to measure. Item analysis thus strengthens content validity of a test.

Concurrent validity is the most objective form of test validity and is derived from comparisons between the way in which the child performs on the test and some other independent measure of their ability. The comparison measure itself should be valid for the concurrent validity to be meaningful (Bachman 1990).

Predictive validity of a test indicates the extent to which a test is able to predict how a child's development will change over time. It forms an alternative to concurrent validity and involves comparing test scores at one point in time with another measure of performance obtained sometime subsequently (Bachman 1990).

Specificity and sensitivity indices can also be derived from the last two validity studies. Since they are more pertinent to screening tests they have been discussed in that section.

Difficulties in validating tests :

Construct validity relates test performance to the theory on abilities or constructs of target populations (Bachman 1990). This assumes greater importance while developing tests for unexplored populations. For this same reason it becomes more difficult to determine.

The difficulty with establishing concurrent validity lies in identification of a similar test of established validity (Wall et al 1991).

Similarly, predictive validity suffers from the difficulty of finding suitable criterion measures. One potential problem with examining predictive validity alone is that it can largely ignore the question of what abilities are being measured (Bachman 1990). Mismatches can then occur between the abilities measured by the

test and those predicted in the future. Therefore, predictive validity cannot be undertaken until the actual abilities measured by a test in a particular population are distinguished i.e. construct validity.

Many testing situations are under resourced both in human and material terms. Opportunities for pretesting may be limited or non existent. Gathering independent data on candidates abilities can prove a logistical nightmare (Kline 1986, Wall et al 1991).

Framing sample design, for adequate representation in variegated populations is daunting as is establishing sample size (Kline 1986). The latter particularly so in time-consuming tests like those for the assessment of child development.

Summary of the recommended psychometric characteristics of a test

The criteria recommended by several authors for application to developmental tests in preschool children to ascertain their adequacy can be summarised (Kline 1986, Davies 1990, McCauley and Swisher 1984, Sumner 1987, Harris 1990). These include:

1. A clearly defined standardisation sample.
2. Adequate sample size
3. The use of systematic item analysis during item construction and selection to promote reliability and validity of the test.
4. Measures of central tendency (mean scores) and variability (standard deviation) of test scores for relevant subgroups need to be reported.
5. Validity criteria like concurrent and predictive validity and reliability norms like test-retest and inter-tester reliability are of utmost importance.
6. Instructions and scoring procedures should be sufficiently detailed for the test administrator.
7. Special qualifications required of the test administrator should be informative and available.

II.3.2A ADDITIONAL REQUIREMENTS OF A SCREENING TOOL:

Besides the general rules governing test construction screening tools need some special features though the debate on the term 'examining' versus 'screening' continues and Whitmore and Bax (1988) point out that the term screening should be broadened and renamed examination. The present test is being developed mainly for use by professionals including paediatricians and speech therapists in their clinical practice for first stage analysis of a child's cognitive profile, particularly language. A modification of the proposed test for the use of less skilled persons in the field for surveillance may be undertaken at a later stage. The additional features required of a screening tool would then apply.

Cochrane and Holland (1969) described the characteristics of the ideal screening test. The test should be:

1. Simple, quick, and easy to interpret: capable of being performed by paramedical or other personnel.
2. Acceptable to the public, since participation in screening programmes is voluntary.
3. Accurate, i.e. give a true measurement of the attribute under investigation.
4. Repeatable. This involves the components of observer variability, both within and between tests; subject variability; and test variability.
5. Sensitive - sensitivity is the capacity of a test to detect all those who are truly affected by the condition or disorder that it is seeking. Sensitivity is important because the lower the sensitivity of a test, the more children will be missed by the screen who ought to be receiving further attention.
6. Specificity - specificity is the capacity of a test to correctly identify those who are truly non-affected by the condition being screened. Specificity is important because the lower the specificity of a test, the more resources will be required for the further investigation or assessment of children who are subsequently found to be normal.

Some other characteristics for screening tests of neurodevelopment are described by Bellman and Cash (1987). They advocate a test of broad clinical scope which not only covers all aspects of development but also defines the specific ones so as to identify particular as well as general impairments. The test should be brief, simple to perform and interpret. They suggest that minimum equipment be used which is light, compact and also appealing to children. A scoring method over descriptive assessment is preferred to derive either developmental age (DA) or developmental quotient (DQ).

Yield and Predictive value

The presence of maturational lag in normal development emphasises the importance of the predictive value of screening (Stevenson 1984, Bishop and Edmundson 1987).

The more recent concepts of yield and predictive power or value measure the productivity of a screening programme. Rose (1978) defined **yield** as the number of new, previously unsuspected cases detected per 100 cases screened. That is the proportion of those tested who actually benefit from having been screened. A low yield could reflect not only a failure to pick up extra cases, but also ineffective treatment for those screened positive (Ades 1990). Yield is dependent on the prevalence of the sought-for condition or disorder among the screened population. It is also a function of the sensitivity of the screening tests employed (Butler 1989).

Last (1983) defined **predictive value** as the proportion of positive results that are correct. Thus the predictive value of a test will be the number of true positive cases expressed as a proportion of all positive cases, both true and false. Predictive value is a function of the sensitivity and specificity of the test used

(Butler 1989). It is important because the lower the predictive value of a test, the greater the costs, both in financial and personal terms, of the further investigation of children who are subsequently found to be normal.

Both yield and predictive value form the basis upon which judgments about the benefits and hence the value of screening are made.

In his review of the yield and predictive value of various developmental screening programmes Butler (1989) found that most of those for single conditions compared favourably with other well established screening programmes (such as for breast or cervical cancer). They ranged from 5 to 20 percent. Predictive value on the other hand, which depends on the efficiency of the test, spanned a very wide range - 10 to 80 percent. He summed up that though lack of adequate statistical information prevented generalised conclusions the use of these two measures did determine the economic viability of these screening programme.

II.3.2B METHODOLOGICAL ISSUES IN DESIGNING DEVELOPMENTAL TESTS

The methodological issues impacting on the design of developmental tests are central to the aim of this work. Some of them are particular to India and some to developmental tests per se.

Issues particular to developmental tests:

Developmental tests have distinctive characteristics that require consideration.

Change over time: -

Development is a continuous process and will be influenced by a host of extraneous factors that may either conceal or exaggerate the real changes due to maturation.(Harris 1990, Shelton 1987). Situational factors concerning the child or the examiner would influence performance and interpretation at any one time. Therefore tests need to provide data regarding the variability to be expected in test scores.

The framework employed in a test:

Shelton (1987) noted that psychological measurements often deal with intangible variables that are not amenable to direct measurement. Therefore, evidence provided by psychological or linguistic assessments needs appropriate interpretation. This is dependent on the framework incorporated within the

assessment procedure and is therefore implicit. For example, the medium used for evoking language in a child is integral to a test and will influence the type of result obtained. To better understand test interpretations it is important to know the underlying rationale of test design

Developmental norms:

Many assessment procedures are based on an implicit comparison between the development of a child and that of non-disabled children of a similar age. The extent to which the child's response differs indicates the severity of any developmental problem. Rosenbloom (1994) stated while outlining difficulties in defining developmental disorders that there is '... a need to recognise that there must inevitably be a continuum between normal and abnormal development and that any cut off will be arbitrary and at best statistically or clinically rather than pathologically based.' Normal children show considerable variation with respect to the speed of development, particularly language, in terms of the relationship between the structural, semantic and functional features (Brown 1973, Lieven 1978).

Establishing age norms has several problems. It is not easy to be precise about when any specific skill has been mastered by a child. Also, a child's performance may vary from moment to moment.

Since children's linguistic performance varies across situations it is important to replicate conditions that existed during data collection for age norms while testing (Shelton 1987). The knowledge and sensitivity of the observer are very important to the authenticity of results obtained (Harris 1990).

The competence and performance gap:

Developmental assessments assume that it is possible to sample a child's ability and that, under certain conditions, this will provide a useful indication of the child's potential. This may not necessarily be so since the testing situation demands use of communicative, social and other psychological skills that could cloud the child's performance. Cronbach (1970) distinguished between measures of maximum performance and typical performance.

Others:

Some other issues are typical to language assessments. Mittler (1972) pointed out that language is a group of skills. These different aspects of language develop at varying rates. Language competence also depends on cognition, on some of its dimensions more than the others. Other psychological processes such as auditory perception, attention and aspects of memory also influence language development. All these factors may confound language assessment (Hardy 1987).

II.3.2C USES OF DEVELOPMENTAL SCREENING AND SCREENING TESTS

Developmental screening is a system that aims to check that children are developing normally for their age, as measured against prescribed criteria. Failure to meet these criteria may indicate developmental delay or defect, or may be caused by environmental factors. Rosenbloom (1994) emphasized the relevance of environmental factors to developmental disorders and suggested separate evaluation of them. They are of even greater importance to child development in Third World countries. When a possible problem is identified by a screen appropriate referrals, detailed assessments and subsequent management can be planned.

Screening tests can be used in several ways at different levels. Primary care personnel use them to identify children with problems requiring referral. Developmental or community paediatricians may use the same test as a first stage analysis of a referred child's cognitive profile; in the case of the Bus Puzzle Test the profile will suggests global delay or specific language delay or disorder.

Developmental screening forms an integral part of child health surveillance in the Western World (Bellman and Cash 1987, Hall 1989, Committee on Children with Disabilities 1986). Prevention of possible problems, early identification of problems and management and care of children once a problem has been identified form the core aims of such programmes. Through early identification it is hoped to mitigate the effect of developmental disabilities on later education. Information from surveillance programmes can help to identify health trends, plan health and social service resources and even influence social and political policies.

In **Third World countries** screening tests have been used for establishing prevalence rates of specific developmental delays and disorders (Khan & Durkin - in press). They have also been used for comparing various subpopulations (Pankajam 1990) and to establish and evaluate intervention programmes (Murlidharan and Misra 1988 - cited in Murlidharan 1992) . They can be used to identify areas requiring greater resources particularly in improving detailed diagnosis and management of such problems and research into aspects of development.

Lack of adequate personnel, screening tools and resources have made large scale child surveillance impossible in the Third World. However, staff in health clinics see a preponderance of young children, a proportion of whom will have developmental delays of significance for later progress (WHO 1992). An opportunity can be taken to assess the development of children who attend clinics for health reasons, particularly when parents themselves are uncertain whether their offspring are developing normally and ask for advice. Many will attend for physical complaints which turn out to be related to learning problems in children of low ability of whom too much is expected either at school or at home. Specific learning

impairments may present in the same way. In this context, several countries have added records of developmental milestones to children's health record cards (WHO 1992). The availability of simple tools testing infant and preschool development will enable a substantial proportion of the child population to be covered.

WHO (1992) recommends that screening tests should be developed for the use by teachers to identify those who are likely to have severe learning problems. Such an exercise would help identify children with treatable medical conditions or those in need of remedial education. Expectations of their performance would also become more realistic.

II.3.3A PSYCHOMETRIC STATUS OF TESTING TOOLS IN THE DEVELOPED AND DEVELOPING WORLDS:

Developmental tests and screening tools have been refined over the last two to three decades in the developed world. This is demonstrated by two reviews done a decade apart (Glascoe et al 1990, McCauley and Swisher 1984).

Glascoe et al (1990) reviewed 19 developmental screening tests for young children according to guidelines laid down by the American Psychological Association (1985). Four of the 19 tests had excellent reliable studies, 2 rated good, 5 rated fair, 2 were poor and 5 tests had no reliability studies done. Three of the 19 tests reviewed by Glascoe et al (1990) had excellent validity studies; two rated good; 4 rated fair; 8 were poor and 2 of the tests had no validity studies. Three of the tests reviewed rated excellent with regards to the sensitivity index; 1 rated good; 3 rated fair and the rest were either poor (3) or had no sensitivity index at all (12). Five of the tests showed an excellent specificity index, 1 was good , 1 was poor and for the rest no specificity index was derived. They concluded that several tests approached recommended standards for educational and psychological tests.

McCauley and Swisher (1984) reviewed 30 language and articulation tests for preschool children for their psychometric characteristics. Only 20 per cent had adequate sample size. Three out of the thirty tests analysed gave description of the normative sample. Only thirty per cent of language tests examined, had been subjected to any item analysis. Seven of the thirty tests gave the mean and standard deviation of raw scores . Test-retest reliability was reported in only one of the 30 tests. None reported interexaminer reliability. Sixteen per cent of the 30 tests reviewed had reported concurrent validity. No test had reported predictive validity. McCauley and Swisher concluded that most of the instruments available for testing the language of preschool children were not well developed and imposed important limitations on their use.

Third world countries are only recently developing an interest in psychometric tests on a large scale. This is in part due to the WHO initiative (1992) and in part due to the success of intervention programmes like the ICDS in India.

In her review of developmental test instruments in India, Murlidharan (1992) pointed out the lack of standardisation and established norms. Only one of the 19 tests had been standardised. Six of the tests had norms. Eight tests had test-retest reliability ranging from 0.56 to 0.99. Whilst only one reported inter-examiner reliability. Four of the tests reported validity indices ranging from 0.73 to 0.81. Two tests reported sensitivity and specificity indices. She concluded that though ' a great deal of activity in testing' existed in India, the psychometric properties of the instruments need to be improved particularly in regards to standardisation and norm-establishment. The information provided on socioeconomic target groups was inadequate and regional, ethnic, rural-urban-tribal variations need to be addressed in standardisation and norm- establishment. Item Analysis was not done in any of the tests reviewed.

Many western tests have been adapted for Indian children in the past - Bender Gestalt Test for Children (Dwivedi 1970), Standford Binet (Kulshrestha 1971) and Gesell's modification (Bevli 1978). Modifications have been minor without item analysis and are less than satisfactory. Pictures of a needle, a rose or a picture depicting a letter being posted in a letter box, which were employed in Bevli's study, are in fact out of the realm of experience of rural or even slum children.

II.3.3B CONSIDERATIONS FOR DEVELOPING OR ADAPTING TESTS FOR THIRD WORLD COUNTRIES:

Psychological assessment in Third World countries has to be undertaken with the assistance of ' a rather motley collection of semi-standardised instruments' (Mittler and Serpell 1985). There is a tendency to rely on tests which have not been adequately adapted or standardised for the population from which subjects are drawn (WHO 1992). Anandalakshmy (1982) and Bevli (1990a) concurred and pointed to the dangers of importing Western tests, sometimes standardised decades earlier, for use in other sociocultural settings. The dangers included use of culture inappropriate test items; use of irrelevant test items; use of inappropriate testing methods and use of tests not standardised on the target population (WHO 1992).

Often users are aware of the problems inherent to such tests and make ad hoc allowances for them. They may adjust scores; give extra practice on introductory items; omit selected 'inappropriate' items; modify items to suit the child's prior experience; and finally actually teach the main task and assess the rate at which the child learns. Such strategies violate essential assumptions on which the tests depend and thus their validity (Mittler and Serpell 1985, WHO 1992).

A more systematic approach would be to adapt and restandardise foreign tests for local use or develop new tests using concepts, methods and materials derived from the local culture. Developmental status is necessarily interwoven with a child's social environment and life situation and these should be considered in test construction. Schwarz and Krug (1978) opined that test rationale, test contents and testing techniques should account for local culture and skills. Crosscultural research has shown the importance of other factors in determining the level of performance on many structured cognitive tasks. These include the testee's repertoire of perceptual and motor skills and the extent to which these are matched by appropriate nonverbal test materials as well as subtle aspects of social interaction (Mittler and Serpell 1985). WHO (1992) advocated involvement of persons familiar with the local language to make the test instructions explicit.

Issues particular to India:

All language usage is social and embedded in culture (Miller 1984). Language assessment tools need to be culture-specific and bias-free (Diamond 1981). Comparative studies of subpopulations require an instrument applicable to all sections of society. Many issues need to be considered when a common tool is being devised for a diverse society like India. These include the matter of multilingualism and of highly disparate social and economic groups. They concern test design, test administration and test interpretation.

Heterogeneous Culture:

The assessment of language skills can be undertaken only within a child's experience. Experiences are determined by factors in a child's sociocultural and material world and include social customs, child rearing practices and physical artifacts bound by standards of living. All these are peculiar to each society. In India there are a great diversity and disparity among various socioeconomic classes that influence their living styles. To design a common tool applicable to all sections of society is indeed a formidable task.

Multiple Languages

India has over 300 languages and dialects. Rajasthan alone has more than three main languages including the local dialect. A review of the languages of India is given on p.... Though language development follows universal rules, acquisitions of specific words depend on their use in a particular socio-cultural environment (Fletcher 1987) and on a particular language (Raghavendra and Leonard 1989; Mikes and Vlahovic 1966). Very young children usually understand and speak only their mother tongue though older children and adults in India are most often bilingual. The effect of bilingualism on early language development also needs to be considered.

The medium of instruction used and interpretation of responses obtained in language tests for children from different linguistic environments need special attention.

SUMMARY:

Test construction involves several stages including detailed planning of test design; item analysis for item selection; pilot studies on test applicability and final test standardisation. Reliability, validity, sensitivity and specificity studies are essential on completion of test construction. All stages should consider the sociocultural and linguistic characteristics of the target population.

The above review also explains the problems and dangers of using inappropriate tests particularly in Third World countries.

The author decided to concentrate on adequate cultural adaptation of the Bus Puzzle so that the early stages of test development would have a firm scientific foundation; to focus on item analysis to ensure that test content was appropriate for the pluricultural Indian society; to standardise the test and to construct norms according to sociocultural groups; to make an effort towards defining the proposed test's content and construct validity particularly as the basic neurodevelomental skills of the target populations were unknown. This would ensure sound underpinning of the test and allow its further development in terms of validity and possible future modification as a surveillance tool for field workers

II.4 SOCIOCULTURAL BACKGROUND OF THE TARGET POPULATION

As mentioned on p. 95 , consideration of sociocultural background of the target population is important to test design.

The Kota district is probably typical of the sociocultural mix of India but there are no research studies of the characteristics pertaining to it. The population characteristics and the language profile of India are therefore reviewed below and indicate the lifestyles of the various social groups. In the later section, literature on early language and cognitive development in India in the different socioeconomic groups has been reviewed.

POPULATION CHARACTERISTICS OF INDIA

India is a vast and diverse country. A recent census (Gupta 1992) reported that three quarters of the 857 million people live in villages. Recent economic growth has increased the middle class population to 200 million. An equal proportion of the people live below the poverty line. The rural sector accommodates most of the poor. 39.5 percent of the population are children aged zero to 14 years.

Though 95.7 million six to 11 years old children enroll in primary school only 30.9 million reach middle school and 20 million high school; school dropout is more than 60 percent; the literacy rate in India is 52 per cent. The number of students enrolled in 1988-89 in Engineering and Technological colleges were 4.9 million and in Medical and Dental colleges 3.7 million.

SOCIAL CLASS AND LIFESTYLES

The above statistics show the disparity between socioeconomic groups within the country. There is a wide chasm between the lifestyles of the affluent and the poor which are reflected in child rearing practices and education.

ADVANTAGED GROUP

The advantaged group consists of the rich, upper and middle classes. Wide variation is also seen within this group but aspirations are similar. Liberalisation of economic and industrial policies over the past five years has led to a boom in the consumer market. Television and refrigerators have become status symbols. A remarkable increase in the television industry has led to wider dispersion of information.

Jayaram (1990) discusses how advantaged Indians in higher education smoothly embody Western culture and ideas. Indian youngsters speak English and relish an apparent western lifestyle. Western ideas of child rearing practices influence and often clash with more traditional ones. Children at this age are not as independent as their Western peers. They are not expected to pay through college nor work to earn pocket money. Parents work hard to provide for their future. Divorces are rare and families are stable. Families are often autocratic and decisions about education, career and marriage are frequently taken by parents (Narayan 1986). Yet rapid changes in lifestyle and increased economic aspirations have resulted in more stress-related problems of modern society (Misra 1991, Sinha 1988).

Education is seen as a way of improving individual circumstances. Private schools have proliferated and are preferred to state-run schools (Jayaram 1990). Many children start school at a very young age. Toys and books are readily available but are not state-provided and are of variable quality. Oral story-telling remains more common than reading stories out aloud.

DISADVANTAGED GROUPS

In the sociological sense disadvantage signifies an enduring impoverishment that at school contributes to poor academic achievement of children and in the larger society generally lowered chances of success.

Disadvantage has sociocultural dimensions and while one cannot simply equate disadvantage with poverty, there is no doubt that the two often coexist (Edwards 1989). The constant battle to etch out a living caused by substandard living conditions does not leave much time for adequate child rearing (Tragler 1985). These authors and Narayan (1986) discuss how poor nutrition complicated by infectious disease in unhygienic conditions leads to chronic ill health which in turn dampens initiative and drive. Antisocial activities such as alcoholism and criminality creep in and result in an unstable environment. The culture of poverty constrains the potential of the individual.

Large family size, poor environmental living conditions, incomplete or disorganised families, low value placed upon formal education and absence of books and other cultural and educational material at home are some characteristics of the underprivileged society leading to poor school performance (Ferguson et al 1971, Hunt 1969, Ogbu 1982, Murlidharan 1990, Misra and Tiwari 1990).

The dimensions of disadvantage in India are vast and poverty is a dominant characteristic (Anandalakshmy 1982). Other important factors are caste and the female sex (Sinha 1982).

RURAL GROUP

Eighty per cent of the Indian population live in villages (Gupta 1992). In relation to urban India the rural population is poorer and most villages lack many basic amenities so that distinction between rural poor and non-poor is erroneous (Sharma 1989). However, poverty is relative and complex and villages are distinct from urban slums in terms of living conditions, work profile and attitudes.

Socioeconomic characteristics:

In a study of 585 persons from villages of Kanpur and Varanasi Sharma (1989) reported that 84.4 per cent were married, 68 per cent were literate, 39.5 per cent were cultivators and 35 per cent were landless labourers. The proportion of people owning less land than their fathers was 58 %. Some of the reasons were mortgaging and selling of the land due to economic compulsions and division of land amongst brothers. Thirty five per cent of them felt that there was a deterioration in their socioeconomic status.

An American sociologist and an anthropologist together with their coworkers made a detailed sociocultural study of a village in Uttar Pradesh, a state adjoining Rajasthan (Minturn and Hitchcock 1963). Eighty to ninety per cent of the men in the village worked in the field. Some women worked in the fields or were employed as labour in large farms. Their children were left at home in the care of grand parents, older siblings or occasionally other family members or neighbours. Those under two years accompanied their mothers to the fields. In this village fewer women worked in the fields than is the case in the Kota district where the proportion (90 to 95 per cent) concurs with the statistic defining a village population in India (Gupta 1992).

In a description of rural life, Minturn and Hitchcock (1963) describe the village as a cluster of huts which line winding narrow lanes. The hut is usually a mud plastered adobe. More prosperous families may have quarters built of bricks. The size and type of construction of these houses are an indication of the wealth and status of the families. A hut consists of a few windowless rooms that open into the courtyard. The floor of the courtyard is surfaced with a mixture of water and cowdung and is renewed every week. It forms a hard, dustless, water-absorbent functional surface.

The hub of all family activity is the open courtyard. Rooms are used only in winter and as storerooms. An all purpose string cot forms the principal furniture. It is used for sleeping, sitting, baby parking, grain drying and dish draining. Family cooking is done on the hearth - an u-shaped mud fireplace about a foot square and six inches high, usually built against a courtyard wall. A cooking pot rests on the mud support, and cow dung or wood is burned underneath. Part of the courtyard may be set aside as a cattle-compound for cows and buffaloes, who are tethered here at night. The number of cattle owned is a status symbol.

Families may live together in a joint family system, i.e., grandparents, brothers with their wives and children often share a single courtyard. The more recent trend is to live in nuclear units with grandparents.

Minturn and Hitchcock studied the attitudes and values of the villagers. Those related to child rearing and education are summarised below.

Child rearing practices:-

An essential part of living is bearing and raising children. Children are considered incapable of distinguishing good from evil and are "pure" or holy.

Infancy : Infants spend the first two years as passive observers of busy courtyard life, never alone, nor the centre of attention. They sleep with their mother who has the prime responsibility for feeding, washing and dressing. Other women of the family also participate in care. A baby's life is bland and free from stress, but is, also free from deliberate creative stimulation. Mothers, who have more experience with children than those reared in nuclear families, are quite comfortable with them. Therefore, babies are neither objects of anxiety nor objects of interest. They are held on the hips, as a mother or elder sibling goes about her work. Adult interaction with babies is generally aimed at producing a cessation of response rather than stimulating it. Thus they are picked up only when they cry or fuss. The idea of educational toys is alien and apart from a few rattles babies have no toys.

Preschool: No demands are made on a child until she acquires speech as she is considered unteachable till then. The child is considered too small to learn from verbal instructions and it is believed that young children learn best through observation and imitation rather than instruction.

Infancy to school is a transition period during which a child moves from observer to participant in the life of the village. Few demands are made upon the child and discipline is minimal besides vague scoldings. Adults pay little attention to the activities of children, unless there is quarreling or trouble. Thus children's recreation is informal and without adult supervision. A great deal of the play of younger children consists of almost random activity. They chase each other, tease each other, climb on a vacant cart, or play seesaw on a wagon wheel that maybe lying near their house.

Children have few toys. Some girls have rag dolls or miniature cooking utensils, but rarely play with them. Boys sometimes have bows and arrows, small iron hoops or crudely made small bullock carts. Children usually tag after an older sibling or grandmother when mothers are working in the fields.

Children of this age are not trained to comply with requests. Self reliance is not taught and mothers reinforce dependency. Primary emphasis is placed on obedience and training of passivity.

School and Education :

Although, literacy is becoming increasingly valued as an avenue to job opportunities, villagers' interest in education is practical more than scholarly. Therefore their attitude toward academic achievement is very casual. They do not press their children to attend school, get good grades, or encourage them to study. Most parents (especially mothers) are illiterate, and cannot successfully help their children with their studies. Parents often take children out of school when their services are needed at home as during harvest time. Young girls seldom go to school and are caretakers for younger siblings. The prevailing belief is that teaching a girl to write will only turn her head so she will not like to cook and keep house.

Schools are sparsely furnished. Children write on a regular blackboard type slate. Learning is primarily by rote. Attendance is low and absenteeism ranges from 20 to 40 per cent, especially so in younger age groups. Teachers use punitive methods to maintain discipline.

Jayaram (1990) pointed out that only 23 out of a 100 students reached eighth grade. It would take a long time before the rural population reached the general levels of literacy. He further added that 'education seldom rises above the socioeconomic and sociopolitical situation in which it is embedded'.

URBAN SLUMS:

One of the most striking trends over the last 35 years is the growth of squatter settlements in Indian cities. They may form 20 to 50 per cent of a city (Gupta 1992). This burgeoning of slums is as a result of rural-urban migration, mostly for economic reasons (Prakash and Doshy 1983). The common characteristics are extremely high population densities and almost totally inadequate sanitation and water supply (Bradnock 1984). Overcrowding and unhygienic living conditions mark the slums.

Houses are collections of village-type huts or temporary structures constructed from waste material put up in any available open space (Bradnock 1984). They are almost always on government-owned land from which eviction is politically impossible. The squatter settlements of Indian cities lie close to factories, railway yards and government offices i.e. place of work.

Socioeconomic characteristics:

In a study of factors affecting status of urban slum dwellers in Lucknow, Kumar (1983) found that 53.4 per cent of 1051 slum adults were married and 4.4 percent divorced or widowed. Forty six percent were illiterate and almost an equal number had some school experience. Ten per cent of the slum population was unemployed while the rest worked as labourers, shopkeepers, caste occupation and in some form of

temporary service. Sixty six per cent lived in a nuclear type family. The average size of a family was 4.9 with typically 2.7 children per family. The standard number of rooms per family was 1.5.

In a study of 1313 slum households in Bombay, Tragler (1985) found a overall literacy rate of 70 per cent with 62 percent females being literate. Thirty nine per cent of mothers were working, leaving their children with inadequate substitute care. Women lacked knowledge on cause and spread of diseases, nutrition and environmental health hazards. Infant mortality (130 per 1000 live births) was higher than the national average

Psychosocial profile:

Community living in urban slum areas is less harmonious and antisocial problems are higher (Sinha 1982). Parents work overtime to make ends meet and little time is spent as a family. Often there are serious discrepancies between community expectations and parental role (for e.g. smuggler or prostitute). These lead to alcoholism, gambling, wife beating and other familial problems. Due to social and economic pressures within the family in slums, parents are unable to meet a child's needs (Narayan 1986). These children face physical, emotional and intellectual deprivation.

A child in the slum has to assume many adult roles - income generator, parent to younger siblings and housekeeper (Narayan 1986). Formal recreation has little place in their lives, yet they indulge in street games, gambling, roaming with friends and watching films. Delinquent behaviour like smoking, gambling and drug-taking is common. Subhramanyam and Sondhi (1990) reported that 41 per cent of street children they studied saw more than three movies per week; 28 per cent admitted to gambling; 63 per cent of the boys smoked and some were obviously addicted to drugs but did not admit to it.

Educational aspirations are related closely to socioeconomic factors (Jayaram 1990). These linked with job opportunities and the ability to better their own future influences a family's attitude to education. Ninety six per cent of the boys, studied by Subhramanyam and Sondhi (1990) believed that they could get a better job if they were educated. Yet, 41 per cent of them were illiterate and had never been to school either due to poverty, ill treatment or failure at school, dislike for school or too much work at home.

Slum children matured faster than middle class children. They learnt to make decisions earlier and developed a commercial and a survival instinct (Narayan 1986). However, 85 per cent of Subhramanyam and Sondhi's cohort had feelings of resignation and fatalism about their future and only 48 per cent of them planned for the future.

The diversity in socioeconomic background and lifestyles is evident and designing a common tool for children of all social groups will be a complex task.

SECTION III

RESEARCH DESIGN AND METHODOLOGY

It was decided to design a developmental cognitive tool emphasizing language for preschool Indian children of all socioeconomic groups, based on the Bus Puzzle Test (Egan & Brown 1984), for the application by professionals in clinical practice for first stage analysis of a child's cognitive profile. The stages of cultural adaptation, item analysis, standardisation and preliminary reliability and non-empirical validity studies would be undertaken.

DESIGN AND ADAPTATION OF THE BUS PUZZLE TEST FOR INDIA:

INTRODUCTION

The Bus Puzzle Test (Egan & Brown 1984) is colourful, quick, easy to administer and a comprehensive screening tool exploring early development. It was selected over other available screening tests for the reasons given on p. 41.

Early language skills need to be assessed in the context of a child's experience. Certain objects in the Bus Puzzle, such as a buggy and a lollipop man, are outside the realm of experience of Indian children. There is a greater diversity of living styles and socioeconomic groups in India than in England. Household objects and everyday experiences differ for urban and rural children and also for upper urban and slum children. Rural children do not see postboxes or cars and buses regularly.

The first step in adaptation was to design a picture in which the situations, objects and persons would be in the everyday experience of young Indian children in all socioeconomic groups and in both urban and rural populations. This required several stages, here called models I - IV, in test design. Models I and II correspond to the planning and pre-pilot stage, Model III (Item analysis) to the pilot stage and Model IV (standardisation, reliability and validity) to final stage described on p. 141. Thus each model was a refinement and dependent upon the findings of those that preceded it. The stages in test design are summarised below and in the flow chart (fig.III.1 p. 105).

Model I

Ethnic modifications were made to the original picture from The Bus Puzzle Test and piloted on twenty-seven children.

Model II

The findings suggest that a more typical Indian scene was necessary. Four Indian scenes were constructed and tested in the field for vocabulary and response to questions on the situations depicted in the scenes.

Model III

Suitable characters, objects and situations were selected from analysis of the four model II scenes and transformed into a cohesive scene. Nineteen noun labels and fourteen situations for questions were depicted. The picture was converted into a wooden insert puzzle. Four hundred and fifty children were tested in the field on 'Verbal labels' and 'Questions'. The findings were subjected to the statistical procedure of Item Analysis and unsuitable items were discarded.

The ability to interpret pictures was apparently a problem in deprived sections of the population and seemed to interfere with the assessment of language. This problem was explored in two ways:

1. The ability of children from urban and rural groups with three-dimensional miniature objects of fifteen of the nineteen verbal labels was explored.

2. The ability of adults from deprived and advantaged groups for the Model III picture was explored.

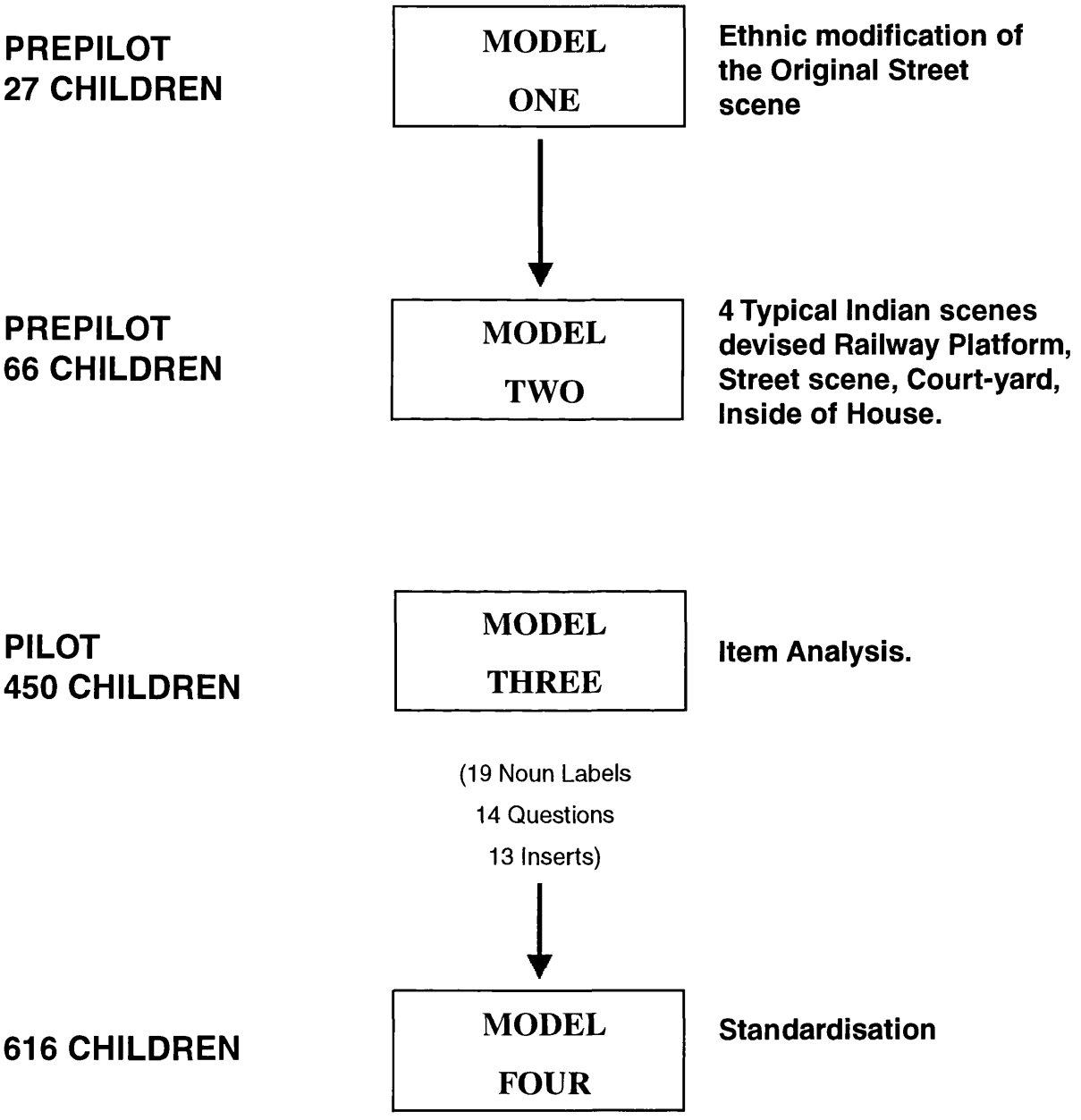
Model IV

Noun labels and questions were selected for the final version (Model IV). A further two hundred children were tested bringing the sample for standardization to six hundred and sixteen. Percentile charts were constructed for each subsection of the test for each socioeconomic group and for the total sample. The 24 charts were smoothed. Reliability coefficients were calculated.

FIG. III. 1

FLOW CHART

TEST DESIGN



POPULATION DESCRIPTION

Children were recruited from the Kota district for each stage in the development of the new Indian Test. The demographics of those participating in each stage are indicated in the text pertaining to it.

A profile of Kota, followed by a description of the method used to determine sample size and the sampling technique used for standardisation purposes is outlined below.

I PROFILE OF KOTA

A. Geographic location:

Kota district is located in the southeastern part of Rajasthan State. The state itself lies in northwestern India next to the borders of West Pakistan. The land is drained by the Chambal River. Hence Kota is quite green compared to the rest of the state that has vast desert land. The climate is dry and summers are long and hot with temperatures above 40'C. The district has 4 subdivisions with 12 tehsils (counties) and 11 towns. Kota city is its headquarters.

Kota city is a rapidly expanding industrial town with a population of 100,0000.

B. Historical background :

The district is named after its county town Kota, which was the capital of the erstwhile state of the same name. According to available records Jait Singh the grandson of the chief of Bundi, a neighbouring state, founded Kota by attacking and ousting some Bhils of Kotah clan from the east of Chambal that he named Kotah.

Many reorganisations took place since then, the major ones were in 1863, 1874, 1933 & 1948. Kota district, as it is today, came into being in 1948 and was integrated into the United States of Rajasthan in 1949.

C. People and Culture

Rajasthan is an Indian state of great contrast. Infant mortality rate is high. The Rajputs form the majority. Hindi is the dominant language spoken by 91 % of the population. Hadoti, the regional dialect, is commonly spoken. Many people from Madhya Pradesh, Uttar Pradesh, Kerala, Punjab and Bengal have migrated to Rajasthan to seek work. Bengalis and Sindhis fled to Rajasthan during the India Pakistan

wars and live in colonies in Kota. The society is therefore multiethnic and different languages, styles of living and sociocultural customs abound.

D. Social classes - Rural & Urban definitions :

Urban areas have been defined for census purposes as those which satisfy one of the following criterion:-

a. All places with a Municipality, Corporation or Cantonmend Board or notified area committee.

b. That there is

(i) A minimum population of 5000 people

(ii) At least 75% of the working males are engaged in non-agricultural work.

(iii) Population densities of at least 400 per square mile.

Most of the urban middle class is employed in Industrial concerns, government services or are shop owners or petty traders. The upper class own small or large industries, are executives or self-employed professionals. The urban lower class work as sweepers, domestic servants or are involved in petty trade.

The slums are well demarcated from other residential areas. Certain colonies of houses are distinctly upper class or middle class. Ambiguity exists for borderline cases who may belong to either of the classes.

The houses in the urban sector are usually brick and cement bungalows or semidetached homes, village houses are made of mud as are some slum homes.

There are over 300 schools in Kota that may be government run or privately owned. Many of the private schools cater to upper and middle class and are regarded as superior to those run by the state government.

The villages are defined for the census as those areas which have a population of less than 5000 people, or where 75% of working men are farmers or the population density is less than 400 per sq.mile.

Over the last decade many of the farmers have become more prosperous. Farmers owning 10 acres or more of land are considered middle class. They enjoy a better economic standard but their life style is not very different from the smaller farmer or the farm labourer. For this study all economic classes were grouped as one in the rural sector.

The village homes in Rajasthan are typically made of mud and are beautifully decorated with embedded bits of mirror and glass and frescoes. The courtyards are used as sleeping quarters. If the family owns animals they live in barns within the courtyard.

There is one middle school for several adjoining villages. They are run by the government and do not offer preschool and nursery training. Children enter school at 5 to 7 years. Televisions are owned by 10 to 20 % of rural homes. Popular programme are watched by most villagers with their neighbour. A transistor radio was owned by 60 to 70 % of rural families.

Literacy is less than 4 % in women and 40% of men have received primary or middle school education. Even so newspapers are not widely read.

Socioeconomic classification :

There are many socioeconomic classifications which use different indices to define class. Most use income of the house which is often concealed from the investigator. The Market Research Society (MRS) classification does not consider income and is based on the level of education of the father/head of the family and his/her occupation; the MRS classification was therefore chosen for this study. Various permutations define 8 social classes (Table III.21A and III.21B, p. 208 - 209).

II SAMPLING :

SIZE:

In the formula recommended by the WHO (1986), sample size depends on the number of relevant variables to be jointly analysed. Age is always treated as 2 cells no matter how many subgroups are employed (WHO 1986).

The formula for sample size is N = 3000 log 10 x - 700

Where x = total number of cells. The formula requires additional 2 cells for the age factor. In the Kota study there are 3 cells for socioeconomic groups - urban advantaged group, urban lower group and rural groups and 2 for age.

Thusx = 3 x 2 (For age) = 6

Therefore, N = 3000 log10x6 -700

N = 1300

The sample size should be 1300 (WHO 1986).

SAMPLE SIZE FOR INDIVIDUAL SOCIOECONOMIC GROUPS:

Sample size was calculated separately for each socioeconomic group, using the same formula, when it became evident that separate norms would be required for each (p. 102).

Based on the formula, the sample size needed for each socioeconomic group was 203. As 'x' in the formula reflects the variation within a sample, greater uniformity within each social class results in a smaller sample size requirement.

$$N = 3000 \log_{10} x - 700$$

x = 1 (single social class) x 2 (for age)

Therefore, $N = 3000 \log_{10} 2 - 700$

$= 903 - 700$

$= 203$

A sample size of approximately 600 was decided upon for the standardisation - 200 children were from the upper and middle class, 200 from the urban slums and 200 from the rural sector.

III METHOD

A stratified sampling design was used. The primary sampling units were socioeconomic strata (SES) and the subunits were children aged 2 to 5 years. Children with congenital anomalies, mental retardation and obvious deafness were excluded.

Primary Sample :

Four strata were defined :

Stratum one	:	urban upper class	-	SES 1 and 2 by MRS	classification.
Stratum two	:	middle urban class	-	SES groups 3,4,5 by MRS	classification
Stratum three	:	urban lower class	-	SES 7,8 by MRS	classification.
Stratum four	:	rural children.			

To circumvent the problem of inadequately maintained or nonexistent birth registers in the district the following procedure was adopted.

For strata one and two a list of upper and middle class residential colonies and nursery schools was

drawn up. Using Random Number Tables colonies and nursery schools were selected. A register of children aged two to five years from the chosen primary units was made after home visits. A further random selection of the children was done. Appointments were taken and data collected prior to the testing.

The subsample for stratum three was selected from the primary units of Anganwadis of the Integrated Child Development Scheme (ICDS). The ICDS is a government run intervention scheme for 0 to 6 year olds from the rural and slum populations. Anganwadi is operated for a population of 1000 persons and is manned by Anganwadi workers (AWW). A Lady Supervisor (LS) manages 10 to 12 Anganwadis. Immunisation, nutrition and early education are cornerstones of the program.

Orientation lectures were held for the Lady Supervisors with the help of Mr.Dadich, the Regional Deputy Director of the ICDS. The nature of the study and its requirements were explained. With their help from a list of all the Anganwadis operating in Kota district 10 were randomly shortlisted.

From each Anganwadi every 5th child listed in the register who was 2 to 5 years was enrolled. The AWWS, helped to collect data on parents education, fathers job, number of siblings and birth order.

Those villages not covered by the ICDS project were listed. Randomly selected villages from them were admitted in the study.

The headman or a senior citizen of the village was approached for assistance. Refreshments, free medical checkup and free medicines were used as inducements. All children aged 2 to 5 years were tested in each selected village.

MODEL I (PREPILOT I)

Ethnic modifications to the original picture of the Egan Bus Puzzle Test were made (photo.III.1 p. 111) and the response of Indian children to it was explored. The overall size of the picture was 33.5cm x 43cm.

(a) Subjects:

Twenty seven children from one urban and one suburban school of Kota attended by upper and middle class children participated: The eleven girls and sixteen boys were aged 33 to 55 months - five aged 35 months or less; four 36 to 38 months; eight 39 to 41 months; six 42 to 44 months and 3 over 44 months.

(b) Materials

The following ethnic modifications were made to the picture of the original Bus Puzzle Test (Photo III.1):-

. Clothes, hair and skin colouring were suitably altered.

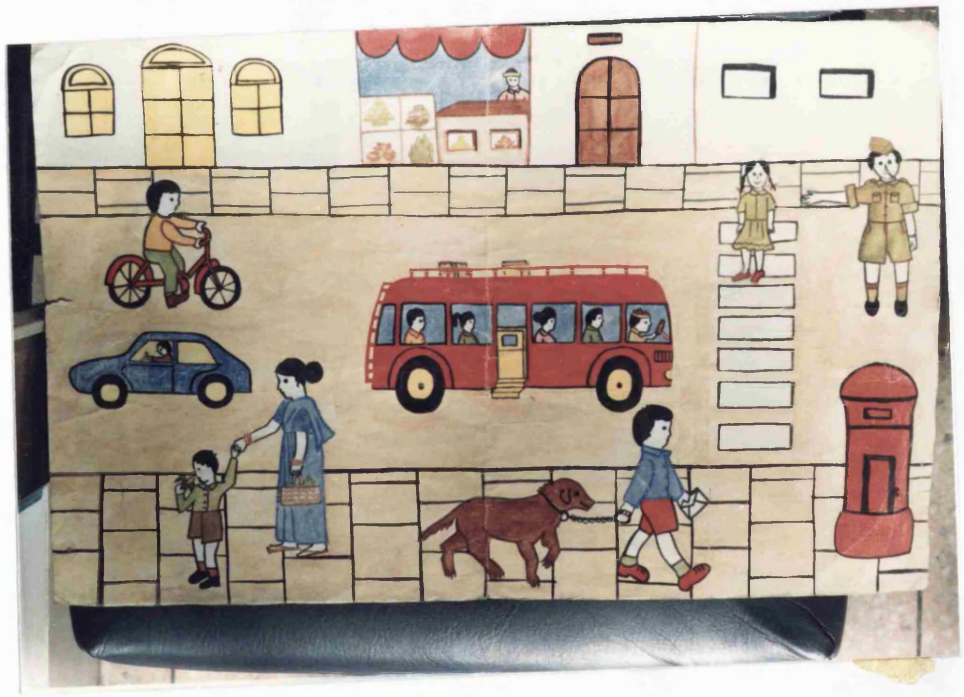
. An Indian bus replaced the red London bus.

. A ubiquitous policeman was substituted for the lollipop man who does not feature in India.

. A buggy or pram is rarely used by Indian mothers; so the whole situation of a mother pushing a buggy was replaced by a mother holding the hand of a child walking beside her.

. Most Indian mothers do not carry a handbag. The Indian mother instead carries a shopping basket full of fruit and vegetables.

PHOTO.III.1



ETHNIC MODIFICATION OF THE BPT - MODEL I

As in the English version there were nine noun labels - **'dog', 'car', 'bus', 'postbox', 'mummy', 'boy ', 'bike', 'policeman', 'bag';** and six questions - **Q.1 'Why do we have steps on a bus?'** (to go up), **Q.2 'What is mummy doing?'** (Going shopping), **Q.3 'What is he going to do with it?'** (Put it in the postbox), **Q.4 'What is he doing with his other hand?'** (Taking the dog for a walk), **Q.5 'What is this boy doing?'** (Riding his bike), **Q.6 'What is the policeman doing?'** (Stopping the cars to let children cross the road).

(c) Procedure:

Subsections were those of the Bus Puzzle Test - Expression - verbal labels (9 items); Comprehension verbal labels (9 items); Comprehension of questions (6 questions); Expression on questions (6 questions). Administration followed that of the Bus Puzzle and the English scoring system was applied to each section. Performance skills were not included at this stage because the adaptation was still a paper model.

(d) Results

The distribution of raw scores and developmental ages for each section of the test are detailed in Table III.1, p . 216. Developmental age was estimated by plotting each child's raw score on the centile graphs of the English standardisation sample (Egan & Brown 1984). Egan referred to children falling below the 20th centile as below average, among the 20th and 50th centile as average and above the 50th centile as above average.

Figure III.3 (p. 291) presents the centile findings of the Indian sample in histogram form. In all sectors except expression on questions the majority of the Indian children fell in the below average group. The distribution of types of expressive verbal label (EVL) - generic/functional/proper term - used by the children to name the nine items is given in Table III.2 p. 217. The proportion of children comprehending each of the six questions varied from 59 to 96 per cent (Table III.3, p. 217). The type and level of expressive response to questions is shown in Table III.4, p . 218.

Generally, the level of expressive response for those understanding a question was higher in Indian children suggesting that the ability to formulate a sentence was not the main reason for below average achievement in other areas.

(e) Conclusions :

The finding of this small pilot study suggests that these minor ethnic modifications of the street scene of the original Bus Puzzle would be insufficient and that more authentic and familiar scenes of life in India are required.

MODEL II (PREPILOT II)

AIM

To determine a scene appropriate to the multiethnic and socioeconomic society of India.

(a) Subjects:

Sixty six, six to seven year old children were piloted on 4 scenes; older children were used to avoid other developmental factors confounding the findings. Children younger than six may not respond because of immaturity and not because the item is socioculturally inappropriate. Children over the age of eight could have had too wide an experience of the world through television, books and formal education and their responses would not typify the experience of the age group under study. Twenty-three of the 66 children were girls. Socioeconomically, 12 came from rural, 16 from upper class and 38 from middle class backgrounds.

(b) Materials:

Four scenes were developed which adhered to the design principles of the Bus Puzzle Test:-

1. Familiarity of the target population with the objects and situations depicted.

2. A range of complexity of objects and scenes depicted in each picture to cover the age range. Egan, author of the Bus Puzzle test was consulted to confirm the developmental complexity of each of the items in the original test. A similar range and balance was aimed for in each Model II scene.

The four pictures (size 33.5 cm x 43 cm) depicted the following scenes: (Photos III.2 to III.5-p. 114-115)

1. A street
2. A courtyard
3. A railway platform
4. Inside a house

Within the four scenes there were 29 items for noun labeling (4 vehicles, 9 people, a dog, 15 objects) and 20 situations for questions.

Detail of the verbal labels and questions for each scene is given in Table III.5 and III.6, (p. 219 - 220)

PHOTO III.2

A STREET

PHOTO III.3

COURTYARD

PHOTO III.4

RAILWAY PLATFORM

PHOTO III.5

INSIDE A HOUSE

(c) Procedure:

The four test pictures were presented in a randomized order. Some items and situations were common to more than one scene and were requested only once. Vocabulary and response to questions were recorded and analysed.

As in the earlier model the subsections of the test were :- Expression - verbal labels; Comprehension - verbal labels; Comprehension of questions; Expression on questions.

(d) Findings: -

The findings suggested that many children (particularly rural) were not familiar with buses, trains or cars but that all had experience of houses and courtyard. The percentage of correct responses for each item and each question are shown in figures III.4 and III.5, p. 292 - 293.

(e) Conclusions/Selection of items for Model III : -

Verbal labels for Model III were chosen from among those comprehended correctly and named by 60% of the children. Similarly, situations correctly recognised by 60% or more of the sample, were selected. From these items which could not be fitted in a single cohesive scene were rejected.

Verbal labels selected for model three:

Vehicle	:	cycle
Characters	:	mummy, girl, boy, postman, baby, dog
Objects	:	clock, schoolbag, bucket, steps, chair, fan tree, stove, mirror, light, bed, tap

Questions selected for model three

What is mummy doing?	(Bathing Baby)
What is the girl doing?	(sleeping)
What is the dog doing?	(eating or licking)

What are taps for?	(give water)
What is the boy doing?	(reading)
What is the lady doing?	(combing her hair)
What are steps for ?	(to go up/down)
What is a fan for?	(to cool air)
Why do we have clocks?	(to tell time)
What is mummy doing?	(cooking a chapati)
What is the postman doing?	(delivering letters)
What are mirrors for?	(to see reflection)
What is in the schoolbag?	(pencil, rubber, books, pen)

MODEL III (PILOT)

AIM

To subject Model III of the Indian Picture Puzzle Test to Item Analysis in order to select the most appropriate items.

(a) Subjects:

450 children were tested; the first 100 with a paper model, the other 350 with the wooden insert puzzle. The sampling method described in the section on standardisation (p. 108) was used, children were randomly selected from the upper, middle and lower urban class and rural homes.

(b) Materials:

The scene depicted the inside a house within a courtyard and included the eighteen noun labels and thirteen questions on illustrated situations selected from the findings of Model II. (Photo III.6). A situation

depicting a boy climbing a tree to retrieve his kite was added to the list as no suitable situation at a level corresponding to a lollipop man stopping the traffic (in the English version) had been identified from Model II. The 'Kite' formed the 19th verbal label and the Question "What is the boy doing?" - (retrieving his kite) - the fourteenth question.

The picture was converted into a wooden puzzle (31 x 45 x 0.5 cms.) with thirteen lift-out pieces - cycle, mummy, girl, boy, baby, clock, bucket, fan, tree, stove, chair, bed, dog so that recognition of shape and orientation of the pieces could be included in the analysis (Photo.III.7, p. 143). Each piece could be easily removed or replaced by a small knob in the centre of it.
The detailed description of each item is on p. 131 - 136.

PHOTO III.6

MODEL III - INSIDE A HOUSE AND COURTYARD

(c) Procedure:

All children were tested on vocabulary (comprehension and expression) for the nineteen items and on questions (comprehension and expression) for the fourteen situations illustrated; the spatial skills of 350 were tested with the thirteen lift out pieces.

The test environment was made as reassuring as possible. Children were seated on a parent's or grandparent's lap, allowed to play with a few toys and given biscuits before the test was introduced. The latter was an effective method in this cultural group to get the child's cooperation because test situations

are unfamiliar to rural and slum Indian children and cause anxiety. Commands were repeated if a child looked hesitant and awkward pauses were prevented by interspersing a non directive phrase such as "Which one did I ask for?" in an encouraging voice. Hindi was the usual medium of instruction but a child's mother tongue or a mixture of languages was used when appropriate. The principal aim was to communicate the instructions to a child. Care was taken not to give nonverbal clues like pointing or looking at the answer. Usually the test took 10 to 15 minutes. Occasionally in very young children, particularly from the deprived groups, it took up to 40 minutes. Responses were recorded verbatim by a helper. Demographic information on each child was collected on site. It included the date of birth (if available), sex, social class, number of siblings in the family, birth order, level of literacy in mother and father, the father's occupation and mother tongue of the family.

Expressive language on verbal labels:-

The child's attention was drawn to one of the larger items, usually the bicycle and asked "What is this?" As a child named each piece she was asked to lift it out and place it by the tray. The non lift out pieces were tested last and the child's attention drawn to them by saying " Ooh look what's this?"

If a child was too shy to reply to the first question, the assessor named the piece and helped the child to take it out. After the first two hundred children were tested, special tables were drawn up of the different types of responses obtained for the nineteen verbal labels and fourteen questions. This was to aid grading of responses of each of the children (p. 246 - 249)

Comprehension language - verbal labels:

The child was asked to replace each piece in turn, saying "put the ... back". The proper term was used and not the child's version of it. Easier labels like 'Cycle', 'Dog', 'Mummy' were asked first with the more difficult ones e.g. 'Stove', 'Chair' and 'Mirror' coming last. If a wrong choice was made, the piece was taken back from the child and replaced by the tray and the instructions were repeated. The child was given the correct piece after a second incorrect choice so that recognition of the recess could be assessed.
In order to make location of a piece easier for the younger children (< 4 years) the 19 items were presented in two batches - items 1 to 10 and then items 11 to 19.

Recognition of recess or inset:

A child's ability to select the correct recess was noted during the comprehension section.

Orientation of the piece to recess:

A child's ability to orient the piece to the recess was then noted.

Comprehension and Expression of illustrated situations:

The section was introduced by pointing to the man on the bike and asking the child, " What is the man doing?" The response was not recorded. If the child failed to respond, the answer that "He is riding a bike" was given.

The relevant part of the picture was shown with each question. Spoken responses were recorded verbatim and gestured ones described.

SCORING

Initially, responses were scored according to Egan and Brown (see p. 40). However, a class of response was obtained from children in the Kota study which had only been encountered in the English cohort in an occasional child from the youngest age groups whilst standardising the Bus Puzzle Test (Egan - personal communication).

These responses tended to occur in two circumstances, when children were asked to name items in the 'expressive verbal labels' section and in response to questions on the illustrated situations. In the first circumstance, instead of naming the item the child produced a noun label for an item which was perceptually similar to or which bore a functional resemblance to the test item, e.g., 'coin' for 'clock' and 'moon' for 'chapati'. In the second circumstance, some responses obtained for comprehension of questions included those which gave a literal description of the picture without assimilation of the situation depicted, e.g., 'Mummy is holding a moon in her hand' for mother cooking a chapati, 'She is doing namaste' for the girl sleeping in the cot with her hands folded [see photo p . 143]. The children giving such responses were not seeing the pictured item in context and were thus analysing it incorrectly. Examples of these responses are given in Tables IV.16 and IV.17 in English (p. 284 - 286) and Tables III.22 and III.23 in Hindi (p. 246 - 249). The two categories of responses are hereafter referred to as 'CONCEPTUAL' types of INTERMEDIATE RESPONSES.

FREQUENCY OF OCCURRENCE OF (CONCEPTUAL) INTERMEDIATE TYPES OF RESPONSES IN THE KOTA COHORT

The proportion of children giving such responses in the Kota study varied between items and within age and socioeconomic groups. The proportion depending on age and socioeconomic group was 5 to 20 per

cent overall (fig. IV.11, fig.IV.12). Some test items evoked more intermediate type responses than others; these varied according to age and socioeconomic group, e.g., verbal labeling of 'dog' (5 - 22%), of 'stove'(0 -22%), of 'light' (2 -21%), of 'steps' (2 -20%), of 'lady'(1 - 17%), of 'bucket'(1 - 9%), of 'mirror' (0 -10%) and of postman (13 - 40%) (fig. IV.1 to IV.10 p. 297 - 306).

In the <= 36 month age group, advantaged children gave a higher number of intermediate responses when compared to either of the deprived groups. In the 37 to 48 month age group the percentage decreased in the advantaged group but increased in the disadvantaged group and in the slum, more than the rural children. The percentage of intermediate responses fell even further in the oldest advantaged group, although some 12 percent were still using them for some items. In contrast, a rise was seen in both the disadvantaged groups with age. This probably reflects the deprived children moving later from no response to a verbal one.

ADDITIONAL FIELD WORK I - A COMPARISON OF 2 AND 3 DIMENSIONAL STIMULI

In view of these findings, an additional field study was undertaken to explore the problem the Indian children seemed to be having with analysis of the pictures [see p. 136 - 139 for the study details]. The field study compared the expressive verbal labels given by children for the items in the picture puzzle (2-Dimensional stimulus) and for the same items presented as miniature toys (3-Dimensional stimulus).

Children, particularly those from the deprived population did significantly better ($p < 0.05$) when asked to name toys rather than pictures. Since this indicated that the correct labels did exist in the child's lexicon, the problem presumably lay in the analysis of pictorial representations. The ability to interpret a 2-dimensional picture lagged behind the development of language in a significant proportion of Indian children and was indeed an important factor in influencing linguistic responses in this population.

REVISED SCORING

It was felt that, in the Indian context, adjustments to Egan's scoring system were necessary in two sections of the test:

(a) The scoring system devised by Egan for the Expressive label section of Bus Puzzle Test (BPT) took account of immature responses in her cohort i.e. responses which were generic or functional, although the proportion of these types of response was not great. Her cohort, however, did not produce names of objects which were perceptually similar to the test item, or were only part of the test item, as did a significant proportion of Indian children. Therefore it was not necessary for Egan to incorporate these into the BPT scoring system. If a similar approach was used with the Kota sample, the expressive language of a considerable number of Indian children would appear to be less well developed than was actually the

case. In addition, the significance of the influence of the ability to perceive a picture on linguistic responses to the Indian Puzzle would be ignored. To avoid underscoring children with delay/problems in picture perception on expressive language measures it was decided to add another category of INTERMEDIATE response to the levels defined in the English scoring system for 'Expressive Verbal Labels' - '**CONCEPTUAL** . Names of objects with perceptual similarity to the test item or which were only part of the test item were incorporated into the generic type of intermediate response in scoring the Indian test.

(b) Answers to the Comprehension of questions section in the Egan BPT receive 1 or 0. Responses that indicate comprehension of the question form and also that the conceptual aspect of the situation illustrated has been understood score 1. Those which do not embody the latter or are irrelevant score 0. With this emphasis it was decided to rename the Comprehension aspect of the Questions sections, Comprehension of Illustrated Situations.

The final scoring system for Model III is summarised below:-

FINAL SCORING SYSTEM FOR MODEL III

Expressive verbal labels:

Types of Response -

To	=	None or in appropriate, e.g. , "I want a drink" T1A = Conceptual Label incorrect, but appropriate for an object of close physical resemblance. Eg., 'coin' for 'clock'
T1B	=	Functional term (assessment of function or use of the object), e.g., "to sit on" for "chair," "to sleep on " for " bed "
T1C	=	Generic terms (name of another related object from the same generic category). E.g. "table" for "chair", "cat" for "dog"
T1D	=	Generic Label comprised only part of the object. E.g., "fire" for "stove", "wheel" for "cycle"
T 2	=	Correct labels.

T1A to T1D are categories of Intermediate response

Scores for To = 0; T1A, T1B, T1C, T1D = 1; T2 = 2.

The maximum score was = 38

Comprehension of verbal labels :

Two levels of responses -	To	=	incorrect.
	T1	=	correct.
Scores for	T0	=	0;
	T1	=	1
The maximum score was		=	19

Recognition of inset:

Two levels of responses -	To	=	incorrect.
	T1	=	correct (immediate selection or after minimum trial and error).
Scores for	T0	=	0;
	T1	=	1
The maximum score was		=	13

Orientation of the lift-out piece to the recess:

Two levels of response -	To	=	incorrect
	T1	=	correct (immediate selection or after minimum trial and error).
Scores for	T0	=	0;
	T1	=	1
The maximum score was		=	13

Comprehension of illustrated situations:

Types of response: -

	To	=	Response none or inappropriate
	T1	=	Literal description of parts of the picture without assimilation of the whole situation.

E.g., Q. What is the boy doing?

A. Lying down. (correct ans. is reading a book)

E.g., Q. What is mummy doing?

A. Sitting (correct ans. is cooking)

T2 = Description relates a person to an object, but fails to assimilate or express purpose of the activity.

E.g., Q. What is mummy doing?

A. Throwing water on the baby. (correct ans. is bathing the baby).

E.g., Q. What is the dog doing?

A. Putting out his tongue. (correct ans. is eating or licking.)

T3 = The child gives a correct answer.

Score: for T0=0; T1=0; T2=0; T3=1. The marks were given according to the level of response, the scores were totaled. The maximum score was 14.

All responses, either by descriptive gesture or verbal reply, were scored if they conveyed the idea given in the parenthesis to each question. For e.g., in response to Q.10 "What is the boy doing?", deliberate pointing to the kite, whether it was accompanied by words, showed understanding of the situation. Replies were scored if they related to the depicted situation in some way even if the child had not completely understood the picture. In reply to the question "What might be in the school bag? ", marks were given according to the number of relevant items named.

Expressive language - Responses to fourteen questions on illustrated situations:

To score, replies had to relate to the depicted situation. Thus only response type T1, T2 or T3 for comprehension were given positive scores.

Level 0 = Response none or meaningless

Level 1 = Gesture or single word (noun)

Level 2 = 2 words without a verb

Level 3 = 2 to 3 word sentences with a verb - Simple sentence

Level 4 = Compound sentence, i.e., 2 simple sentences with a conjunction.

Level 5 = Complex sentence.

The scores were L0 = 0, L1 = 1, L2 = 2, L3 = 3, L4 = 4 & L5 = 5

The maximum score was 65
In reply to the 14th question "What is in the schoolbag?", a point is awarded for each relevant items named, up to a limit of three.
The maximum score was 3
Tables were constructed to help grade responses in the expressive verbal labels and comprehension of situations illustrated. (Tables III.22 & 23 , p. 246 - 249)

STATISTICAL METHODS

Data were entered into Database III. The statistical package Markstat was used to establish the range, mean and standard deviation for scores in each section of the test according to age band and socioeconomic group. (Table III.10, p. 226).

Item analysis Item Analysis was under taken using the methods described in Osterlind (1987). Each item was subjected to Item Discrimination, Item Difficulty and Item Bias analysis to test its suitability (described on p. 80 - 81).

RESULTS

DEMOGRAPHIC

Four hundred and fifty children were given the Indian Bus Puzzle Test. Thirty were excluded because sixteen were aged more than 60 months, the date of birth was not known in twelve children and data was incomplete in eleven children. The final sample was reduced to four hundred and eleven children. The socioeconomic distribution according to age group and sex are shown in Table III.19 below.

Table III.19

AGE	TOTAL	BOYS	GIRLS	URBAN			RURAL
				UPPER	MIDDLE	LOWER	
< = 36	114	61	53	30	26	28	30
37 - 48	162	88	74	52	38	37	35
49 - 60	135	86	49	36	30	39	30
TOTALS	411	235	176	118	94	104	95

BASIC STATISTICS

The distributions of the range of the raw scores, the mean and the standard deviation for sections - expressive verbal labels, comprehension of verbal labels, comprehension of questions on illustrated situations, expression on illustrated situations, recognition of the recess and orientation of the piece according to age and socioeconomic group is shown in Table III.10 (p. 226).

The average scores in each socioeconomic group, in each subsection of the test were compared with the student's t test for significance (Table IV.11 on p. 157). Differences in the average scores between upper and middle urban groups were not significant in all subsections of the test. The difference between average scores in middle urban and lower urban groups, between lower urban and rural groups were significant in all the subsection testing verbal ability but were not significant in the sections testing performance skills. The upper urban and middle urban group were therefore amalgamated reducing the number of **socioeconomic groups to three.**

ITEM ANALYSIS

Items in each sector of the test were subjected to the statistical procedure of item analysis - item discrimination, item difficulty and item bias.

The purpose of item analysis was to select suitable test items for the final version of the test and to find out the value and the performance of each test item in the various sectors and subsectors of the Indian Picture Puzzle Test. The internal reliability of the test would thus be increased.

SECTOR	SUBSECTOR	NUMBER OF ITEMS SUBJECTED TO ITEM ANALYSIS
Verbal labels	Expression	19
	Comprehension	19
Questions	Comprehension	14
Shape	Recognition of the recess	13
	Orientation of the piece	13

ITEM DISCRIMINATION

Children were allocated to one of three age groups - <=36 months, 37 to 48 months, 49 to 60 months. The number of children giving the correct answer was noted. To help later selection, items were first listed in rank order, for each age group within a sector, according to their ability to judge performance. The range of scores was divided into thirds. Scores in the upper (U) third and in the lower (B) third were counted and converted into a percentage of their respective third and denoted MU% and MB% respectively. The IDI was calculated by deducting MB% from MU% and converting it into decimal form. Tables III.11 A to E, p. 227 - 231 provide the values for each item.

Items falling in the first 5 ranks for any age group were tabulated. (Tables III.12 A TO C, p. 232 - 234)

a) Eleven items fell in the first five ranks in all age groups for Expression on verbal labels and for Comprehension of verbal labels. Eight items did not (Table III.12 A).
b) Ten questions fell in the first five ranks in all age groups for Comprehension of illustrated situations. Four did not achieve the first 5 ranks for any age group. (Table III.12 B).
c) Ten items fell in the first five ranks in all age groups for Recognition of recess. Three did not achieve the first 5 ranks for any age group. (Table III.12 C).
d) Nine items fell in the first five ranks in all age groups for Orientation of the piece. Four items did not achieve the first 5 ranks for any group. (Table III.12 C).At the completion of Item Discrimination the status was as follows:

* Sixteen items featured in all age groups for either comprehension or expression and were carried forward for further review - **'fan', 'cycle', 'tap', 'bucket', 'chair', 'mirror', 'baby', 'girl', 'tree', 'clock', 'stove', 'bed'.**
* The ten questions with the top most item discrimination in all age groups in comprehension of illustrated situations were considered for further scrutiny. They were:-

- **'What is mummy doing? (Bathing baby - C1)', 'What is the girl doing?' (sleeping - C3)', 'What is the dog doing?' (eating -C8), 'What is the boy doing?' (retrieving his kite - C13), 'What is the boy doing?' (reading - C4), 'What is the lady doing?' (combing her hair - C5), 'What is a clock for?' (C10), 'What might be in the school bag?' (C14), 'What is a fan for?' (C7) - [where C1 to C14 imply comprehension for question].**

The analysis for the subsection on recognition of shapes showed that the recognition of recesses did not judge spatial skills after the age of 48 months.

ITEM DIFFICULTY

The statistical procedure assesses the difficulty level of each test item. ((For details of the statistical method see page 80) When an increasing number of children from each successive age group, give the correct response, an item is said to have a 'good' item difficulty. Items with 'poor' item difficulty don't fulfill this criterion and are uniformly easy or difficult for all age groups.

The number of correct responses for each item in each age group was converted into a percentage. A graph was plotted with age groups on the X axis and the percentage of correct responses on the Y axis . Figures III.6 to 8, p. 294 - 296 show the percentage of children giving the correct response according to age for each test item.

The findings are summarised in the Table III.15 below: -

TABLE III.15

ANALYSIS OF ITEM DIFFICULTY

	TYPE OF CURVE		
	Ascending	**Slight flatteningor**	**Retrograde or flat**
VERBAL LABELS:			
Comprehension :	Stove, Baby, Tap, Kite, Bed, Light, Dog Mirror, Bucket	Tree, Cycle, Boy Fan, Clock, Girl Chair, Steps, Lady Postman	-
Expression :	Bed, Bucket, Tap, Clock, Fan, Girl, Boy Baby Stove,	Cycle, Tree, Kite, Chair, Mirror, Light, Lady, Dog	Steps Postman
QUESTIONS:			
Comprehension:	C2,C3,C4,C6, C7,C11,C13, C14	C1,C5,C8,C9,C10	C12
SHAPES:			
Recognition	Baby, Girl, Dog, Fan, Tree Chair, Stove	Lady, Boy, Cycle, Bucket, Bed, Clock -	
Orientation	Lady,Baby,Boy, Stove,Bucket, Fan,Chair,Girl	Bed,Dog,Clock,Tree - Cycle	

From the table it can be seen that verbal labels 'steps' and 'postman' and question C12 'What is postman doing' were equally difficult for successive age groups and did not show improving verbal ability with age.

ITEM BIAS

Bias is a systemic error in the measurement process and denotes the consistent distortion of a statistic. A test item is said to be unbiased when the probability of success on it is the same for equally able examinees of the same population, whatever their subgroup membership. Presence of bias was tested between socioeconomic groups for each item.

In this study the statistical procedure for item bias examines each test item for social group bias. All items of the IPPT were subjected to the procedure. (For details of the statistical procedure see page 80).

The Chi square (X2) analysis rather than Analysis of Variance, Transformed Item Difficulty and Item Characteristic Curve was used because it is simple yet reasonably accurate (Osterlind 1987). Chi square Analysis examines the likelihood of test takers from different subgroups but of the same ability level, giving the correct response. Therefore, an item is unbiased when all test takers at a given ability level have an equal probability of answering an item correctly regardless of their group membership as to sex, socioeconomic background etc.

Children were grouped by socioeconomic status (SES) - urban upper, urban middle, urban slums and rural. The total scores in each section of the test were divided into four categories each of which represented an ability stratum for each SES groups. The total number of children and the number who correctly responded on an item was calculated for each category. Chi square tests were carried out with the null hypothesis that all children, whatever their SES subgroup membership, at any given ability level, have an equal probability of responding correctly. The level of significance was kept at 5% and the degree of freedom was (2 - 1) x (n - 1) where n denoted the number of subgroups, i.e., socioeconomic groups so n = 4. Four chi square statistics were calculated for each of the 2 x n contingency tables constructed from the above steps. Statistical Tables were used to ascertain whether the difference in the number of children responding correctly in ability stratum in each subgroup was significant and therefore biased.

Tables III.14 A to E, (p. 235 - 239) show a summary of the chi square analysis for Item bias between socioeconomic groups for Expressive verbal labels, Comprehension of verbal labels, Comprehension of questions on illustrated situations, Recognition of correct recesses and Orientation of each piece at 5% significance level.

Summary of findings of Item bias results :

Verbal labels:

Test items that were biased in all ability levels in 'comprehension' and 'expression' were excluded from further consideration. (Tables III.14 A and III.14 B, p. 235 - 236). The item excluded was 'postman'.

Questions on illustrated situations: No question showed bias at all the ability levels. (Table III.14 C, p. 237).

Recognition of recess or Orientation of the piece : None of the items showed social group bias. (Tables III.14 D and III.14 E p. 238 - 239).

FINAL SELECTION OF ITEMS FOR STANDARDISATION

The foremost consideration in selection of items and questions for standardisation (Model IV) was the findings of the item analysis. During data collection it was noted that the drawing of some items appeared ambiguous to some children and confused their ability to assimilate the scene correctly; others failed to excite sufficient interest to provoke language. The author observed that children clearly assimilated the activities illustrated in each sector of the picture as they were taken through the verbal labels sections and decided that the final selection of noun labels should include all parts of the picture covered by the questions. These observations/considerations are incorporated in the statistical profile given below of each item and question. In statistical terms items should be rejected if item analysis show them:

- to be extremely **biased** between socioeconomic groups

- not to **discriminate** adequately enough (IDI => 0.5) to judge a child's performance.

- not to become increasingly easy with age (**difficulty**)

PROFILE OF 19 VERBAL LABELS

Comments on general qualities and the statistical profile of all 19 verbal labels are given below.

Dog :

The IDI for expression and comprehension for dog was good in the <=36 mth age group but poor for older children. Only 55% of <=36 month old children, but almost 100% of the oldest group comprehended it. It is unbiased in both expression and comprehension.

Item selected.

Girl:

This item discriminates well in the first and second age groups in expression but only in the first, in comprehension. There is no item bias in expression, bias appears in comprehension in the top ability group.

A girl is generally called a 'person' in Hadoti, the rural dialect, which gets a lower score in the test. Also, the orientation of the girl may cause perceptual difficulty.

Item selected.

Lady:

The lady discriminates well in the youngest age group in both expression and comprehension. There is bias in only one ability level in expression that could be due to the term used in the local dialect for 'lady' which is non specific.

Item selected.

Bed:

The bed discriminates well in both the <=36month and the 37- 48 month age groups. There is no bias in expression or comprehension.

Item selected.

Tree :

The tree discriminates well in expression in 37-48 and 49-60 months old and in comprehension in the <=36 month old children. There is no bias in expression but bias is seen in the top ability group in comprehension.

Item selected.

Kite :

The kite is a good discriminator in the <=36 month old and 37-48 month old children. There is no bias in comprehension but a bias at one ability level in expression.

Item selected.

Mirror:

The mirror discriminates well in the 37-48 month and the 49-60 month age group. It is unbiased in expression and comprehension.

The reflection of the woman in the mirror presented some difficulties in perception and perhaps cognition particularly in the younger children. Since it is a good discriminator in older age groups it was selected.

Cycle :

The cycle is a good discriminator in the < =36 month and to some extent in the 37-48 month old children. It is unbiased in comprehension but is biased in one ability level (0 to 15) in expression.

Many rural children called it a motor cycle more common in villages.

Item selected.

Postman:

The postman is a good discriminator in the oldest age group and a reasonable one in the 37-48 month old children. It is biased in comprehension. As the number of successful children is too small in all ability levels in expression, the computation to estimate item bias failed in this section.

Indian postmen do not wear their uniforms when on duty. They also do not make house to house delivery but tend to give all the post to one person in the village or colony, who then distributes them. Disadvantaged homes rarely get postal deliveries. The Item difficulty curve was retrograde.

Item rejected.

Bucket:

The bucket discriminates well in the 37-48 month and 49-60 month old children. It is unbiased in expression and comprehension.

Water splashing out of the bucket presented problems in some children who identified it as 'flowers', 'flames' or 'plants'.

Item selected.

Fan :

The fan discriminates very well in the <=36 and 37-48 month old children. It is unbiased in expression and comprehension.

Item selected.

Clock :

The clock discriminates well in the 37-48 month and the <= 36 month age groups. It is unbiased in expression and comprehension.

Item selected.

Baby :

The baby discriminates well in the < =36month olds and fairly well in the 37-48 month old children. It is unbiased in expression and comprehension.

Item selected.

Boy :

The boy discriminates well in the <=36 month old children in expression and comprehension. It had a lower IDI in the older age groups. It is unbiased in comprehension but showed bias in the top ability level.

A more general term for a boy, which means person, is more commonly used in Hadoti.

Item selected.

Chair:

The chair is a very good discriminator in all age groups. It is biased in two ability levels in expression and one ability level in comprehension.

A chair is more commonly seen in more advantaged homes and may account for the bias noticed in the lower ability levels.

Since the item was a good discriminator in the oldest age group it was selected.

Stove :

Stove is a good discriminator in the 49-60 month old children. It is unbiased in comprehension and expression.

The stove is an old-fashioned model and caused problems of identification in some urban children. The flames presented perceptual difficulties to a few of the deprived children who called them 'flowers'.

Item selected.

Steps :

It is a good discriminator in both the older age groups. It is unbiased in expression and comprehension.

The drawing of the steps was unclear and resulted in perceptual difficulty for all age groups. The Item difficulty curve was flat.

Item rejected.

Taps:

'Taps' has good discriminating ability in the two lower age groups. It is unbiased in both expression and comprehension.

Like the 'Light' the size is too small and children had problems locating them in the picture.

Item rejected.

Light:

Light is a good discriminator only in the 37-48 month old children. It is unbiased in expression and comprehension.

The size is too small and often children had difficulty locating it in the picture.

Item rejected.

Final exclusions:

Four items were excluded - 'Taps', 'Postman', 'Light' and 'Steps'. 'Taps' and 'Light' were too small and children had difficulty locating them. Since they were not lift-out pieces, testing comprehension of these verbal labels was a problem. Their statistical profile was less than satisfactory; 'steps' were perceptually ambiguous for all ages and the item difficulty curve was retrograde. 'Postman' was biased and too difficult at all ages. In all **fifteen verbal labels** were selected.

PROFILE OF 14 ILLUSTRATED SITUATIONS:

Comments on general qualities and statistical profile on all the 14 questions on illustrated situations are given below.

1. Q. What is mummy doing? (bathing baby)

It discriminates very well in all age groups. It is biased in three ability levels. The item difficulty curve was smoothly ascending.

The situation had been conceived to parallel with that of mummy pushing a buggy in the Bus Puzzle Test - both early childhood experiences in respective cultures. It was recognition of the artistic convention of dashes representing water splashing out of the tumbler that seems to have posed difficulties in the deprived population.

Since the items 'Lady' and 'Baby' were selected for the section on verbal labels, this situation flowed into a 'story' and was retained for the final model. The high discriminatory index contributed to the decision.

2. Q. What is the girl doing? (sleeping)

The situation discriminates well in the youngest children. It is increasingly easier with age. It is not biased.

The girl's folded hands by her head posed some perceptual difficulty in younger children.

Item selected.

3. Q. What is the dog doing? (Eating)

The situation discriminates well in the youngest and in the 37-48 month old children. It is unbiased.

The dog's posture caused some confusion; some children did not agree that the dog was eating even after it was pointed out to them.

Item selected.

4. Q. What are taps for? (To get water)

The question is a poor discriminator in all age groups. It isunbiased.

Item rejected.

5. Q. What is the boy doing? (Reading)

The question discriminates well in all three age groups. It is unbiased.

The boy's long pants confused some children in calling him a man. Some children had trouble with identification of the book in the boy's hand, calling it a television remote controller or calculator and needed pointing out.

Item selected.

6. Q.What is the lady doing?(Combing her hair)

The situation is a good discriminator in both the older age groups. It is biased in the lowest ability level. The comb was not recognised sometimes. The reflection of the woman's face in the mirror caused some perception problems.

Item selected.

7. Q. What are steps for?(To go up)

The question is a good discriminator in the two older age groups. It is biased in the lowest ability group. Since the 'Steps' had been discarded for the section on verbal labels this question was also rejected.

8. Q.What is a fan for? (To cool the room)

The question is a good discriminator in the two older age groups. It is unbiased.

Item selected.

9. Q.What is a clock for?(To show time)

The question is a good discriminator in the two older age groups. It is unbiased.

Item selected.

10. Q. What is mummy doing?(Cooking a chapati)

The situation discriminates well in the younger age groups particularly among the <=36 month old children. It is unbiased.

Item selected.

11. Q. What is the boy doing? (The boy is climbing a tree tofetch the kite)

The question is a very good discriminator in the 37-48 month old and good in the 49-60 month old children. It is unbiased.

Item selected.

12. Q. What is the postman doing? (Delivering letters)

The question is a good discriminator in the oldest age group. It is unbiased. Since the 'Postman' had been discarded in the verbal label section this question was also rejected.

13. Q.Why do we have mirrors? (To see our reflection)

The question is a good discriminator in both the older age groups. It is unbiased.

The question occasionally confused the younger children and the responses were difficult to grade. This was because 'kanch' means mirror and glass.

Item selected.

14. Q. What might be in the schoolbag? (Books, Pen, Copies, Pencil etc.)

This is a good discriminator in the 37-48 month old and in the <=36 month old children. It is unbiased.

Item selected.

Three questions/situations were rejected and eleven were retained for the final model.

ADDITIONAL FIELD STUDIES TO INVESTIGATE INTERMEDIATE TYPE OF RESPONSES

Intermediate types of response were given by a substantial proportion of Indian children, sufficient to suggest a modification in the scoring system. Two field studies were carried out in order to explore the reasons why this type of response occurred and to support their incorporation into the scoring system.

The first of these studies explored whether the problem was one of deficient expressive lexicons or of ability to interpret two dimensional pictorial representations. The second explored the possibility that the quality of the test pictures was ambiguous.

STUDY I - RESPONSE OF CHILDREN TO MINIATURE TOYS

During the pilot study, it had become evident that children, particularly from the deprived populations, had problems with two dimensional pictorial representations. In view of this, the verbal scores might have been depressed by poor picture perception alone or reduced language and poor picture perception might have been two aspects of a single problem. Both these abilities are dependent on representational maturity i.e. the ability to understand that an object or happening can be symbolically represented either by words, pictures or miniature toys.

AIM

To compare the expressive verbal labels produced for the Indian Picture Puzzle Test pictures with those produced for miniature toy representations of the same items to determine whether the items existed in the child's expressive lexicon.

(a) Subjects :

Eighty three children aged 2 to 5 years participated. They came from two socioeconomic groups: an advantaged (upper and middle class - 21) and disadvantaged (slum and rural - 62). Twenty seven were aged less than 36 months (7 advantaged and 20 disadvantaged), 33 were aged 37 to 48 months (11 advantaged and 22 disadvantaged), and 23 were aged 49 to 60 months (3 advantaged and 20 disadvantaged).

(b) Materials :

The final version of the Indian Picture Puzzle Test has 15 items in the section on expressive verbal labels - fan, clock, stove, mirror, chair, bed, dog, bucket, boy, girl, woman, baby, tree, kite, and cycle. Miniature toy versions of 14 of these items (with the exception of the kite) were made of wood or plastic; overall size varied between 1 and 10 cms. Actual measurements in cms. were: clock (2.0), fan (6.2 x 1.1), mirror (10 x 2.5), bucket (4 x 2.5), bed (5 x 2.5), stove (1.1 x 7.5), chair (6.2 x 2.5), tree (6.2), cycle (7.5 x 5), woman (7.5), boy (9), girl (5), baby (5) , dog (2.5 x 4).

(c) Method :

Both the picture puzzle and miniature toy set were presented to each child. The order of initial presentation of the picture puzzle or miniature toy set was randomised. Within each set the order of presentation of items was predetermined. Children were asked to name each item in turn. Correct responses were scored 1. Any other response, whether functional, generic or incorrect, scored 0. A total score was obtained for each child by summating correct responses for the puzzle and for the toys.

For each item the children's responses were divided into four categories:

Category 1 - correct identification of both the miniature toy and the picture

Category 2 - correct identification of the picture but not the toy

Category 3 - correct identification of the toy but not the picture

Category 4 - failure to identify either.

Statistical Method :

The number of responses given by disadvantaged children which fell into categories 2 and 3 were com-

pared for each item in each age group using chi-square test of significance (Table III.16A p. 240). A similar comparison was made between category 2 and category 3 advantaged children (Table III.16B p. 241).

The difference in the total scores obtained on the picture set (2-D stimuli) and the toy set (3-D stimuli) was calculated for each child. The means of these difference scores were compared between advantaged and disadvantaged children using the student's t-test of significance ($p < .05$).

(d) Results :

More children correctly identified the miniature toys compared to equivalent pictures. No child found pictures easier than toys. The average difference between total scores to a 3-D stimulus and 2-D stimulus was 2.35 in disadvantaged children and 0.88 in the advantaged ($p < 0.05$). The chi square analysis shown in Tables III.16A and Table III.16B (p. 240 - 241) demonstrated a significant difference between group 2 and 3 responses for 13 of the 14 items for disadvantaged children and for 5 of the 14 items for advantaged ones.

(e) Discussion and Conclusions :

The study confirms that children giving intermediate responses in the IPPT usually had the word in their lexicons. The problem was not one of size as miniature toys similar in size to those in the puzzle were used for this investigation. Therefore the problem is likely to be relative delay in ability to understand two-dimensional material. The finding was unexpected in view of the wide and successful use of pictures in Western tests for children and Egan's personal experience with the Bus Puzzle Test and the literature survey (p. 55). However, some authors have noted a differential in response to pictures and toys in favour of the latter (Cocking & McHale 1981, Sigel and McBane 1967 and Gray and Klaus 1965). Sigel and McBane (1967) and Deregowski and Serpell (1971) reported separately that children had greater difficulty categorising pictures of objects than the actual objects themselves. This effect was independent of the children's ability to recognise or to name either the objects or their depiction. Interestingly in this study, disadvantaged children were more likely to show this relative delay than advantaged implying that picture perception was more immature and interfered to a greater extent with their responses on the IPPT.

Bevli (1978) in her study of 6995 2,6 to 5 year old Indian children commented on a category of response that she called partially correct responses but did not analyse it further.

The findings of this field work support the modification of the scoring system to include a conceptual type of Intermediate response for Indian children.

STUDY II - RESPONSE OF ADULTS TO PICTURES IN THE INDIAN PICTURE PUZZLE TEST

AIM

To investigate the possibility that the pictures of the Indian Picture Puzzle Test were ambiguous or unclear in any way which would affect recognition.

(a) Subjects :

The sample comprised 45 adults (29 men and 16 women) between the ages of 18 and 60 years: Seventeen were from the advantaged population, seventeen from the lower urban group and eleven from the villages. Ten adults had passed primary or middle school, eleven were high school graduates, eleven were college graduates and thirteen were illiterate; the latter were all from the disadvantaged sector.

(b) Material :

The Indian Picture Puzzle Test.

(c) Methods :

The adults were given the Indian Picture Puzzle Test in the same way as that used in the assessment of children. Their consent was obtained after explaining to them the purpose of the test. They were made comfortable and the testing situation was made as non threatening as possible. Recognition of recess and orientation of piece were not tested.

The findings were analysed to compare the types of responses obtained in the 3 socioeconomic groups in the 'expressive verbal label' section and the 'comprehension of illustrated situations' section of the IPPT. The mean scores in these 2 sections for each group were also compared.

(d) Results :

Expressive verbal labels:

All the advantaged adults gave correct responses for each item in the expressive verbal label section (T2). This was not true, however, for the other two groups. The responses of the adults from the rural group and lower urban group are shown in Table III.17 (p. 242).

The objects which were most difficult to name were 'Mirror', 'Stove' and 'Bucket' for the lower urban group and 'Mirror', 'Kite', 'Girl', 'Boy', followed by 'Chair', 'Stove, 'Dog' 'Bucket' and 'Clock' for the rural adults.

Comprehension of illustrated situations:

All the advantaged adults gave correct responses to each question. Eleven immature responses were given by the lower urban group and 37 by the rural group (Table III.18, p. 243). The rural adults had great difficulty especially on questions requiring greater assimilation of picture. Q1, Q4, Q5, and Q13 were most difficult, followed by Q.3, Q6, Q8 and Q.11.

The distribution of the raw scores, range, mean and standard deviation in all the sections of the

IPPT are shown in Table III.19 p. 244. The rural adults received the lowest mean scores of all groups in all the sections. Their minimum score in expressive verbal labels was almost 10 points lower than that of the advantaged group (range 20-30 and 29-30 respectively) and in comprehension of illustrated situations was 7 points lower (range 20-33 and 32-33 respectively). In both these sections the mean scores for the rural group were lower than the advantaged group by 5.12 points and 4.15 points respectively. A t-test showed that the differences in the scores on expression on verbal labels and comprehension of illustrated situations were statistically significant except for comprehension of illustrated situations for the advantaged and lower urban group (Table III.20, p. 245).

(e) Conclusion :

The performance of upper and middle class adults indicates that the two dimensional pictorial representation of the IPPT was not ambiguous. The intermediate types of response encountered in the main study were unlikely therefore, to be due to lack of picture clarity.

SUMMARY STATEMENT OF MODEL III

With the completion of the third model, the number and type of items for testing of verbal labels and questions on illustrated situations were finalised. Evidence of the impact of picture perception on language findings from, both the main study and the field work justified the change in the heading of the section on **'Comprehension of Questions'** to **'Comprehension of Illustrated Situations' and incorporation of an additional category of scoring - 'conceptual' category in both expressive verbal labels and comprehension of illustrated situations**

The underlying perceptual, cognitive and linguistic processes involved in responding to the test items were clarified at the end of this stage. The Indian Picture Puzzle Test assessed some aspects of language development, some performance skills and some knowledge of objects in everyday use. The use of a picture, as a medium of testing also assessed the child's ability to perceive and interpret pictures, i.e., representational maturity.

The number of socioeconomic groups was reduced to **three** by combining the upper and middle socioeconomic groups into the advantaged group based on the findings of the study.

MODEL IV

FINAL VERSION OF THE INDIAN PICTURE PUZZLE TEST

With the completion of item analysis the IPPT was ready for **STANDARDISATION.** Data was collected for construction of norms for each of the three socioeconomic groups - advantaged urban group, lower urban group (slums), rural group.

(a) Subjects :

411 children from the Item analysis (Model III) and 205 new children. The number of new children recruited was determined by the need to balance the numbers in the 3 SES groups - see sampling p. 109.

SUMMARY OF SAMPLE SELECTION TOTAL = 655

Stratum	Sampling frame (24 to 60 mths)			Subsample children
One	School	:	5	
(Upper Urban)	Residential colonies	:	4	120
Two	School	:	7	
(Middle Urban)	Residential colonies	:	5	99
Three	School	:	7	
(Lower Urban)	Residential colonies	:	7	215
	Anganwadis	:	10	
Four				
(Rural)	Villages	:	23	221

Data on 39 children had to be discarded as their date of birth and other data were incomplete. The Upper Urban Group and the Middle Urban Group had been combined (see p.126).

(b) Material :

The wooden version of Model III (Photo III.7) was used with its 13 lift out pieces; verbal labels were reduced from 19 to 15 and the questions from 14 to 11 (see p. 134 - 136).

(c) Procedure :

The subsections of the test and their administration were as for previous models.

1. **Language and picture perception :**

i) Expressive language verbal labels, i.e., naming thelift out pieces of the puzzle and some other itemsfrom the scene, i.e., Dog, Mummy, Girl, Baby, Boy,Cycle, Tree, Cot, Fan, Clock, Stove, Chair, Bucket,Mirror, Kite (fifteen verbal labels).
ii) Comprehension of verbal labels: i.e., identification of all the liftout pieces and some of the non liftout pictures of the puzzle on spoken request.

iii) Comprehension of illustrated situations: Eleven questions on situations assessed the child's language ability and the ability to perceive and interpret pictures.

They were given in the following order:

Q1 What is mummy doing?	(Bathing baby)
Q2 What is the girl doing?	(Sleeping)
Q3 What is the dog doing?	(Eating)
Q5 What is the boy doing?	(Reading)
Q6 What is the lady doing?	(Combing her hair)
Q7 Why do we have a fan?	(To cool the room)
Q8 What are clocks for?	(To show us the time)
Q9 What is mummy doing?	(Cooking)
Q10 What is the boy doing?	(retrieving his kite)
Q11 Why do we have mirrors?	(To see our reflection)
Q12 What might be in the school bag?	(Pens, pencils, book etc.)

iv) Expression for questions on illustrated situations - Responses for the eleven questions on illustrated situations.

2. **Performance skills**:
i) Recognition of shape: i.e., recognition of the outline of a recess in the tray corresponding to the 13 lift out pieces.
ii) Orientation of piece, i.e., orienting a lift out piece correctly to recess.

This part of the test provided an opportunity to observe some spatial skills and motor function of upper

limbs and hands.

PHOTO III.7

MODEL IV - WOODEN FORM

SCORING

Scores in each section were reduced in parallel with the reduction in number of items.

Scoring for the different types of response was changed in the section on comprehension of illustrated situations to T0=0, T1=2, T2=2, T3=3.

Scores in response to Q 11. 'What might be in the bag?' were restricted to three.

Thus, maximum scores in each section were:

Expressive language: verbal labels	30
Comprehension verbal labels	15
Comprehension illustrated situation	33
Expressive language:	
Response to illustrated situations	53
Recognition of recess	13
Orientation of piece	13

The Results and Conclusions for Model IV are presented as Section IV

SECTION IV

RESULTS AND ANALYSIS

IV.1 PROFILE OF STANDARDISATION SAMPLE

The standardisation sample was 616 children. The age, sex and socioeconomic distribution is shown in the Table IV.1:

TABLE IV.1

AGE mths	TOTAL	BOYS	GIRLS	URBAN upper	URBAN middle	URBAN lower	RURAL
< = 36	179	101	78	30	26	56	67
37-48	226	125	101	51	38	72	65
49-60	211	132	79	37	30	75	69
TOTAL	616	358	258	118	94	203	201

Two hundred and eighteen children (35%) were first born. Of these 218, 96(16%) were in the advantaged group, 58 (9%) in the urban slums and 64(10%) were rural children. 225(37%) ranked third or more in birth order. 40(6.5%) were from the advantaged group, 93(15%) and 92(15%) were slum and rural children respectively. (The figure in parenthesis represents per cent of the whole sample.)

Two hundred and ninety three (48%) mothers were illiterate, 93(15%) had received primary or middle school education, 92(15%) had been to high school and 138(22%) were graduates or postgraduates.

Two hundred and twenty one (36%) children had Hindi as their mother tongue. 327(53%) Hadoti (the local dialect) speaking. 68(11%) children spoke a variety of other Indian languages.

IV.2 CONSTRUCTION OF NORMS

The distribution of raw scores range, mean and standard deviation for expressive verbal labels, comprehension of verbal labels, comprehension of question on illustrated situations, expression on illustrated situations, recognition of the recess and orientation of the piece according to age and socioeconomic group is shown in Table IV.2. p. 147.

The steps in the process used to construct norms in the Kota study are shown below. The technique used to smooth individual charts is then described on p. 146.

Method used in the Kota Study to construct norms :

The steps in this process are listed below.

Step1. 'Markstat' a statistical software program was used to calculate cumulative frequencies after the values of the total scores were divided in single cell intervals for each computed age.

Step 2. The cumulative frequency was converted into cumulative frequency percentage.

Step 3. The values of the total scores were read off against the cumulative frequency percentage (Table III.24, p. 257)

Step 4. A curve was drawn for each computed age with the X axis showing Raw Scores (Total Scores) and Y axis showing the cumulative frequency percentage.

Step 5. The raw scores corresponding to the 10th, 20th, 50th, 75th and 90th cumulative frequency percentage were estimated by dropping a perpendicular from the intercept point on the curve obtained from step 4.

Step 6. Subsequently 10th, 20th, 50th, 75th and 90th centile curves were drawn for each section of the test, with computed age on the X axis and raw scores (total scores) on the Y axis.

This exercise was carried out separately for the total sample and each socioeconomic group - the advantaged (upper and middle class), the urban slums and the rural groups for each section of the test.

Thus, for each section of the test, 4 centile charts were constructed - total 24.

Finally the 24 centile curves were smoothed to streamline irregularities (see page 145 for details of the method). Figures IV.1 to IV.4, (p. 148 - 152) show the final centile charts.

SMOOTHING OF DATA

Young children show a sharp gradient in their developmental abilities with age. Therefore, the Indian Picture Puzzle Test, like the Bus Puzzle Test was standardised using three month intervals.

To reduce individual variation, an average of three consecutive points was taken. Abnormal variation around a particular age group was decreased by a third and homogeneity of the sample was improved.

In samples the size of each SES (approx. 200) averaging with neighbouring scores increases the density at a point. For 616 (standardisation sample) children the data readings were 1814 which helps to counter the small sample size. Smoothing the data would serve to scale down any errors that might have been made when noting age.

Technique :

The results for each 3 month period were smoothed by averaging with those immediately above and below. For the end points (top and bottom), the average with the next highest (lowest) points was taken. The midpoint of the total period was taken as the age. Thus 37 to 39 months was centred at 38.5 months. The formula used was computed age (CA)

$$CA = 3 \times \text{Truncated} \frac{(\text{age})}{3} + 1.5$$

For e.g. 35 months

$$CA = 3 \times T\frac{(35)}{3} + 1.5$$

$$= 3 \times T\ (11.6) + 1.5$$

$$= 3 \times 11 + 1.5 \text{ i.e. } 34.5 \text{ mths.}$$

All ages were converted into computed ages. They were then placed into 3-month group intervals and smoothed.

TABLE IV.2

DISTRIBUTION OF RAW SCORES, RANGE, MEAN ( ), AND STANDARD

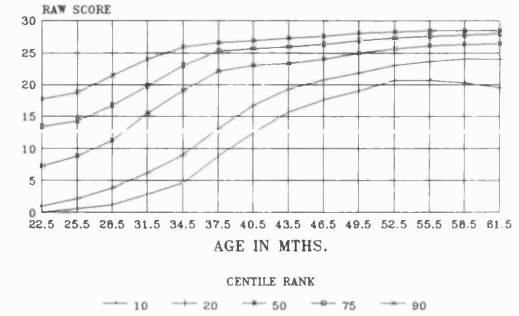
DEVIATION { } ACCORDING TO AGE AND SOCIOECONOMIC GROUP.

AGE (mths)	URBAN Upper	middle	Lower	RURAL
EXPRESSION VERBAL LABELS : (maximum score 30)				
< = 36	0-27(13.5){7.99}	0-27(12.2){8.22}	0-29(8.6){9.38}	0-24(3.85){5.92}
37-48	9-30(23.0){4.47}	8-29(23.0){4.87}	0-28(16) {9.48)	0-30(11.0){8.94}
49-60	14-30(25.5){3.45}	9-27(25.6){4.55}	0-30(22) {7.05}	0-30(19.0){7.35}
COMPREHENSION VERBAL LABELS : (maximum score 15)				
< = 36	3-15(7.0){3.97}	0-15(10){3.80}	0-15(8.2){4.48}	0-14(7){3.96}
37 - 48	9-15(13.5){1.64}	10-15(14){1.41}	3-15(12) {2.57}	0-15(11){3.55}
49 - 60	12-15(15.0){0.63}	10-15(14){1.23}	1-15(13){2.21}	5-15(12){2.22}
COMPREHENSION ILLUSTRATED SITUATIONS (maximum score 33)				
< = 36	0-28(13){9.24}	0-30(12){9.62}	0-33(7){ 9.8}	0-24(3){ 5.87}
37 - 48	0-33(25){7.06}	9-33(27){5.31}	0-33(15){10.9}	0-32(11){10.15}
49 - 60	21-33(30){3.45}	3-33(29){6.10}	0-33(24){7.77}	0-33(19){ 9.07}
EXPRESSION ILLUSTRATED SITUATIONS (maximum score 65)				
< = 36	0-32(15){10.70}	0-33(15){11.06}	0-33(8){11.25}	0-31(4){7.53}
37 - 48	0-37(29){ 7.19}	10-34(29){ 4.94}	0-33(8){11.25}	0-31(4){7.53}
49 - 60	22-38(32){ 3.07}	3-36(31){ 6.02}	0-36(27){ 7.56}	0-36(22){9.46}
RECOGNITION OF RECESS (maximum score 13)				
< = 36	0-13(8){3.49}	0-13(7){2.68}	0-13(9){3.60}	0-13(7){3.61}
37 - 48	9-13(12){1.16}	8-13(11){1.46}	6-13(11){1.89}	4-13(11){2.37}
49 - 60	8-13(13){1.00}	10-13(12){0.93}	7-13(12){1.50}	8-13(12){1.23}
ORIENTATION OF PIECE (maximum score 13)				
< = 36	0-13(7){3.38}	0-13(7){2.95}	0-12(8){2.95}	0-13(7){3.24}
37 - 48	8-13(11){1.32}	5-13(10){2.17}	6-13(10){1.92}	6-13(10){2.05}
49 - 60	7-13(12){1.54}	8-13(12){1.39}	8-13(12){1.18}	1-13(11){2.24}

FIG.IV.1

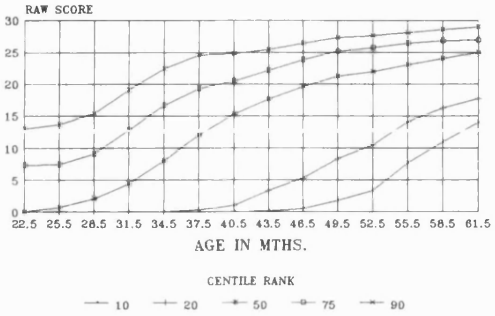
CENTILE CHARTS

EXPRESSION ON VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



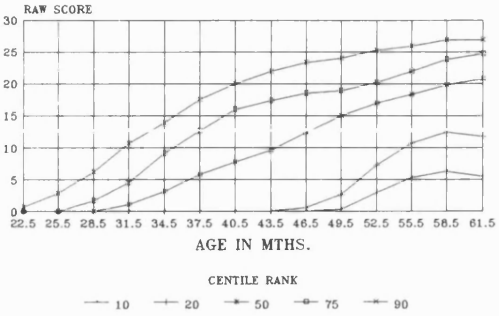
ADVANTAGED GROUP

EXPRESSION ON VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



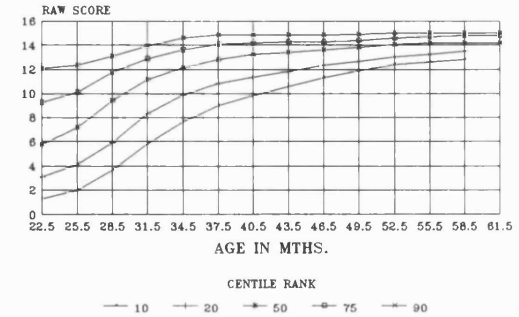
LOWER URBAN GROUP

EXPRESSION ON VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



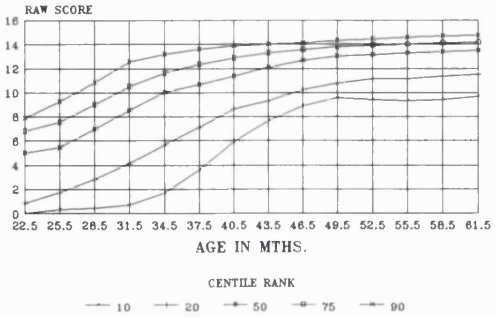
RURAL GROUP

COMPREHENSION OF VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



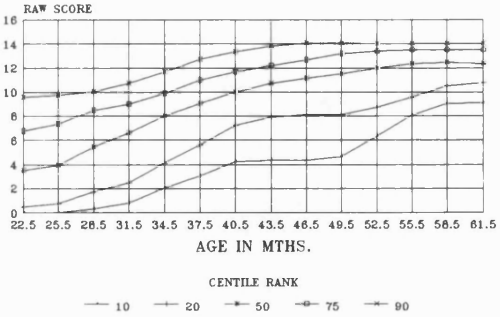
ADVANTAGED GROUP

COMPREHENSION OF VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



LOWER URBAN GROUP

COMPREHENSION OF VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)

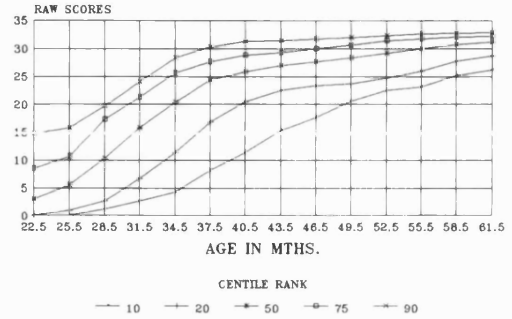


RURAL GROUP

FIG.IV.2

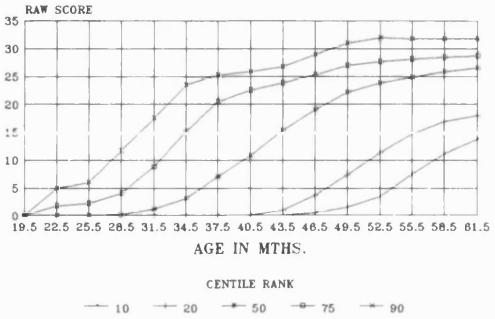
CENTILE CHARTS

COMPREHENSION OF ILLUSTRATED SITUATIONS
CENTILES OF TOTAL SCORES (smoothed)



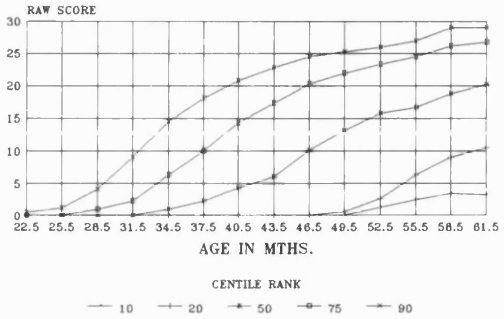
ADVANTAGED GROUP

COMPREHENSION OF ILLUSTRATED SITUATIONS
CENTILES OF TOTAL SCORES (smoothed)



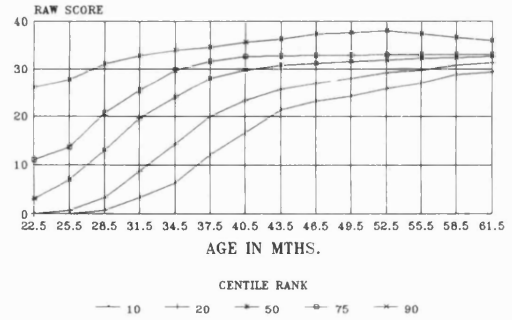
LOWER URBAN GROUP

COMPREHENSION OF ILLUSTRATED SITUATIONS
CENTILES OF TOTAL SCORES (smoothed)



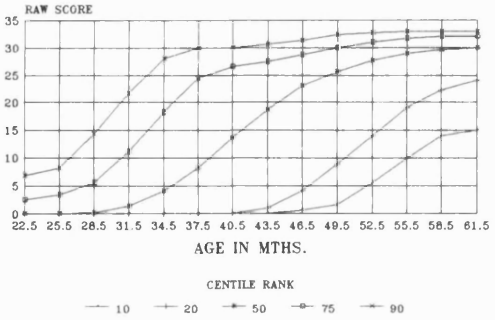
RURAL GROUP

EXPRESSION ON QUESTIONS
CENTILES OF TOTAL SCORES (smoothed)



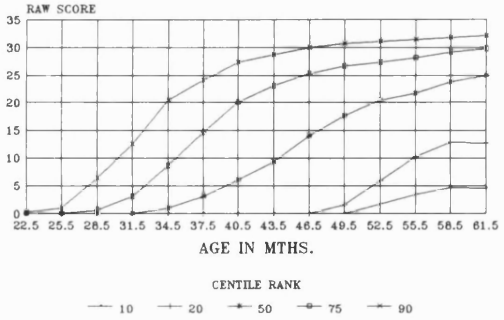
ADVANTAGED GROUP

EXPRESSION ON QUESTIONS
CENTILES OF TOTAL SCORES (smoothed)



LOWER URBAN GROUP

EXPRESSION ON QUESTIONS
CENTILES OF TOTAL SCORES (smoothed)

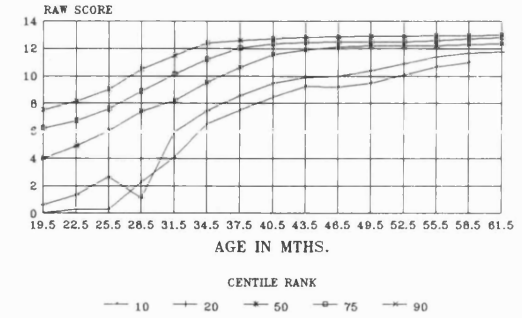


RURAL GROUP

FIG.IV.3

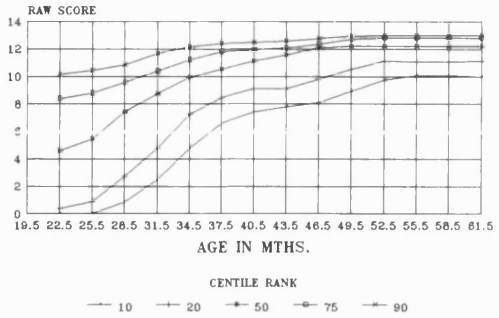
CENTILE CHARTS

RECOGNITION OF RECESS
CENTILES OF TOTAL SCORES (smoothed)



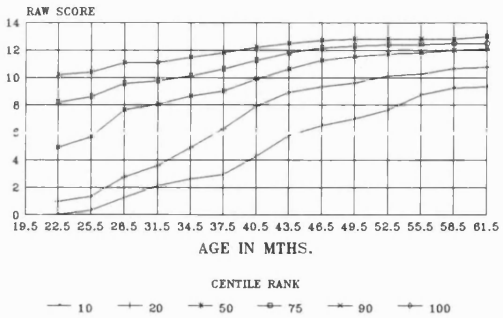
ADVANTAGED GROUP

RECOGNITION OF RECESS
CENTILES OF TOTAL SCORES (smoothed)



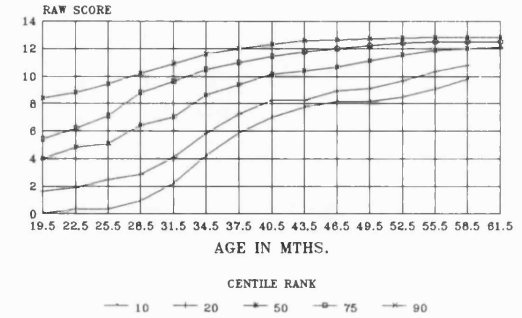
LOWER URBAN GROUP

RECOGNITION OF RECESS
CENTILES OF TOTAL SCORES (smoothed)



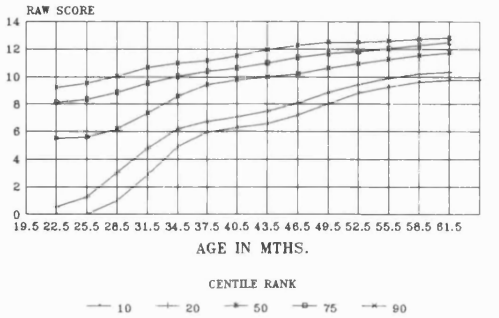
RURAL GROUP

ORIENTATION OF PIECE
CENTILES OF TOTAL SCORES (smoothed)



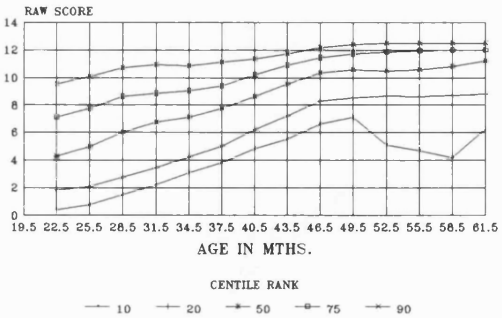
ADVANTAGED GROUP

ORIENTATION OF PIECE
CENTILES OF TOTAL SCORES (smoothed)



LOWER URBAN GROUP

ORIENTATION OF PIECE
CENTILES OF TOTAL SCORES (smoothed)

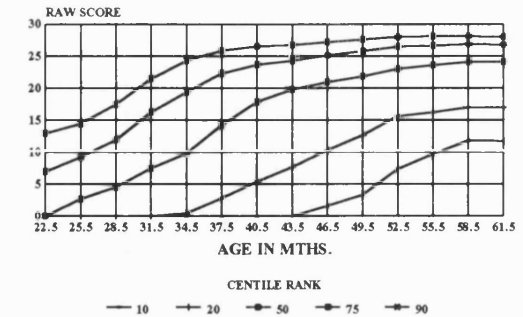


RURAL GROUP

FIG.IV.4

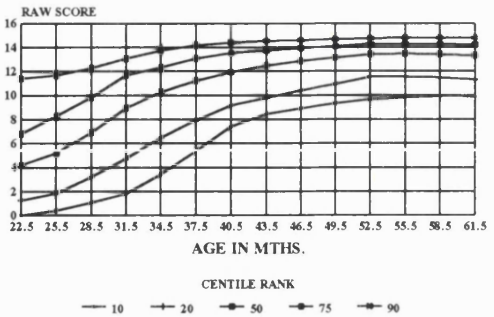
CENTILE CHARTS

EXPRESSION ON VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



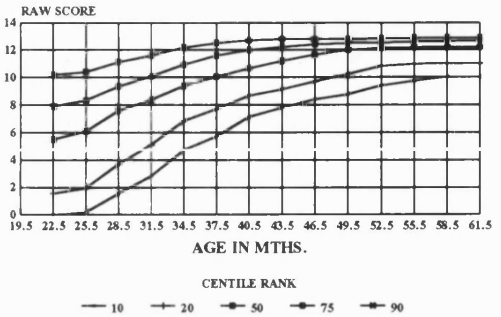
total sample - 616

COMPREHENSION OF VERBAL LABELS
CENTILES OF TOTAL SCORES (smoothed)



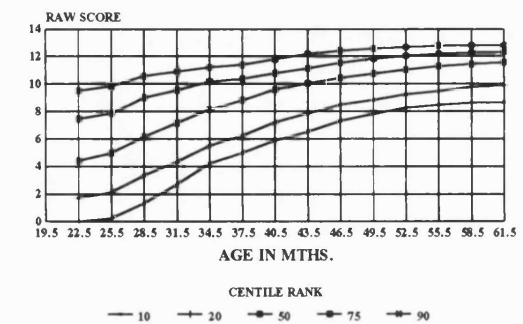
total sample -616

RECOGNITION OF RECESS
CENTILES OF TOTAL SCORES (smoothed)



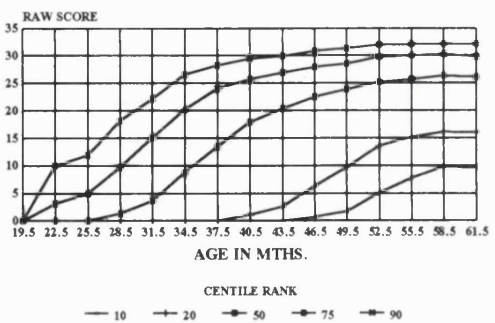
total sample-525

ORIENTATION OF PIECE
CENTILES OF TOTAL SCORES (smoothed)



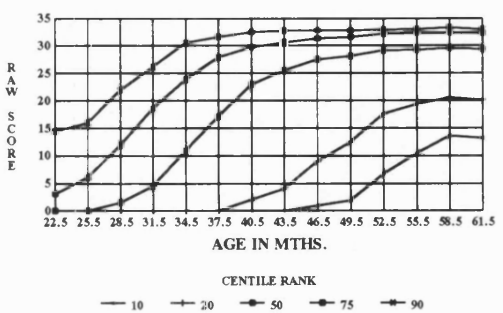
total sample-525

COMPREHENSION OF ILLUSTRATED SITUATIONS
CENTILES OF TOTAL SCORES (smoothed)



total sample-616

EXPRESSION ON QUESTIONS
CENTILES OF TOTAL SCORES (smoothed)

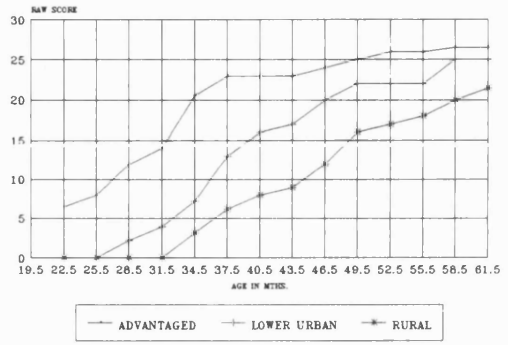


total sample-616

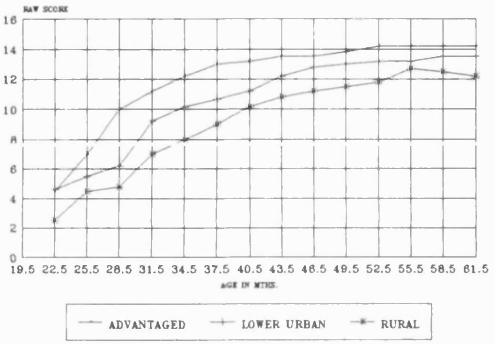
FIG.IV.5

COMPARISON OF THE 50th CENTILE OF EACH SES GROUPS IN ALL SECTIONS OF THE TEST

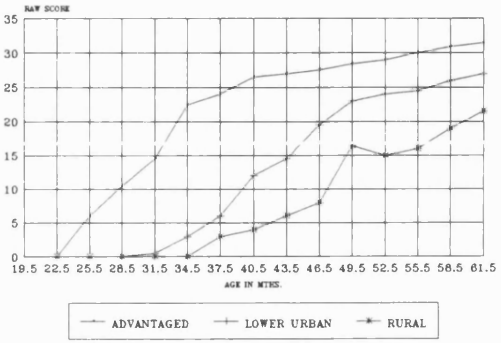
EXPRESSION OF VERBAL LABELS
COMPARISON OF 50th CENTILE OF SES GROUPS



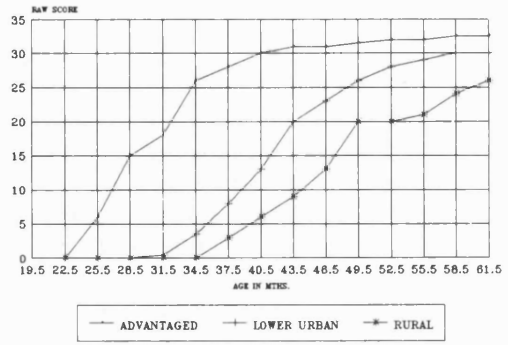
COMPREHENSION OF VERBAL LABELS
COMPARISON OF 50th CENTILE OF SES GROUPS



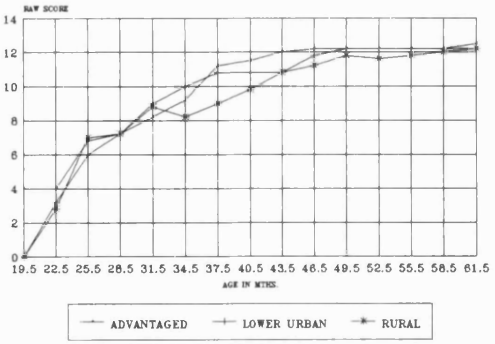
COMPREHENSION OF ILLUSTRATED SITUATIONS
COMPARISON OF 50th CENTILE OF SES GROUPS



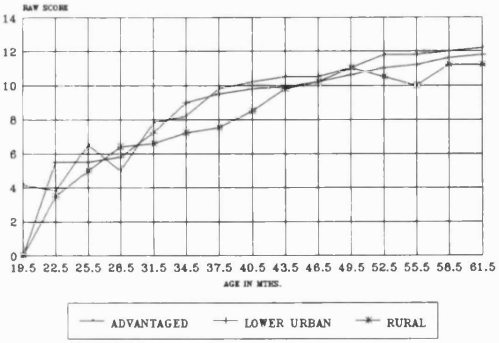
EXPRESSION ON QUESTIONS
COMPARISON OF 50th CENTILE OF SES GROUPS



RECOGNITION OF RECESS
COMPARISON OF 50th CENTILE OF SES GROUPS



ORIENTATION OF PIECE
COMPARISON OF 50th CENTILE OF SES GROUPS



IV.3 RELIABILITY AND VALIDITY OF THE INDIAN PICTURE PUZZLE TEST :

INTER-RATER RELIABILITY :

The standard procedure of estimating inter-rater reliability (Henning 1987, Carmines and Zeller 1979) could not be carried out due to the author's pregnancy. Inter-rater reliability for three sections of the IPPT - Expressive verbal labels, Comprehension of illustrated situations and Expression in response to questions on illustrated situations was measured using a modified procedure in consultation with the statistician.

Fifty-two response sheets containing verbatim responses of children were randomly selected from the total samples (616 children). The original grades and scores were obliterated by an outside person unconcerned with the research. Photocopies were made of these 52 pro formas and given to two trained raters who scored them independently. The two sets of scores were correlated and the reliability coefficient computed. (Table IV.9, p. 153).

TABLE IV.9

Inter-rater Reliability (n = 52)

Section of test	Correlation coefficient-r
Expression - verbal labels	0.993
Comprehension of illustrated situations	0.995
Expression - response to questions	0.968

TEST RETEST RELIABILITY :

Twenty-three children were randomly selected and tested twice on the Indian Picture Puzzle Test with an interval of two weeks. The two sets of scores in the six sections of the test were correlated to compute the reliability coefficient-r (see Table IV.10, p. 154).

TABLE IV.10

Test - Retest Reliability (n = 23 cases)

Section of test	Correlation Coefficient-r
Expression - verbal labels	0.952
Comprehension verbal labels	0.943
Comprehension of illustrated situations	0.937
Expression - response to question	0.748
Recognition of shape	0.928
Orientation of piece	0.763

VALIDITY OF THE IPPT

TREATMENT VALIDITY

A small field study was carried out in a village to pilot treatment validity of the IPPT (**Field study III**).

AIMS :

1. To provisionally explore treatment validity (see p. 86) of the IPPT.
2. To pilot an intervention programme to improve abilities embodied in the IPPT of the rural children, who were far behind the upper and middle class children.

(a) Subjects :

A rural village was selected; all 29 two to six years old children were registered and participated in the programme. Fifteen children (8 boys and 7 girls) who completed a second assessment with the IPPT formed the cohort. Of the 14 remaining children, 8 were too old (>6 years) for the application of the IPPT, 3 were not available at the time of reassessment and in 3 the age could not be determined. The community leaders and parents were consulted before the start of the programme. Detailed demographic information relating to family background and linguistic environment was obtained and was consistent with a typical Indian village described on p. 101.

(b) Method :

All children were given an initial assessment with the IPPT. They then took part in the intervention programme for a period of 6 months. The programme ran daily for the first 6 months and thrice weekly there after.

Two language teachers, as well as the author and research officer designed a programme based on an established one described by Cooper et al (1978). Time tables, teaching schemes and methods of recording progress of individual children were also planned. Regular team meetings were held.

The programme emphasized four areas of cognition embodied in the IPPT: expressive language activities, receptive language, nonverbal concepts and symbolic processes. Attention control and listening skills were included (Cooper et al 1978). Self discipline was promoted through yoga. Community participation was encouraged. Grandparents narrated stories and anecdotes of local history. Child-to-child learning was advocated and selected older children were allowed to participate in the programme.

Fifteen children completed a second assessment at the end of six months participation in the programme. Comparisons of percentile achievement in each section of the IPPT was made. Thus each child acted as their own control. No untreated control group was available. The findings are presented qualitatively and have not been subjected to tests of significance.

(c) Results :

The scores of the 15 children for the different sections of the IPPT before and after intervention are given in Table V.1, p. 258. Their centile ranks in each section of the IPPT are given in Table V.2, p. 259.

With the exception of one child (case 12) positive centile gains in all four language sections were made. The numbers of children showing gains for each section were as follows: **expressive verbal label**- 14 out of 15; **comprehension verbal labels** - 9 out of 15; **expression on questions** - 13 out of 15; **comprehension of illustrated situations** 13 of the 15 children. In the nonverbal sections the gains, though not dramatic, did occur: **recognition of recess** 8 of the 15 and **orientation of shape** 7 of the 15 children.

(d) Discussion and Conclusions :

A problem encountered in estimating centile gain in some sections of the IPPT was that a raw score of 0 did not clearly discriminate lower centiles of ability for younger children e.g. case 4 in comprehension of

illustrated situations (CQ1 and CQ2, Table V.2, p. 259). The ages where a full centile range was available varied for each sector.

To establish treatment validity of a test, the effect of a proven treatment programme should be evaluated and established by the test in the target group. The abilities embodied in the programme should be those measured by the test (Bachman 1990) . The steady progress in performance in the cohort is in keeping with the findings of the main study that the rural children were not disadvantaged in nonverbal skills when compared to the advantaged children (p. 258 - 259).

The trend for an **increased rate of progress** in the language sections lends a modicum of treatment validity to the IPPT.

A much tighter design and a larger sample with an untreated group is required to firmly establish treatment validity of the IPPT.

IV.4 SOCIAL FACTORS AND TEST RESULTS:

Comparison of the mean scores in all the sectors of the test between various socioeconomic groups

The mean scores in each sector of the test in all socioeconomic groups were examined to look for any statistically significant difference amongst them. The student's t test was used (Table IV.30 - overleaf).

TABLE IV.11 -

COMPARISON OF MEAN SCORES BETWEEN VARIOUS SOCIOECONOMIC GROUPS IN EACH SECTOR OF THE I.P.P.T. ACCORDING TO AGE :

age mths.	upper vs middle	middle vs lower	lower vs rural	advan. vs lower	advan. vs rural
EXPRESSIVE VERBAL LABELS					
<=36	13.5,12(NS)	12,9(NS)	9,4(S)	13,9(S)	13,4(S)
37-48	23,23(NS)	23,16(S)	16,11(S)	23,16(S)	23,12(S)
49-60	26,25(NS)	26,22(S)	22,19(S)	26,22(S)	26,19(S)
COMPREHENSION VERBAL LABELS:					
<=36	14,14(NS)	10,8(S)	8,7(S)	10,8(S)	10,7(S)
37-48	14,14(NS)	14,12(S)	12,11(S)	14,12(S)	14,11(S)
49-60	15,14(NS)	14,13(NS)	13,12(S)	14,13(S)	14,12(S)
COMPREHENSION SITUATIONS ILLUSTRATED:					
<=36	13, 9(S)	9, 7(NS)	7, 3(S)	13, 7(S)	13, 3(S)
37-48	25,27(NS)	27,15(S)	15,11(S)	26,15(S)	26,11(S)
49-60	30,29(NS)	29,24(S)	24,19(S)	29,24(S)	29,19(S)
EXPRESSION ON QUESTIONS:					
<=36	15,15(NS)	15, 8(S)	8, 4(S)	15, 8(S)	15,4(S)
37-48	29,29(NS)	29,17(S)	17,14(S)	29,17(S)	29,14(S)
49-60	32,31(S)	31,27(S)	27,22(S)	31,27(S)	31,12(S)
RECOGNITION OF RECESS:					
<=36	7, 7(NS)	7, 8(NS)	8, 7(S)	7, 8(S)	7, 7(NS)
37-48	11,10(S)	10,10(NS)	10,10(NS)	11,10(NS)	11,10(NS)
49-60	12,12(NS)	12,12(NS)	12,11(S)	12,12(NS)	12,11(S)
ORIENTATION OF PIECE:					
<=36	8, 7(NS)	7, 9(NS)	9, 7(S)	8, 9(S)	8, 7(NS)
37-48	12,11(NS)	11,11(NS)	11,11(NS)	12,11(NS)	12,11(S)
49-60	13,12(NS)	12,12(NS)	12,12(NS)	13,12(NS)	13,12(NS)

S = Significant; N S = Not Significant; Advan. = Advantaged;

IV.4.1 BIRTH ORDER IN RELATION TO A CHILD'S PERFORMANCE :-

In order to look at birth order and mother's educational level in relation to performance the mean scores in expressive verbal labels was taken as the index of performance of each child. The children were divided into two groups - BO1 (first born) and BO2(birth order => third). The mean scores in expressive verbal labels within each age group was compared between these two groups (Table IV.12).

TABLE IV.12

BIRTH ORDER AND MEAN SCORES IN EXPRESSIVE VERBAL LABELS

GRP.s	MEAN SCORES EXPRESSIVE VERBAL LABELS		
	< =36 MTHS.	37-48mths.	49-60 mths.
Advantaged grp.:-			
BO1	12	24	25
BO2	16	23	26
RESULT-T test	S	NS	NS
Lower urban grp.:-			
BO1	9	16	22
BO2	8	14	23
RESULT-T test	NS	NS	NS
Rural grp.:-			
BO1	4	6	10
BO2	4	12	19
RESULT-T test	NS	S	S

S = Significant; NS = Not significant; (0.05% level)

Children with a birth order of third or more did significantly better than those born first in advantaged children aged <=36 month and in rural children aged 37 months and more.

IV.4.2 MOTHER'S EDUCATION AND A CHILD'S PERFORMANCE ON THE IPPT

The children were divided into groups based on their mother's educational level - level ME1 (illiterate), ME2 (primary or middle school), ME3 (high school) and ME4 (graduate and postgraduate mothers). The mean scores in Expressive Verbal Labels was compared (Table IV.13).

TABLE IV.13

MEAN SCORES IN EXPRESSIVE VERBAL LABELS AND LITERACY LEVEL OF MOTHERS:

Age	Mean scores in Expressive Verbal Labels			
(mths.)	ME1	ME2	ME3	ME4
< = 36	6	7	9	15
37-48	12	19	22	23
49-60	19	24	26	26

Since most illiterate mothers belonged to the disadvantaged class and most of the graduates were from the advantaged class the mean scores were also compared within the two groups. For this children from advantaged background were divided into two subgroups - Adv ME1 (=< eighth grade) and Adv ME4 (graduate and postgraduate). The mean scores in Expressive Verbal Labels were compared (Table IV.14).

Similarly, children from disadvantaged backgrounds (urban slums and rural) were subdivided according to mothers educational level - D Adv ME1 (illiterate) and D adv ME2 (primary and /or middle school). The mean scores in Expressive Verbal Labels were compared (Table IV.15).

TABLE IV.14

MEAN SCORES IN EXPRESSIVE VERBAL LABELS AND MATERNAL EDUCATIONAL LEVELS IN THE ADVANTAGED SOCIAL CLASS: (0.05% significance level)

Age	Mean scores in Expressive Verbal Label		
(mths.)	Adv ME1	Adv ME2	Result of 'T' test
<=36	10	15	significant
37-48	22	24	not significant
49-60	26	26	not significant

TABLE IV.15

MEAN SCORES IN EXPRESSIVE VERBAL LABELS AND MATERNAL EDUCATIONAL LEVELS IN THE DISADVANTAGED SOCIAL CLASSES: (0.05% significance level).

Age	Mean scores in Expressive Verbal Labels		
(mths)	D Adv ME1	D Adv ME2	Result of 'T' test
<=36	6	6	not significant
37-48	20	18	significant
49-60	19	24	significant

Children aged <=36 months from advantaged background, whose mothers had a higher educational level did significantly better than those whose mothers were less educated; similarly, rural children aged 37 months and more, whose mothers were literate did significantly better than those whose mothers were illiterate.

IV.5 PICTURE INTERPRETATION AND TEST RESULTS:

Responses given in the sections on Expression of verbal labels and Comprehension of illustrated situations demonstrated a child's inference of the picture which was influenced mainly by the ability to decode pictures and level of language development.

The responses were classified as detailed on p. 246 - 249. The distribution of types of responses in relation to age and to socioeconomic class are presented in fig. IV.1 to IV.12, p. 297 - 308.

There was considerable difference in the responses given by children from the four socioeconomic groups within each age bracket. The following general trends in the type of responses were noted :

No response and correct response :

* Correct responses occurred more frequently with increasing age in all socioeconomic groups (see fig. IV.1).

* A higher proportion gave correct responses and a lower proportion no response at every age in the upper class (see fig.IV.1, IV.2, IV.3).

***Intermediate responses*:-**

* The use of intermediate type responses - perceptual similarity (Conceptual)(T1A), functional term (T1B) generic term(T1C) and naming part of the object (Generic)(T1D) was observed in all age groups and all social classes. Some examples of intermediate responses in expressive verbal labels and comprehension of illustrated situations are given in Tables IV.16 and IV.17, p. 284 - 286. It was of developmental interest in comparison of Indian with English children. The distribution of these types of responses according to age and socioeconomic group for each noun label is shown in fig.IV.1 to IV.12, and for total responses in 'Expressive verbal labels' and 'Comprehension of illustrated situations' in Fig.IV.1 and Fig.IV.12 in (p. 297 - 308), where T1B, T1C and T1D have been amalgamated.

* The difference between socioeconomic groups in the type of response given becomes greater with increasing age (see figs.IV.11 and IV.12) but was also dependent on the type of noun label (for dog fig.IV.1 to IV.3 and for light fig.IV.7 to IV.9).

SECTION V

DISCUSSION AND CONCLUSIONS

I THE INDIAN PICTURE PUZZLE TEST

An attempt has been made to develop - the Indian Picture Puzzle Test, a test of early cognitive development, emphasizing language, for Indian preschool children taking into account the multilingual, multicultural and variegated population.

I.1 PSYCHOMETRIC EVALUATION OF THE IPPT:

If the IPPT is to be used outside the research situation it is necessary that it meet certain psychological criteria (McCauley and Swisher 1984, Sumner 1987, Davies 1990, Kline 1986, Harris 1990). As indicated above some of these have been met fully, some partially and others still require to be undertaken.

The scientific development has included cultural adaptation, item analysis, standardisation and establishment of norms for three socioeconomic groups. Other psychometric studies included inter-rater reliability, test-retest reliability, face, content and construct validity.

Item Analysis :

Each item for noun labels and each situation for questions in the IPPT was carefully deliberated and piloted. Items familiar to children of all social groups were further considered. Item analysis refined the process of final selection. It included the use of item difficulty analysis that discarded uniformly difficult or easy items. It also defined items suitable for a particular age group based on their level of difficulty. The process of item discrimination was applied to evaluate an item's ability to distinguish language performance in test subjects. Item bias examined presence of significantly different performance on a given item by children from each socioeconomic class. These statistical procedures promote the reliability and validity of the IPPT.

The mean and standard deviation of raw scores in six sectors has been reported and analysed for each of the socioeconomic groups .

Sample size

The Indian Picture Puzzle Test has been standardised on 616 children to construct norms, as percentile charts, for three socioeconomic groups. When individual SES groups are considered the sample size conforms to the WHO recommendations i.e. 200 in each group (WHO 1986).

The ideal sample size for use of the total population norms is 1300 (WHO 1986); however, the gross differences between the groups makes this usage inappropriate.

Description of the normative sample :

The Kota sample was clearly defined in terms of geographic location, socioeconomic status and home background.

Reliability studies :

Ideally reliability studies should be carried out on approximately 10 per cent of the sample population (Glascoe et al 1990). The acceptable correlation coefficients for reliability studies recommended by different authors range from 0.7 (Harris 1990), 0.8 (Glascoe et al 1990) to 0.9 or better (Salvia and Ysseldyke 1981).

Inter-rater reliability was carried out on 52 (10%) response sheets; coefficients ranged from 0.99 to 0.97 in the language sectors of the IPPT. Variation consequent to different examiners or different recorders has not yet been undertaken.

Test-retest reliability was carried out on 23 (5%) subjects; coefficients were between 0.93 and 0.95 in the language sections. The test-retest reliability is slightly lower for the sections entitled Orientation of the piece and Expressive response to questions (0.763 and 0.748 respectively). The former may reflect the rather arbitrary method of evaluating how a child orientates a piece to its recess (refer p....). The latter is of greater concern, and probably reflects a number of factors influencing the child - e.g., level of relaxation/rapport; 'practice effect'; variability in the amount children talk on separate occasions.

The psychometric status of the IPPT would be strengthened by a study of inter-examiner reliability and a bigger sample for test-retest reliability.

Validity :

Non-empiricai

The IPPT is based upon the Bus Puzzle Test, a standardised screening tool with a high face validity,

extensively used in the U.K. The IPPT also achieves face validity judging by the responsiveness shown by the children, parents and field workers to the test.

The content validity of the IPPT is supported by the use of pictures to test both vocabulary and the level of expressive language in well established tests, for example, the Reynell Developmental Language Scales (1969), the British Ability Scales (Elliott et al 1978) and the British Vocabulary Test (Dunn et al 1982). Similarly the use of form boards to explore spatial skills has been established for over half a century, for example, the Seguin Form Board in the Merrill-Palmer Preschool Performance Test (1931-48) and the Stanford Binet Test (Terman and Merrill 1960).

The additional field studies I and II (p. 136 - 139) enhance construct and content validity. They explored the psychological processes underlying the IPPT and thus what it purported to test. In the first field study the children named more miniature toys than pictures of the verbal labels of the IPPT. This indicates that the verbal labels were in the children's lexicon and suggests that immature ability to interpret two-dimensional pictures had constrained naming. In the second field study advantaged adults were able to name all the pictures and situations illustrated, implying that the picture in the IPPT was not ambiguous. Therefore, the constructs of the IPPT were clarified and indicated that ability to perceive pictures was measured by the test. The third field study in a rural village, (p. 154) although on a small sample using index children as their own controls implied benefit from an intervention programme embodying the abilities of the IPPT. This lends a modicum of treatment validity to the IPPT. Further, more scientifically designed treatment validity studies are indicated.

Empirical:

Neither concurrent validity nor predictive validity have yet been undertaken for the IPPT. It is essential that the external criterion has itself been validated and standardised. In the current status of test standardisation in India (Murlidharan 1992) it is difficult to identify a suitable test. Also, most rural and slum children do not attend nursery schools and a teacher's judgment on their abilities cannot be used as an external criterion to derive concurrent or predictive validity. Establishing predictive validity for an ability which is sensitive to environment stimulation like language, may pose difficulty as persisting deprivation may depress the ability with time.

If in the future the test is modified for surveillance Sensitivity and specificity indices, yield and predictive value will need to be derived to assess the productivity of the test as a screening tool.

I.2 PROBLEMS ENCOUNTERED IN TEST CONSTRUCTION

Problems peculiar to India and mainly reflecting her social, linguistic and economic diversity were encountered during construction of the IPPT.

Developing a culture-specific test :

The complex sociocultural and linguistic features of India's widely disparate socioeconomic groups need to be considered and makes development of a test more formidable than in the West. Only those items familiar to all socioeconomic groups were selected for the IPPT. Pilot studies and item analysis particularly item bias helped this endeavour.

Often rural children took much longer to respond to the IPPT test items when compared to advantaged children. This was also reported by Satyanath and Satyanath (1990) while testing rural and urban children from Madhya Pradesh on a language test.

Sampling :

Sampling presented several difficulties.

Sample representativeness:

For a sample to be truly representative it must depict the variability of a society proportionately. However, subgroup composition varies in different districts. To overcome this dilemma an equal proportion of children were selected from each social class.

Definition of social class

This was challenging in the face of the diverse living standards and styles, quality of education and occupation in cities, towns and villages. Family income was difficult to pinpoint due to reluctance to reveal revenue, presence of multiple earning members, varying family size and joint family systems. The Market Research Society classification (MRS) was employed as it did not consider family income or specific lifestyles. MRS is based on the level of education and type of occupation of the head of the family, usually the father. Tripathi (1982) and Chatterjee (1982) have also noted that a linear relationship between socioeconomic class and psychological behaviour under study cannot be assumed and may cause erroneous conclusions. They concur that defining social class is difficult in India and conclude that the method used to define it influences the results.

Lack of a postal address and birth records:

Most disadvantaged families do not have a postal address. Thus random selection was achieved through enrollment registers in Anganwadi centres in the urban slums. Anganwadi centres are part of the ICDS

project - an intervention programme for disadvantaged children aged less than six years. Since they register all slum children in the vicinity, the selection was truly random.

ICDS does not cover the total number of villages of the Kota district hence all of them were enlisted and randomly selected for the study. All non disabled children in the enrolled villages were tested.

Birth records are rarely maintained by the disadvantaged families. Historical events like monsoons, festivals and harvest time that can be time locked to a child's date of birth were used to deduce the age when necessary.

The above measures provide a practical way of combating the various problems encountered.

Standardisation :

The test responses in sections on verbal ability were vastly different in the three socioeconomic sub-groups. Average scores varied significantly and distribution curves were greatly skewed in the deprived populations dictating a need for **separate norms** for each socioeconomic group.

Multiple languages and bilingualism :

India has over 300 languages and dialects. As Shrivastav (1980) had noted no state is monolingual and at least three languages are used in each. Children tested in an unfamiliar language may make semantic mismatches (Massey et al 1982). These mismatches occur because of higher anxiety levels in children who then fail to respond (Ben-Zeev 1977) and as a result of misinterpretation of responses by the tester.

Many upper class children in Kota studying in English medium nurseries insisted on answering in English inspite of the fact that they were requested to speak in any language they felt comfortable with and the tester spoke in Hindi. Presumably, they associated the author (tester) with their teachers who conduct lessons in English . Noun labels were often incorrect in English but correct in Hindi, when the latter was coaxed out of them. Fantini (1978) also noted that bilingual children were sensitive to their interlocutors and rigidly used the language they associated with the speaker.

Another problem encountered in the Kota study was common usage of some terms. For example, the Hadoti term 'log' is commonly used to denote man, woman, girl, or boy. The IPPT considers such a response a level lower than the more specific term. The relative importance of a word in a cultural subgroup decides when it will develop and how it will be used has previously been noted by Miller (1978), Howlin and Rutter (1987) and Halliday (1975) respectively.

Most children spoke Hindi and Hadoti, the dominant languages/dialects of the region. However there were some children who spoke and understood only their mother tongue. These were usually the very young children from deprived groups. Some shy children would not respond to Hindi if it was their second language. This reluctance faded once the mother tongue was used.

The phenomenon of 'mixing' was seen in all social groups but more so in older upper class children, between their mother tongue and Hindi or occasionally English. Apparently the language used in the test situation was of significance. Miller (1978) advocated the study of a child's sociolinguistic background to select the most appropriate language for the test. He recommended assessment of 'collective competence' using a mixture of languages. Although, the response given must be equivalent to that expected for the original term. This may be difficult as structural or semantic equivalence between languages need not be synonymous. Therefore, order of acquisition of those structures or meanings may not be equal. Despite the difficulties envisaged in assessing collective competence of a child, it seems a reasonable solution to multitudinous dilemmas in testing of bilingual children.

Some problems with multiple languages in a test situation encountered in the Kota study were mitigated using the following techniques.

1. A list of the verbal labels was made in the major languages - Gujrati, Marathi, Malyalum, Tamil, Bengali.
2. The parent, grandparent or a community worker was instructed simultaneously as an interpreter.
3. The child's responses were recorded verbatim and cross checked later with a more objective native language speaker.
4. The questions the assessor had to ask were simple and the tester learnt their Hadoti translations as this was the major local dialect.

Interpreters were sometimes eager for a particular child to do well and would translate an incorrect verbal label correctly. This was countered by having two or three interpreters available, made possible as a small crowd always gathered at the testing site and most communities living together had a common mother tongue. Local interpreters are useful but need to be contained and instructed properly to avoid biased results. Technique 3 is an important way to achieve a reasonable balance in such situations.

Cross checking responses with master charts of correct terms in a language is practical in the field. The advantage of the IPPT is that the section on comprehension does not involve long complex sentences. Technique 4 is simple for professional testers to undertake when working clinically or doing research in a region.
The general approach was flexible with an objective of communicating the task to a child. If necessary, more than one language was used.

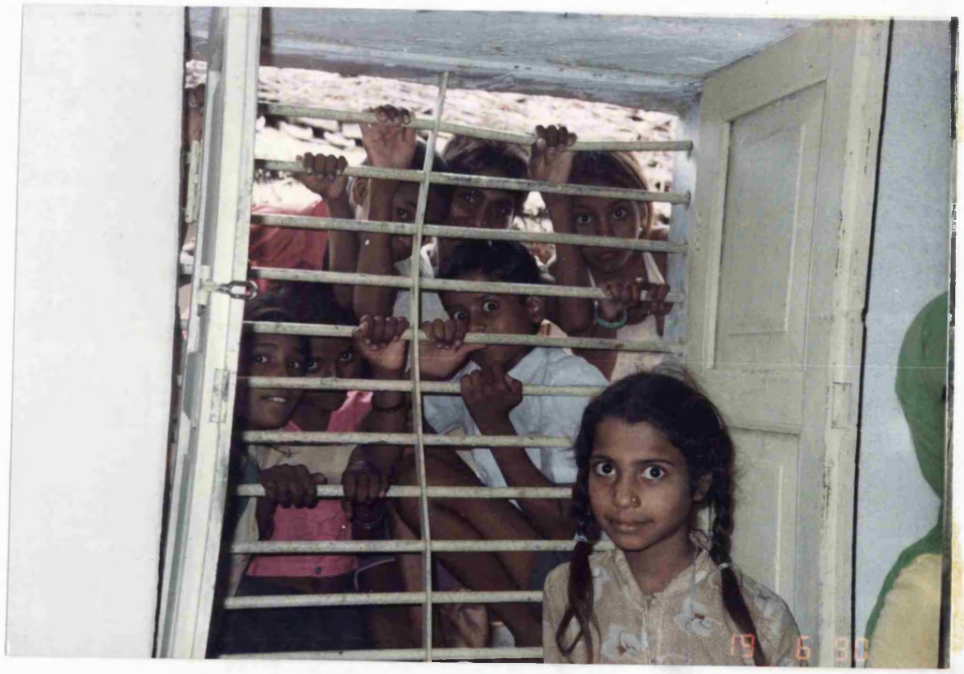
Problems in the field :

Many logistic problems were confronted in the field. To administer the test without disturbance was almost impossible. The novelty of a car, of persons who were overtly different from the villagers and of the test situation attracted large crowds who milled around the testing site (photo on pg...). It was very difficult to explain the need of seclusion and quiet. Anandalakshmy (1982) described similar problems encountered in such studies. He suggested involving a team of field workers who could help in distracting and organising the crowds. He noted that high motivation, respect for the individuals and culture under study, understanding the human psyche and ingenuity were major factors in gathering reliable data. Tripathi (1982) cautioned that 'dress, diction and deportment' of the investigator, which was usually different from that of the respondents, often inhibited them.

In Kota, rapport was built with the community leaders and parents by talking in their mother tongue and using inducements like free medical examinations, cold-drinks for parents and biscuits for children. These also acted as distraction tactics. Information on early development, age-appropriate play and toys attracted upper and middle class parents. Henning (1987) has also suggested use of incentives to promote cooperation from the respondents.

Many problems encountered with this study could occur in any Third-World research and solutions employed here may be applicable to them.

PHOTO.V.1



CHILDREN AT A TESTING SITE

II DISCUSSION OF RESEARCH FINDINGS

II.1 SOCIAL FACTORS AND TEST RESULTS

A subsidiary aim of this study was to look for differences in performance of children from various socio-economic groups. Deprivation is a major concern of researches in India. However, social and economic classes are not homogeneous and differ from region to region. This presents important methodological issues that include appropriate socioeconomic classification and relevant test tools applicable to varying sub populations. Anandalakshmy (1982) and Bevli (1990a) have pertinently pointed out the paucity of investigating tools developed specifically for Indian populations. Comparative studies, therefore, need cautious interpretation.

Findings in the Kota study showed that preschool children from disadvantaged backgrounds were significantly behind their advantaged peers in verbal performance (Table IV.2 see p. 147).

Other research studies have vividly shown the disabling effect which disadvantage has on child development (Bernstein 1975, Davie et al 1972, Bevli 1978, Misra and Tiwari 1990).

Initially data in the Kota study was compiled and collated for four socioeconomic groups and the central tendency and variation was calculated for each group and compared. Significant differences were found between the upper urban, slum and rural groups but not between the upper and middle urban groups (Table IV.11, see p. 157). Therefore, upper urban and middle urban groups were amalgamated to form the advantaged group.

The distribution of various scores in each of the 3 groups was also examined (fig. V.1, p. 309). The distributions in both the rural and slum populations were negatively skewed to a marked degree. While the frequency distribution of the scores in the advantaged group was more normal with slight positive skew. Clearly, separate norms were necessary for the three groups - the advantaged , slum and rural.

Common norms for the whole population would spuriously label advantaged children above average. Also, below average advantaged children in need of deveiopmental intervention would be missed.

Interestingly, ***slum children did significantly better than their rural counterparts.*** Other Indian researchers have observed similar findings (Bevli 1978, Pushpa 1990 and Pankajam 1990). Rural children receive less stimulation from the environment and lead bland lives (Minturn and Hitchcock 1963). On the other hand slum children are exposed to a greater variety of experience. Material deprivation is, in a way,

compensated by a diverse social life. Rutter (1980) pointed out that different aspects of adverse experiences in early childhood have different effects on child development. Parental education especially that of the mother, father's employment, mother child interaction and number of siblings were some variables found to significantly influence development of Indian children (Bevli 1990b, Murlidharan 1990, Pushpa 1990, Misra and Tiwari 1990)..

Mother's education and verbal ability: (p. 159)

A mother's level of education was related significantly to the mean scores in expressive verbal labels in the Kota cohort (Table IV.13 to IV.15). Under three year old advantaged children of graduate mothers had significantly higher scores than those of the undergraduate ones; presumably, school environment in the older advantaged children played a compensatory role. Conversely, in the disadvantaged group, maternal education had a greater impact on children of three and over. Preschool children from lower socioeconomic groups rarely attend nurseries in Kota and thus maternal educational level, possibly, assumed greater importance. Murlidharan (1990) reported significant correlations between mothers' education and arithmetic and reading scores in primary school children.

Birth order and verbal ability :

The Kota study did not reveal any correlation between birth order and verbal scores in children from the urban upper, middle and lower groups. Conversely ***older rural children (37 to 60 months) who ranked third or more in birth order had significantly higher verbal scores than the first born*** (Table IV.12, p. 158). Possibly families with many children provide more verbal stimulation. Rural mothers are involved in household chores or are working in the fields in India and seldom talk to young children (Minturn and Hitchcock 1963). First born children thus, are relatively deprived of verbal stimulation. Older children often act as caretakers for their younger siblings and possibly interact with them more than the adults. Similarly, the ordinal position of an Indian child accounted for only 3 per cent variances in performance on the Story Pictorial Embedded Test amongst 3rd and 4th graders (Misra and Tiwari 1990). Western literature has reported contrary findings. Rutter and Madge (1976) reported that firstborn and only children have a slight advantage in intellectual ability and school achievement. Davie et al (1984) observed that a higher ordinal position in preschool children contributed to better performance on a language rich IQ test. Also that only children and eldest children received more adult attention. **A rich language environment appears to promote language development, whether provided by adults as in the West, or by siblings as is the possible reason for the findings of the Kota study.**

Effect of age related to social class :

Until four years of age a widening gap was noted between advantaged and disadvantaged groups in

verbal ability on noun labels. After that it narrowed but remained disparate (fig. IV.11 & IV.12, p. 307 - 308). The gap in performance on certain nonverbal tasks increased with age between advantaged and disadvantaged young Indian children (Jachuk and Mohanty 1974) . Sinha (1977) and Misra and Shukla (1984) noted similar findings while studying various aspects of development in Indian children.

Collectively, these findings support the introduction of early intervention, especially in language since some Western studies have shown that it may help future intellectual development (Reynell 1980, Huntley et al 1988).

Test response differences related to social class

i) **Verbal**: (Fig. IV.11 & IV.12, p. 307 - 308)

Advantaged children from the youngest age group gave more spoken responses. Interestingly, many of these children gave intermediate types of response (T1A to T1D) when compared to the deprived groups. The rural group gave the least number of spoken responses.

In the 37 to 48 month age group the percentage of the intermediate types of response reduced in the advantaged group but increased in the disadvantaged group. More slum than rural children responded positively and the percentage of the intermediate variety (T1A to T1D) was also higher. In fact, the response characteristics of the 37 to 48 month old slum children was similar to that of <=36 months old advantaged children.

Almost all children responded positively in the oldest age group. The percentage of the intermediate varieties of response fell even further in the advantaged group presumably because they moved up to the higher level; a rise occurred in such responses in both the disadvantaged groups. Thus many underprivileged four to five year olds and 12 percent of advantaged four to five years old still decoded pictures incorrectly. It seems that representational immaturity concerning pictures persisted in older disadvantaged children. The influence of deprivation and age on recognition of pictorial material was also apparent in the studies of Misra and Shukla (1984) and Sinha (1977) .

Thus, within each socioeconomic group the number of children responding to the test items increased with age. Intermediate types of response were higher in disadvantaged children of all ages. As a percentage of total responses they fell in the oldest advantaged children but increased with age in all of the disadvantaged groups. The findings show that a child used more language with age, the maturity of which also improved with age.

Intermediate responses increased with verbosity but reduced with maturity in language use and picture interpretation.

In the Kota study intransitive verbs were noted at an earlier age than transitive verbs. The verbal labels for objects were the earliest. As in the Egan and Brown (1984) and the Bevli (1978) studies, naming or describing events were noted in older age group.

ii) Nonverbal :

Spatial abilities explored by the IPPT were recognition of recess and orientation of the insert. There was ***no discrepancy in the average scores of the advantaged and disadvantaged groups.*** This is in contrast to those of verbal abilities discussed in the previous sections.

Other Western and Third world studies of children have shown a similar lack of discrepancy between advantaged and disadvantaged children. Vandenberg (1975) concluded that 'Spatial ability is a cognitive skill that is less correlated with social class differences than performance on vocabulary tests or on tests of general intelligence'. Similarly, Nuttin (1965) observed in a study of Belgian children from five socio-economic groups that performances on tests requiring spatial ability were not affected by social class. Misra and Tiwari (1990) in their study of 300 Indian primary school children found that boys from urban and rural homes did similarly on the Bender Gestalt Test. The probable explanation is that spatial experiences are universal and not reduced by poverty per se.

Spatial scores increased with age in each social group (Table IV.2, p. 147) suggesting a maturing process in spatial abilities. Item analysis revealed that recognition of recess and orientation of a piece was not useful in judging performance in children over 48 months. Egan and Brown (1984) reported a similar finding in English children.

Western literature on language delay and disorder has shown that language deficit correlates with fine motor control. Paul et al (1983) suggested that a general apraxic condition affecting both speech-motor and fine-motor control might explain an association between clumsiness and developmental language disorder. A clear association between language impairment and slow performance on the peg-moving task was reported by Bishop and Edmundson (1987). In this task, a child is timed as she moves 10 pegs from holes at the back of the peg board to corresponding holes in the front. This association was seen between children and also within an individual child over time. Bishop and Edmundson, like Johnston et al (1981) and Reitan (1984), interprets the association in terms of neurological immaturity. The difference seen in verbal and nonverbal scores between social classes in the Kota study is more likely to reflect environmental deficit than underlying neurological immaturity; even though dexterity was not systematically recorded, there did not appear to be any difference in the prevalence of clumsy hand skills in the socioeconomic groups - which would have been likely had the cause of delayed language been neurological in the deprived groups. Further analysis of verbal and spatial scores would need to be undertaken within each social group in order to correlate language delay and spatial ability in the Kota study,

Although there were no significant difference in visuo-spatial abilities, significant differences were seen in other area of visuoperceptual function.

II.2 PICTURE PERCEPTION AND TEST RESULTS:

A difference was seen in responses to pictures between the Kota cohort and their English peers. Variations were also seen between social groups. Therefore, the ***development of a capacity to recognise pictorial representations of objects, persons and situations became an important developmental parameter of the Indian Picture Puzzle Test.*** The content of the spoken response judged the level of picture assimilation. Three types of response were encountered in the Kota study - no response, an intermediate or immature response and the correct response.

The characteristics of the intermediate response for expressive labels were a noun label perceptually similar or with a functional resemblance to the test item. For example, 'coin' for 'clock' and 'table' for 'bed'. Fenson et al (1988) noted that most of the two years old children in their study could match objects to categorically related pictures when a moderate perceptual likeness existed. Few could match perceptually dissimilar objects and pictures, though they represented the same superordinate category. Some children in the Kota study, in fact, named objects from the same superordinate category even if perceptually dissimilar, for example, 'table' for 'chair'. Several reasons could possibly explain this phenomenon. The conceptual knowledge of the older children in the sample was more advanced than their language; these examples represented 'overextensions' of words; socioculturally, children did not need nor were expected, to use precise terms in everyday conversations.

The younger children in this study gave a literal description of the picture without assimilating the situation it depicted. For example, when asked to describe the situation of 'mummy cooking' a child answered that 'mummy is sitting' or that 'mummy is holding a plate in her hand'; 'mummy bathing a baby' was 'mummy is throwing water on baby.' Comprehension of situations requires development of representation of common events, for example, 'cooking', 'combing' or 'sleeping'. Mandler (1983) described this process as representation of sequences of action and changes of states and referred to them as 'scene schema' or 'event schema'. Kirasic et al (1980) found that kindergarten children recognised objects better in context than out of context, for example, a picture of a stove was recognised more easily when seen in a kitchen than by itself. Nelson (1978) noted that 4 to 5 year old children described events better if the situation was more familiar. Similarly, ***the responses obtained in the Kota study suggested the importance of familiarity of a particular object or activity depicted in a picture***. For example, the stove in the IPPT is an old-fashioned one, the type not frequently seen in upper class homes. There was no real difference in the responses of the advantaged and disadvantaged groups as occurred with other items (Fig.IV.1 to IV.3, p. 297 - 299). The dress of the woman (mummy bathing a baby) is more similar to the attire of villagers and, interestingly, deprived children did better than the advantaged (Fig. IV.4 to IV.6,

p. 300 - 302). Children from privileged homes are often asked to point to pictures of different animals from picture books and identified the dog as zebra, horse, lion and other exotic animals commonly seen in picture books in India. T1A to T1D responses to the noun label 'Dog' accounted for 20 to 34% of responses even in children as old as four to five years. Similarly, as many older rural children identified the situation of mother cooking chapati as the privileged children.

For the rest of the noun labels and questions disadvantaged children lagged behind the privileged group. Problems in identifying pictures by deprived Indian children have been noted by Misra and Shukla (1984) and Sinha (1977) but they did not attempt to study the incorrect responses obtained nor give explanations for them. Bevli (1978) in her study of early language in young Indian children was the only one who did record incorrect responses but she did not identify them as a problem of picture perception. Bevli classified partially correct responses as that either had some association with the object or those that partially resembled the object. Thus for 'rose' the partially correct responses were 'garden' or 'leaf'; for 'cow' 'cat', or 'tail', or 'bark'; for 'book', 'box', or 'house' and for 'clock' 'wheel' or 'coin'. The partially correct responses in the Bevli study were similar to the now categorised intermediate types of response in the Kota study. Perceptual similarity, was seen with responses like 'house' and 'box' for 'book' and 'wheel' and 'coin' for 'clock'.

Functional similarity was seen in responses like 'garden', 'leaf' for 'rose' and 'cat' for 'cow'. Occasionally only parts of the picture were identified like 'tail' for 'cow' and 'paper' for 'book' like the T1D type of intermediate response with IPPT.

Mandler (1983) noted that very few studies in development of representation have been conducted in very young children particularly in Third world countries. No studies could be located from either Western and Indian literature to explain the findings on picture perception in the Kota study.

PICTURE INTERPRETATION:

As noted earlier picture perception is present in infants as young as five months (Rose 1977, DeLoache et al 1979) The occurrence of intermediate types of response in the Kota sample could not be explained in these terms and required further consideration. **The data seemed to indicate that the perception and the interpretation of pictures were two different processes.** Interpretation of pictures seems to require a higher level of cognition and a broader experience than picture perception. The work with the IPPT in the Kota children has led to a tentative hypothesis concerning **Picture interpretation**. Picture interpretation differs from picture perception in that age and cognition interact with other visuomotor and perceptual skills to deduce the representation, so that with increasing age and experience picture decoding ability for pictures improves.

Some factors possibly influencing the development of picture interpretation are discussed below:

Representational maturity:

Representation of children's knowledge consists of 'what is known' and how that knowledge is structured called **'conceptual representation '** and **' symbolic representation'** respectively (Piaget 1951). The former is based on a system of concepts or mental schema and the latter is the capacity to evoke by a sign or a symbolic image an absent object or an action not yet carried out. Recognition of toys and pictures of familiar objects are aspects of symbolic understanding (Reynell 1980). These develop in parallel by eighteen months of age and are mature by 6 to 8 years (Piaget 1951, Mandler1983).

A gap in both aspects of representation may be the cause of the intermediate types of responses obtained in the Kota study. Representational maturity seems to play an important role in recognition of pictures.

Stages of intellectual development

Piaget described the stages of development of intelligence from infancy to adolescence. In the preoperational stage from 2 to 5 years, a child is said to be '. . . perception bound, captured by the surface appearance of things unable to dig beneath the surface to represent deeper meaning. . .' This egocentric stage is characterised by an inability to pick up contextual clues. In the section on 'comprehension of situations illustrated' in the IPPT, a child's description of the picture which is literal and in which its context has not been assimilated reflects Piaget's preoperational stage; for example, when a child says, " The girl is doing namaste (with folded hands) " instead of 'the girl is sleeping', the child is disregarding the shut eyes, the orientation of the girl lying down and the bed.

Early categorisation/concept development:

Conceptual categorisation of objects plays a role in the way a picture is interpreted.

A concept designates a set of properties that are associated with each other in memory and thus form a unit (Clark 1983). These properties can be transitory or permanent, concrete or abstract, perceptual or functional. They are combined to form units of representation which provide reference points for categorization. Clarke (1983) noted that young children rely on properties like shape, size, movement, sound and taste to categorise.

The members of a category share to varying degrees, features of the family category; some have more of these features than others. A member is considered more prototypical the greater the number properties possessed, Eg., robins are more prototypical of the category 'birds' than penguins. Membership is dependent upon the emphasis put on individual properties by the observer and will vary with a child's

experience and individuality (Rosch and Mervis 1975); the latter possibly accounts for some of the diversity of responses obtained from the Kota cohort.

Mervis and Mervis (1982) noted that basic level categories for adults are not necessarily the same for children. This may result in greater difficulty in analysing responses of children on the picture puzzle. Hence, a list, classifying and grading probable responses have been appended with the Indian Picture Puzzle Test (Tables III.22 & III.23, p. 246 - 249).

Some categories may be more accessible than others in that they have specific linguistic expressions as labels and therefore appear to represent a conventional classification. Other categories, for example, things that are carried on the head such as hats, pots or even luggage, may have more of an ad hoc character that makes them harder to remember and to name (Barsalou 1981). Accessibility may also be different for various terms in different languages depending on cultural usages. Item analysis, in test development, cannot completely circumvent this problem, for example, a boy or a girl is commonly called person in the local dialect of Kota and this would influence the score of the locals on the IPPT.

Some of the Intermediate Type of responses in the Kota study indicated use of perceptually similar objects such as 'ball' or 'coin' for 'clock' and functionally similar objects such as "stool" or "sofa" for 'chair'.

Children also need to construct conceptual categories for situations (Comrie 1976, Vendler 1967). Two such categories are:

a) **Processes** - Ongoing activities of a limited duration,
Eg., sleeping, running.

b) **Events** - Activities that result in a change of state,
Eg., running a race, combing hair, cooking food.
Events involve an activity with an outcome or distinct result.

A child requires to have a representation of the everyday process or event in her memory to appreciate a situation depicted in a picture. The latter may be the higher level, for example, 'cooking food' and 'fetching a kite' is conceptually more advanced than 'sleeping' or 'sitting'. Familiarity with an event in daily life probably increases the chance of recognition.

Ability to scan :

The manner in which children look at a picture influences the way they perceive its meaning

Children make shorter eye movements than adults, and tend to look at fewer informative areas (Mackworth and Bruner 1966). There is less use of peripheral scanning leading to rejection of these areas. Further more the children appear trapped by a detail, returning repeatedly to it, and to restrict themselves to a very small field. Generally, children's search techniques in examining pictures are piecemeal and less successful than adults. They are also highly variable from one to the other and within themselves (Mackworth and Bruner 1966, Vinh-bang -cited in Gibson 1967, Abercrombie 1969, Vurpillot 1968) .

Immature scanning skills may have contributed to the findings of the Kota cohort which could be secondary to inexperience of being talked to about pictures. This 'piecemeal' method of viewing a picture may be one explanation for a child ignoring the setting of a situation in the picture when responding to questions on it. Eg., "She has a moon in her hand" for the lady with a chapati in her hand while she is cooking. A child may look at the most salient feature of the object without associating it with the rest of the picture. Eg., A child looks at parts of the object without relating it to the whole. Eg.,"wheel" for cycle; "fire" for stove; "number" for clock.

Cultural influences :

Cultural diversity influences picture interpretation but not picture perception (Kennedy 1974). Friedman and Stevenson (1975) and Cazden (1972) have suggested pictorial devices for showing motion (or pain or impact) are merely conventional in Western culture. These may be misinterpreted by people from other culture.

Serpell and Deregowski (1980) noted from results of various cross-cultural studies that differences in picture perception were related to use of specific skills in a particular society. They referred to picture perception as a 'culturally restricted perceptual skill'. Western children, according to them, learn to perceive pictures in the functional contexts of learning to speak and listening to stories with the help of picture books. They quote Dasen's study on cross-cultural Piagetian psychology on spatial concepts and conservation to emphasize the relationship between eco-cultural demands and performance on cognitive and perceptual tasks. The lack of experience with pictorial material in underprivileged societies in India probably accounts for the problems the children had with pictures in the Kota studies.

Language: (Lexical development)

Clark (1983) stated that words flag concepts and serve to evoke them. Learning the meaning of words is also learning the ideas each word conventionally denotes within a language community. Language aids concept formation by helping to code concept categories.

Picture interpretation seems to follow the stages of early development of words. **Overextensions** and

underextensions (Clarke 1983), commonly found in young children's speech, may explain the use of noun labels which are perceptually similar to the test item, for example, responses like 'moon' for 'chapati' in the IPPT; similarly, **overlaps** and **mismatches** may explain the naming of only parts of objects, for example, 'string' for the string cot.

Picture perception

A picture can be perceived in two ways. First, one can perceive the picture as an object and secondly, the scene or the layout within the picture (Hagen 1974). In the early development of whole-part relationships in perceiving pictures (see p. 54), a child focuses on only one dominant aspect of the picture so that she may notice the colour but not the shape of an object. Another aspect of whole-part perception has to do with the ability of a child to extract relevant or pertinent detail from contexts that contain irrelevant or distracting information (Williams 1983). Embedded figures have been used to assess this ability. Williams et al (1979) found that six and eight-year-olds were more mature in discerning relevant figures from a distracting background than five-year-olds. Familiar items were more easily perceived than unfamiliar or abstract items such as geometric shapes.

Maturity of picture perception may influence the amount of information gleaned from a picture.

The Kota study may have highlighted several stages in the development of picture perception/ interpretation not previously recognised by researches in the field of child development. These stages were more clearly seen in the most disadvantaged children, and presumably are passed through too quickly for recognition in European and advantaged Indian children whose early exposure to conversation about pictures in books, magazines etc. is superior. This contention is supported by the discrepancy noted between the Kota groups and by the low incidence of immature responses in Egans cohort.

It seems reasonable to suggest, from the findings of the Kota study, that the ability to pick up distinctive features of a picture increases with age. The ability to extract information from the contextual clues of a picture to assist recognition of the objects depicted probably improves with age and perhaps with experience.

To conclude, it seems that picture interpretation may involve several processes ranging from visuomotor ability employed in picture scanning to representational maturity . These different components may develop at varying rates in different cultural groups and social classes depending to some extent on experiences and the need to use the particular skill in daily life.

Practical Implications

The findings on picture interpretation from the Kota study are important to designers of developmental tests for Indian children. They affect test construction, interpretation of test findings and are of particular relevance to comparative studies between various populations.

SIGNIFICANCE OF PICTURE PERCEPTION IN LITERACY

Early language, pictorial assimilation and literacy are related through a fundamental skill of symbolic understanding. There is evidence that the cognitive representations of meanings are organised in a semantic system common to pictures and words. Picture perception and interpretation may therefore be an important stepping stone to literacy.

Pictorial material is used for didactic purposes, for publicity, marketing, and health advertising like accident prevention and family planning. Serpell and Deregowski (1980) noted the heavy reliance placed on pictures by Western communication systems particularly in education. Pictures are commonly used in the Western World in training in early literacy. Pictures and texts play a complex and significant part in introducing children to literature and preparing them for literacy. They establish patterns of active reading and meaning prediction. Goldstein and Underwood (1981) analysed the functions of illustrations while reading. They provide a referent for a specific word, extend contextual support and generate motivation for reading by making the text more interesting and comprehensible. Picture books stimulate the creation of links between book worlds and everyday life and shape individuals' direction of literary conventions (Whitehead 1990).

In view of the persistently low literacy rate in India (52 percent) and the high number of dropouts from primary school (60 percent) the results on picture assimilation in the Kota study assume significance. It seems necessary to explore the relationship between picture perception in early years and future literacy. Experience with printed and pictorial material is minimal in illiterate and technologically unsophisticated populations. The message of pictorial material could be misinterpreted or differently perceived as the ability of the target population to interpret pictures determines the understanding of the message imparted. (Hudson 1967). Adults from deprived populations in the Kota field study (p. 139) showed problems with pictures implying a possible critical sensitive period in childhood.

Several cognitive developments and strategies precede the complex process of reading and writing. Development of more complex thinking depends on the gradual freeing of thought from its links with very specific actions and objects (Werner and Kaplan 1963). Initially, Piaget (1956) suggested, that thinking develops from the internalization of actions, movements and images. This is the sensorimotor period when iconic representation is noted in the first two years of life. The appearances of gesture, language

and make believe play suggest the developing ability to represent thought symbolically. Emergence of object to picture matching occurs at this stage (Reynell 1980). This stage is increasingly accompanied by mark-making, drawing, pretend-writing and eventually recognisable conventional writing (Whitehead 1990).

Pictures are a representation of events and objects and are two-dimensional symbols of the three-dimensional world. When young children recognize pictures of cats in books, and name them or react by eagerly setting off to search for their own cat the phenomenon of 'distanced representational thinking' is clearly happening (Whitehead 1990). Picture recognition, then is part of representative ability. Children show us that they know something by doing it, by creating or responding to a picture image of it, or by using an abstract symbolic means such as a number or language to represent it.

The stage of reading and writing seems not to develop naturally in children but requires training and encouragement. All peoples in the world have a spoken language but not all a written one. Pictures form a link between existing cognitive schemas and the emergence of reading and writing. Greater use of pictures in preschool education and promoting picture books for young Indian children could enhance symbol development and future literacy. The significance of picture perception is best expressed by Serpell and Deregowski (1980).

'. . . An understanding of skills required in picture perception is likely to carry implications for the design and distribution of a wide range of educational material, especially in nations of the Third World . . .'

The IPPT can be used to identify children and populations who might benefit from intervention. It could also be used for assessment of the ability to assimilate picture material in children and to monitor intervention programmes devised to increase this skill toward the path to literacy.

III CONTRIBUTIONS OF THE KOTA STUDY TO THE FIELD OF DEVELOPMENTAL MEDICINE

* A test of early cognitive development, emphasizing language, has been constructed and standardised for three socioeconomic groups of Indian preschool children. The scientific development included cultural adaptation, item analysis, standardisation and establishment of norms for three socioeconomic groups. Other psychometric studies include inter-rater reliability, test-retest reliability, face and content validity. This could prove particularly useful to professionals, including paediatricians and speech therapists in clinical practice.

* An innovative method of scoring has been developed taking the Indian context into consideration i.e.

immature ability in analysing pictorial representation, multilingual background and limited social interaction with adults particularly in a structured and dyadic manner.

* The importance of the representational medium, particularly pictures, in tests of language in the Indian population has been highlighted.
* A hypothesis on the development of picture interpretation in the Indian population has been presented. It differs from picture perception in that it is age and experience dependent.
* The findings on picture perception raise the question of an association of picture literacy with future literacy which needs further investigation.
* The results on the performance skills revealed no significant difference ($p<0.05$) between various socio-economic groups. This was contradictory to the findings on the verbal scores indicating that language was more vulnerable to the environment. Intervention programmes enhancing language for the disadvantaged groups could be vital to their development.
* Contrary to Western literature, the Kota study revealed that older rural children (37 to 60 months) who ranked third or more in birth order had significantly higher verbal scores than the first born. Possibly families with many children provide more verbal stimulation. The older sibling acting as a substitute caretaker communicate more with the younger children than her parents did with her. This can be considered in formulation of child-to-child programmes, particularly those enhancing language and literacy .

IV THE FUTURE

Further work is necessary to strengthen the psychometric properties of the IPPT. Studies of the IPPT in clinical practice and as a research tool are needed to substantiate its envisaged uses. Several avenues for research in the field of Developmental Medicine have opened up as a result of this piece of research.

Further work to strengthen the psychometric status of the IPPT-

Further work is required on some psychometric properties of the Indian Picture Puzzle Test to refine and strengthen its status and include the following:

* Further reliability studies, particularly inter-examiner reliability, is required. Additional test-retest data is needed; another 27 cases would bring the data set to the advised 10 per cent of sample size.
* Studies of concurrent and predictive validity are important. As Wall et al (1991) report the problem of validation is complex and difficult in developing countries; however, a reasonable solution needs to be found if a newly constructed test like the IPPT is to be meaningful.

Predictive validity could be determined by following up children who were estimated to be below average by the IPPT and observing their later language development and/ or school performance. The Stanford Binet (Kulshrestha 1971) has been standardised on older children and could serve as an external crite-

rion for predictive validity.

The ICMR Developmental Test Battery is presently undergoing standardisation nationwide on a large sample of the low socioeconomic population. It is a screening instrument with simple culturally appropriate milestones in 5 developmental areas - motor, cognitive, language, social life skills and self-help abilities. Once standardised and validated it could be used to determine concurrent validity of the IPPT for the disadvantaged group.

Further investigation of treatment validity would be valuable. It will be important to include an untreated control group, and increase sample size.

* Productivity statistics which include specificity and sensitivity indices, yield and predictive value need to be ascertained, particularly when the test is modified for surveillance by field workers.

* Competent assessors are essential for a test to be effective as a screening tool. Studies are needed to determine the qualifications of the tester. It is hoped that doctors, psychologists, speech therapists and teachers can be trained to use the IPPT. Inter-examiner reliability studies should include these groups.

* Applicability of the IPPT in the varied ethnic and linguistic populations from different parts of the country is important in the context of nationwide usage and requires further study.

Envisaged applications of the IPPT

Once the status of the IPPT is strengthened its uses are envisaged as follows.

Clinical use :

* It will be suitable for use by professionals, including paediatricians in clinical practice for a first stage analysis of a child's cognitive profile. It could also be used to identify children with developmental problems within each socioeconomic groups and to identify subpopulations in need of intervention.

* Once its predictive validity has been measured the IPPT could be used to design and monitor intervention programmes. The profile of the IPPT in a target population could be used to plan interventions which embody aspects of development measured by the test. Such programmes could be incorporated in large, ongoing intervention projects like the ICDS.

Research use

* The IPPT could be used to help establish prevalence rates for learning and language problems; to compare the effects of child rearing practices on early development particularly language and to compare the cognitive development of subpopulations; to evaluate the effect of early language development

on later ability for higher abstract thinking and later educational performance; to investigate the development of picture perception/interpretation and the question of a critical period.

For surveillance

* Once modified for use by field workers the IPPT could be used for clinical surveillance within subpopulations. As a research tool, the test could also be used to highlight important social, educational and health trends; thus plan health and social service resources and influence social and political thinking. For example, preschool education may be more important to literacy than adult literacy programmes and may deserve greater resources.

Thus the test has potential as a tool for clinical practice, for assisting in the design and monitoring of intervention programmes, for research and after modification for child surveillance.

Further avenues of research :

The findings of this thesis have opened up several avenues of research in the field of Developmental Medicine and include aspects of test administration in Third world countries.

One notable area is that of the development of picture perception and other perceptual skills because pictures are implicit in many psychological tests and play an important role throughout education. The relationship of the development of pictorial representation to literacy will make a fascinating area of research. Werner and Kaplan (1963), Piaget (1956) and Reynell (1980) have all stressed the importance of symbol formation to language development. Its importance to emerging literacy needs to be studied. This research further emphasizes vulnerability of language development to environmental factors. Studies to determine their nature and relative impact assumes importance in the context of widespread adversity in India.

Contrary to Western studies, later-born children in the rural sector showed better language development than firstborns. Studies to verify these findings and explore possible causes will be of value.
Studies to justify the innovative methods of scoring introduced in the IPPT may be pertinent in the context of the widespread use of pictures in other developmental tests and the multilingual climate of Third World countries.

Pretest play, food inducements and occasional coaxing were used to obtain responses. Absence of these motivational factors affect test-retest reliability in disadvantaged groups (Ziegler et al 1973). Further studies are needed to substantiate the usage of incentives in test administration in India.

The author proposes to publish the test after it has been refined and make it available for professional use.

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DESIGN AND STANDARDISATION OF A DEVELOPMENTAL TEST FOR INDIAN CHILDREN
THE INDIAN PICTURE PUZZLE TEST

A thesis submitted to the University of London for the degree of Doctor of Philosophy in the Faculty of Medicine

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VOLUME II
APPENDIX

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APPENDIX

TEXT

STANDARDISATION

THE MARKET RESEARCH SOCIETY - SOCIOECONOMIC

CLASSIFICATION (1990)

The classification of SES is based on the level of education of the head of the family and his/her occupation. Income is not considered.

Levels of Education:

There are seven education levels in all :

1) Illiterate
2) School to 4 years
3. School from 5 to 9 years
4) High School
5) Some college education but not graduates (Diplomas)
6) Graduation/Post graduation (General)
7) Graduation/Postgraduatlon (Professional)

Levels of Occupation:

Level I - Unskilled workers: E.g. peons, messengers, safaiwalas, cooks, waiters, stewards, helpers in shops, domestic servants, hamals, unarmed security guards, ward boys etc

Level II - Skilled Workers: Workers who handle machinery or require special training/diplomas e.g. drivers, mechanics, repairmen, electricians, wiremen, wrapers, firemen, tailors, fitters etc. Occupations considered equivalent are jawans and constables in police and security forces.

Level III - Petty Traders: Traders and persons engaged in providing personal services (e.g.dhobi) who have no pucca establishment i.e.hawkers, street vendors, owners of some pan bidi shops, urban owners of livestock.

Level IV - Shop owners : Those engaged in providing retail, restaurant, personal services and operating from a pucca establishment. The category encompasses most shop owners,grocers, general merchants, as well as miscellaneous categories like money lenders, real estate agents, petty landlords who have no other occupation.

Level V - Businessmen/Industrialists: Wholesalers, hoteliers industrialists,builders contractors i.e. self employed persons not classified as petty traders, shopowners or professionals.

Level VI - Self employed professionals: Independent professionals such as lawyers, architects, cinematographers, actors, authors, doctors.

Level VII - Clerical/Salesmen: The category includes white collar workers such as clerks, salesmen, shop assistants, fieldworkers.

Level VIII - Supervisory level: Those in supervisory/regulatory positions who are not senior enough to be called officer/executives' e.g. Head Constables, Head Clerks, Station Masters, Civil Over seers. Occupations considered equivalent : school teachers teaching at 9th standard level or below.

Level IX-X - Executives - junior level and middle/senior level: In case of government servants, officers/executives are those who are Gazetted Officers or of equivalent level. In case of public/private sector companies, these are people who are in the management cadre of the company.

TABLE III.21 A - MRS CLASSIFICATION

				Education			
Occupation	**Illit.**	**4 yrs**	**5-9 yrs**	**High**	**Dip.**	**G.Coll.**	**Pr.Coll.**
Unskilled worker	8	8	7	6	6	6	6
Skilled worker	8	8	7	6	5	4	4
Petty trader	8	7	7	6	6	6	6
Shop owner	7	6	5	4	3	2	2
Businessmen/ Industrialist	5	5	5	3	3	2	1
Self employed professionals	6	6	6	5	4	2	1
Clerical/Salesmen	6	6	6	5	4	3	3
Supervisory level	6	6	6	5	4	3	2
Officers/Executives - Junior	3	3	3	3	3	2	1
Officers/Executives - Middle/Senior	2	2	2	2	2	1	1

The 'businessmen' category is to be broken up further according to size of business

Table III.21 B

No. of Employees	Education of CWE						
	Illiterate	School upto4 years	School 5-9 years	SSC/ HSC	Some college (dipl.)	Graduate/ Post Graduate	Graduate/ Post-Grad Profess-ionals
	1	2	3	4	5	6	7
None	7	7	5	4	3	2	1
1 - 4	6	6	3	3	3	2	1
5 - 9	4	4	3	3	3	2	1
10 +	2	2	2	2	2	1	1

* CWE : Chief Wage Earner

SAMPLE SIZE

A method for determining sample size (Lawley D.N. 1950) using variance of the per centiles is described below:

$V = \frac{pq}{nf2}$ where p is the percentile (20% = 0.2)
q is 1-p = (0.8)
n is the number in the group
f is the density at the point
(number - interval width)

If the variance V is taken as 1 i.e. $V = 1$ then $n = \frac{pq}{f2}$

This means that the standard error (S.E.) is also taken as 1.

Example : Taking one year/socioeconomic groups as an example.

Year 2 : Socioeconomic group = Middle class (M
Total number n = 26

Score	% age	Cumulative % age
.	.	.
.	.	.
5	3.8	15.4
6	3.8	19.2 20th percentile
7	3.8	23.1

$$\text{mean } f = \frac{1/3\ (3.8 + 3.8 + 3.8)}{100} = .-38 = .04$$

p = 0.2
q = 0.8
f = 0.4
n required for SE (Standard Error) = 1 v= 1 is given
by $n \frac{0.2x0.8}{(.4)2} =$ 100 in that group.

That would mean we need 400 children in each year interval from all socioeconomic classes. So far year 2,3,4 & 5 we need 4 x 400 = 1600 children

The sample size for the study should be 1600.

INTERPOLATION OF CENTILES

One of the standard methods used for interpolation of centiles is given below (Guilford and Fruchter 1987):

$$m = \frac{Lm + (PX - F) \times w}{fm}$$ where

m = percentile value

pm = lower limit of the class interval containing the centile points.

PX = percentile value item (centile point)

F = Cumulative frequency of the class interval below Lm

fm = frequency of the interval containing the centile point.

w = class interval..

APPENDIX
TABLES

TABLE II.1 **LANGUAGES PER COUNTRY**

No.of languages	No. of countries of the world	Percentage of countries
1	6	4 %
2	22	14 %
3 - 5	27	19 %
6 - 50	24	16 %
11 - 50	46	30 %
Over 50	28	18 %

source - Coulmas (1984)

TABLE V.2

STATEWISE DISTRIBUTION OF LANGUAGES

Name of the State/ Territory	No.of Indian mother tongues spoken	No.of foreign mother tongue spoken	Total
Andhra Pradesh	186	24	210
Assam	162	30	192
Bihar	121	32	153
Gujrat	106	32	138
Jammu & Kashmir	90	13	103
Kerala	69	41	110
Madhya Pradesh	233	25	258
Madras	100	59	159
Maharashtra	410	53	463
Mysore	128	42	170
Nagaland	89	6	95
Orissa	50	8	58
Punjab	135	26	161
Rajasthan	78	11	89
Uttar Pradesh	117	25	142
West Bengal	236	37	273
Delhi	92	49	141
Himachal Pradesh	203	7	210
Goa, Daman and Diu	15	13	28
Pondichery	36	19	55
Dadara & Nagar Haveli	23	3	26
L.Mm. & Islands	12	2	14
A. & N.Islands	65	8	73
Manipur	82	5	87
Tripura	107	5	112
NEFA	162	6	168

(source: Census of India - 1961)

HINDI

NIA - New Indo Aryan language
Script - Devanagiri
Stress - not phonemic
Morphology & syntax : no article two genders word order - subject object verb (Katzner 1986)

Characteristic

It is the most widely spoken Indian language. There are two hundred and twenty five million speakers of Hindi in the world. It thus forms one of the leading languages in the world.

Yet only one third of Indians understand it. It is also the most common inter-regional 'contact' language of India. Other countries using Hindi are Fiji, Mauritius , Trinidad , Guyana, Suriname.

It has descended from Sanskrit with Sanskrit characters. It is akin to Urdu which has Perso Arabic script. Hindustani/Hindavi is the old Hindi which is a precusor to both Hindi and Urdu and was spoken for over 4 centuries.

Hindi developed into a National language because the British cultivated it during the 18th and 19th century.

In India, Hindi serves as a majority language in six states with the following percentages: Rajasthan (91.13 %), Haryana (89.24 %), Uttar Pradesh (88.54%) Himachal Pradesh (86.87 %), Madhya Pradesh (83.3 %) and Bihar (79.77 %) as well as in two Union Territories Delhi (75.97 %) and Chandigarh (55.96 %). It is the numerically second most important language in the Punjab (20 %) and West Bengal (6.13 %) and is third in number in no less than five states Jammu Kashmir, Maharashtra, Andhra Pradesh Tripura and Assam. Thirty eight per cent of India has Hindi as its mother tongue.

Hindi is a contact language in more than one third of the entire bilingual population and takes on the communicative load on the all India scene.

RESEARCH DESIGN AND METHODOLOGY

TABLE III.1

MODEL I

DISTRIBUTION OF RAW SCORES AND DEVELOPMENTAL AGE IN EACH SECTION OF MODEL I

THE TEST N = 27

CA	Expressive verbal labels		Comprehension of verbal labels		Comprehension of questions		Expression on questions	
	Raw scores	DA	Raw scores	DA	Raw scores	DA	Raw scores	DA
44	18	30	8	27	3	28	9	34
40	21	31	7	26	4	30	15	40
39	21	32	8	27	4	30	13	36
41	24	36	8	27	5	33	13	36
39	22	33	6	25	4	30	11	34
37	20	31	8	27	5	33	13	36
33	21	32	8	27	4	30	11	34
33	24	36	7	26	6	36	12	35
37	18	30	8	27	6	36	17	46
33	20	31	8	27	4	30	11	34
39	25	42	9	30	4	30	11	34
37	16	28	8	27	6	36	15	40
39	24	36	9	30	6	36	15	40
35	20	31	9	30	6	36	14	39
36	26	43	7	26	4	30	11	34
42	24	36	8	27	6	36	17	46
42	27	48	9	30	6	36	16	45
40	24	36	9	30	5	33	16	45
42	25	42	9	30	6	36	15	40
33	15	29	7	26	6	36	16	45
47	22	33	9	30	4	30	12	35
55**	23	35	9	30	5	33	14	39
53**	20	31	9	30	5	33	10	33
50**	25	42	8	27	5	33	14	39
42	15	29	8	27	5	33	11	34
41	24	36	9	30	5	33	16	45
42	27	48	9	30	6	36	17	46

Ages are given in months

CA = Chronological age ** children over the upper age limit (48 mths) of the English sample

DA = Developmental age - estimated from raw scores applied to the 50th centile curve in the Egan Bus Puzzle Test

TABLE III.2

EXPRESSIVE VERBAL LABEL :Distribution of types of response (N) for each item

N (%) = 27 (100)

	Dog	Car	Bus	Boy	Mummy	Post box	Police man	Bag	Bicycle	Total
no reply	1 (4)	0	0	3 (11)	2 (7)	10 (37)	8 (30)	6 (22)	2 (7)	32 (13)
Generic term	0	0	0	1 (4)	1 (4)	6 (22)	7 (26)	3 (11)	1 (4)	19 (8)
Functional term	1 (4)	0	0	0	3 (11)	2 (7)	2 (7)	1 (4)	0	9 (4)
Proper term	25 (73)	27 (100)	27 (100)	23 (85)	21 (78)	9 (33)	10 (37)	17 (62)	24 (89)	363 (75)

TABLE III.3

COMPREHENSION OF QUESTIONS - N (%) = 27 (100)

-	Questions					
	1	2	3	4	5	6
Correct response :	22 (81)	26 (96)	24 (89)	16 (59)	26 (96)	18 (67)

TABLE III.4

EXPRESSION ON QUESTIONS :Distribution of types of responses (N) for each item

N (%) = 27 (100)

	Question Number						
	1	**2**	**3**	**4**	**5**	**6**	Total
No reply	6	1	2	9	7	7	32(20)
Gesture	2	1	0	1	3	3	10(6)
1-2 word sentence	1	6	11	4	8	8	38(23)
3 or more word sentence	18	19	14	13	9	9	82(51)

MODEL II:

TABLE III.5

VERBAL LABELS IN THE ADAPTED SCENES:-

1. Street Scene

Vehicle	:	bus, car, cycle
Person	:	mummy, girl, coolie, policeman, sweeper, green grocer, baby
Animal	:	dog
Objects	:	trunk, steps, waterpump, bucket.

2. Courtyard Scene

Vehicle	:	bus, car, cycle
Person	:	mummy, girl, postman, baby
Animal	:	dog
Objects	:	water pump, steps, schoolbag, bucket, tree

3. Railway Scene

Vehicle	:	train, cycle
Person	:	mummy, girl, coolie, guard, baby
Animal	:	dog
Objects	:	water pump, clock, bench, trunk, steps, bucket.

4. Inside the house

Vehicle	:	cycle
Person	:	baby, boy, postman, girl, mummy,
Animal	:	dog
Objects	:	stove, chair, cot, light, fan, mirror, tap, bucket,

MODEL II

Table III.6:

QUESTIONS ON ILLUSTRATED SITUATIONS IN THE ADAPTED SCENCES:-

1. Street Scene

Level	I	Ques.	-	What is mummy doing ?
		Ans.	-	Bathing baby
Level	II	Ques.	-	Why do we have steps ?
		Ans.	-	To go up / come down
Level	III	Ques.	-	What Is the boy doing ?
		Ans.	-	Riding a bike.
Level	IV.	1.Ques	-	What is mummy doing ?
		Ans.	-	Buying vegetables.
		2.Ques.	-	What is the sweeper doing?
		Ans.	-	Sweeping the floor.
Level	V	Ques.	-	What is the coolie doing ?
		Ans.	-	Loading the bags on the bus.
		Ques.	-	What is the man doing?
		Ans.	-	Pumping water.
Level	VI	Ques.	-	What is the policeman doing ?
		Ans.	-	Directing traffic.

2. Courtyard Scene

Level	I	Ques.	-	What is mummy doing?
		Ans.	-	Bathing baby.
Level	II	Ques.	-	Why do we have steps ?
		Ans.	-	To go up.
Level	III	Ques.	-	What is the boy doing?
		Ans.	-	Writing (Reading/Drawing/Painting)
Level	IV	Ques.	-	What is mummy doing ?
		Ans.	-	Buying vegetables.
Level	V	Ques.	-	What is the girl doing ?
		Ans.	-	Pointing to the balloons (asking for the balloons)
Level	VI	Ques.	-	What is the postman doing ? or What does a postman do
		Ans.	-	Delivering letters.

3. Railway Station

Level	I	Ques.	-	What is mummy doing ?
		Ans.	-	Bathing baby
Level	II	Ques.	-	Why do we have steps ?
		Ans.	-	To go up / come down
Level	III	Ques.	-	What is the Chaiwalha (man at the tea stall) doing ?
		Ans.	-	Making tea.
Level	IV	Ques.	-	What is the family doing ?
		Ans.	-	Boarding the train.
Level	V	Ques.	-	What is the little girl doing ?
		Ans.	-	Pointing to the toys.
		Ques.	-	What are clocks for ?
		Ans.	-	Telling the time.
Level	VI	Ques.	-	What is the guard doing ?
		Ans.	-	Signaling for the train to go

4. Inside a home

Level	I	Ques	-	What is the girl doing ?
		Ans.	-	Sleeping.
Level	II	Ques.	-	What is the boy doing ?
		Ans.	-	Studying/reading.
Level	III	Ques.	-	What is the lady doing ?
		Ans.	-	Combing her hair.
		Ques.	-	What is mummy doing?
		Ans.	-	Cooking.
Level	IV	Ques.	-	What are taps for ?
		Ans.	-	To get water.
Level	V	Ques.	-	What is a fan for ?
		Ans.	-	To cool the room.
Level	VI	Ques.	-	What is the postman doing ?
		Ans.	-	Delivering letters.

TABLE III.8 :

A DETAILED DESCRIPTION OF VERBAL LABELS INCLUDED IN MODEL III

Verbal labels : (PHOTO III.8 TO III.20, p 315, 316)

1. DOG : A black and white dog is shown eating some food in the left hand corner of the courtyard, close to the cot. He has his tongue stuck out and some food is lying in front of him. size = (7 cm x 3 cm). It is a lift out piece.

2. GIRL : A girl with her back to the viewer is shown in the right hand corner of the courtyard. She is watching and pointing to a boy climbing the tree. Size = 9 cm x 3cm. It is a lift out piece.

3. LADY : A woman is shown sitting under the tree and bathing a baby. She is wearing a sari and is holding a mug of water in her hand with which she is pouring water. Size = 8x4 cm. It is a lift out piece.

4. BED : A string cot is lying in the courtyard near the dog. A girl is shown sleeping on it. Size = 9x4cm. It is a lift out piece.

5. TREE : There is a tree in the right side of the courtyard with a kite stuck in the branches. A boy is trying to climb the tree. Size = 18x12cm. It is a lift out piece.

6. KITE : A kite is stuck in the branches size (3x2mm). It is part of the tree.

7. MIRROR : A lady is standing in front of the mirror combing her hair in the left hand section of the house. She has her back to the viewer and her face is visible in the mirror. The mirror is a square hanging on the wall. Size = 3x3.2 cm. It cannot be lifted out.

8. CYCLE : A postman sits on a cycle on the right hand side of the courtyard. Size = 10x2 cm. It is a lift out piece.

9. POSTMAN : He sits on the cycle and holds some envelops in his hand. He has a few parcels strapped on to the cycle and carries a shoulder bag. Size = 7.5x12.5 cms. It can be lifted out with the cycle.

10. BUCKET : It is lying under the taps on the outside of the house. The mother is bathing her baby near the bucket. Size = 3x2 cm. It is a lift out piece.

11. FAN : A ceiling fan is hanging inside the house. It has three vanes. Size = 7x5 CM. It is a lift out piece.

12. CLOCK : There is a round clock hanging on the wall inside the house on the right side of the fan. Size = 3cm. It is a lift out piece.

13.BABY: A small nude baby is sitting besides the mother near the bucket. Size = 4x3 Cm. It is a lift out piece.

14.BOY: A boy lies on his stomach in the courtyard, reading a book. Some books and a schoolbag lie besides him. Size = 10x5 cm. It is a lift out piece.

15.CHAIR: There is a wooden chair with a straight back, inside the house. Size = 5.5x3 cm. It is a lift out piece.

16.STOVE: An old model of a stove used in poorer homes lies in the kitchen in the house. Pots and pans are lying around. A woman is making a chapati, in front of the stove. A pan is seen with flames under it sitting on the stove. Size = 2.8 x 3cm. It is a lift out piece.

17.STEPS: A couple of steps are seen leading up in to the house. Size = 11.1x1.5 cms. It is not a lift out piece.

18.TAPS: A couple of taps, attached to a water pipe are seen on the outer wall of the house. Water gushes out from one to fill a bucket underneath. Size = 1.2x1.6 cms.It is not a iiftout piece.

19.LIGHT: A bulb with a red shade hangs in the left hand corner of the house. Slze = 2.5x2.5 cms. It is not a liftout piece.

Table III.9

A DETAILED DESCRIPTION OF ILLUSTRATED SITUATIONS INCLUDED IN MODEL III (PHOTO III.8 TO III.20, p 315, 316)

1. 'What is mummy doing ?' - Bathing baby.

A lady is sitting by the tree with a bucket near her. She has a tumbler in one hand with which she is pouring water on a baby who she is steadying with her other hand.

2. 'What is girl doing ?' - Sleeping.

A girl lies on her side on the string bed with her head on a pillow. She has her hands folded by her head and her eyes are shut.

3. 'What is dog doing ?' - Eating.

A dog sits near the steps in the courtyard. He has his tongue out and there is some food lying in front of him.

4. 'What are taps for ?' - for water.

A set of taps are attached to a water pipe on the outer wall of the house with water gushing out of one of them. A bucket is being filled underneath.

5.' What boy doing ? ' - Reading.

A boy is lying on the floor of the courtyard with a book in his hand. A couple of books and a schoolbag lie close to him.

6. 'What is the lady doing ?' - Combing her hair.

A lady stands with her back to the viewer, facing a mirror. She has a comb in her hand and is seen combing her hair. Her face is seen in the mirror.

7. What are steps for ?' - To go up.

A couple of steps lead in to the house.

8. 'Why do we have a fan ?' - To cool the room.

A fan hanging from the ceiling in the house is pointed to for this question.

9. 'What is a clock for ?' - To show time.

The clock on the wall in the house is pointed to.

10. What is mummy doing ?' - Cooking or making a chappati.

A woman sits in front of a stove with a chapatti in her hands. She is surrounded with traditional cooking utensils.

11. What is boy doing ?' - Retrieving his kite.

A boy is shown clasping the tree as he tries to climb it. A kite is stuck in the branches above.

12. 'What is postman doing ?' - Delivering letters.

A postman is extending his arm to give letters. He is sitting on a cycle and carries a postbag on his shoulder.

13. 'Why do we have mirrors ?' - To see ones reflection.

The mirror hanging on a wall in the house is referred to.

14. 'What might be in the schoolbag ?' - Books, pencils, rubber...

The schoolbag lying next to the boy is referred to.

Table III.10 :

DISTRIBUTION OF RAW SCORES, RANGE, MEAN ( ), AND STANDARD

DEVIATION { } ACCORDING TO AGE AND SOCIOECONOMIC GROUP.

AGE (mths)	URBAN Upper	Middle	Lower	RURAL
EXPRESSIVE VERBAL LABELS :				
< =36	0-31(15){9.71}	0-32(13.7){9.86}	0-32(9.0){10.66}	0-18(5){ 6.34}
37 - 48	9-38(27){6.02}	11-37(27.0){6.33}	0-32(19.5){ 9.66}	0-36(13){10.69}
49 - 60	17-35(30){4.09}	12-37(30.0){5.82}	0-37(26.0){8.72}	3-32(22){ 6.84}
COMPREHENSION VERBAL LABELS :				
< =36	3- 19(11.0){5.20}	0-19(11){4.72}	0-17 (8){5.36}	0-14 (7){3.91}
37 - 48	9-19(16.0){2.58}	11-19(16){2.20}	3-18(13){3.08}	0-18(11){3.99}
49 - 60	14-19(17.5){1.29}	10-19(17){2.25}	1-19(15){3.45}	7-18(14){2.57}
COMPREHENSION ILLUSTRATED SITUATIONS:				
< =36	0- 9(3.5){3.06}	0-12(3.5){3.21})	0-13(2){3.73}	0- 6(1){1.54}
37 - 48	0-14(9.0){3.17}	3-14(9.0){2.62}	0-12(5){3.71}	0-10(3){3.06}
49 - 60	4-14(11.0){2.55}	1-14(11.0){2.89}	0-14(8){3.51}	1-12(6){3.19}
EXPRESSION ILLUSTRATED SITUATIONS:				
< =36	0-41(19){14.37}	0-40(19){14.30}	0-43(9){13.45}	0-40(5){10.83}
37 - 48	0-47(38){ 8.79}	16-44(37){ 6.16}	0-45(25){15.31}	0-44(18){15.41}
49 - 60	28-49(42) {4.75}	4-47(39){10.41}	0-47(36){10.20}	1-44(30){10.79}
RECOGNITION OF RECESS:				
< =36	0-13(8){3.95}	0-13(7){2.77}	0-12(8){3.64}	0-13(8){3.74}
37 - 48	9-13(12){1.17}	8-13(11){1.49}	6-13(11){2.09}	8-13(12){1.45}
49 - 60	8-13(13){1.04}	10-13(12){0.95}	10-13(13){0.76}	8-13(12){1.4}
ORIENTATION OF PIECE:				
< =36	0-13(7){3.46}	0-12(7){3.05}	0-12(7){3.32}	1-13(7){3.57}
37 - 48	8-13(11){1.37}	5-13(10){2.22}	6-13(9){1.96}	6-13(10){1.76}
49 - 60	7-13(12){1.59}	8-13(12){1.42}	8-13(12){1.17}	8-13(11){1.72}

TABLE III.11 - A

ITEM DISCRIMINATION :- RANK ORDER ACCORDING TO AGE GROUP

EXPRESSION VERBAL LABELS

< = 36 mths.		37-48 mths.		49-60 mths.	
ITEM	**IDI**	**ITEM**	**IDI**	**ITEM**	**IDI**
FAN	.82	TAP	.80	CHAIR	.67
CYCLE	.79	TREE	.78	BUCKET	.58
BABY	.74	BUCKET	.74	MIRROR	.56
BOY	.68	CLOCK	.69	TREE	.56
GIRL	.68	CHAIR	.65	TAP	.56
CHAIR	.61	GIRL	.65	STOVE	.51
KITE	.61	FAN	.61	FAN	.38
CLOCK	.58	BABY	.57	LIGHT	.38
BED	.58	KITE	.56	CLOCK	.38
LADY	.55	BED	.56	BABY	.38
DOG	.47	CYCLE	.52	STEPS	.38
TAP	.45	MIRROR	.50	GIRL	.33
TREE	.45	LADY	.46	KITE	.33
BUCKET	.34	DOG	.41	LADY	.31
LIGHT	.32	BOY	.39	BOY	.27
STOVE	.18	LIGHT	.35	CYCLE	.27
MIRROR	.18	STEP	.33	BED	.22
STEP	.11	STOVE	.28	DOG	.20
POSTMAN	.02	POSTMAN	.09	POSTMAN	.02

IDI - Item Discrimination index

TABLE III.11 - B

ITEM DISCRIMINATION :- RANK ORDER ACCORDING TO AGE GROUP

COMPREHENSION VERBAL LABELS

< = 36 mths.		37-48 mths.		49-60 mths.	
ITEM	IDI	ITEM	IDI	ITEM	IDI
CHAIR	.84	MIRROR	.74	POSTMAN	.80
BED	.76	TAP	.74	MIRROR	.78
BUCKET	.76	STOVE	.70	STEPS	.71
KITE	.74	STEPS	.70	STOVE	.49
FAN	.74	LIGHT	.67	CHAIR	.44
CLOCK	.74	BUCKET	.59	LIGHT	.42
TAP	.66	CHAIR	.52	TAP	.38
BABY	.61	POSTMAN	.52	BUCKET	.29
TREE	.61	KITE	.43	KITE	.18
GIRL	.55	BED	.24	TREE	.16
LADY	.55	CLOCK	.24	DOG	.07
DOG	.55	TREE	.22	CLOCK	.04
STOVE	.55	DOG	.07	GIRL	.04
BOY	.53	FAN	.19	LADY	.04
CYCLE	.42	BABY	.17	FAN	.02
LIGHT	.42	LADY	.07	BED	.02
MIRROR	.34	GIRL	.06	BOY	.02
STEPS	.34	CYCLE	.06	BABY	.02
POSTMAN	.32	BOY	.03	CYCLE	.00

TABLE III.11 - C

ITEM DISCRIMINATION :- RANK ORDER ACCORDING TO AGE GROUP

COMPREHENSION OF QUESTIONS ON ILLUSTRATED SITUATIONS

< = 36mths.		37-48mths.		49-60mths.	
QUES.	IDI	QUES.	IDI	QUES.	IDI
C1	0.87	C13	0 .90	C1	0.75
C3	0.68	C1	0 .76	C5	0.71
C8	0.66	C4	0.74	C10	0.69
C14	0.63	C14	0.74	C9	0.69
C4	0.58	C5	0.70	C7	0.65
C5	0.47	C7	0.70	C4	0.62
C11	0.47	C10	0.63	C13	0.62
C7	0.39	C9	0.61	C6	0.60
C9	0.34	C6	0.59	C12	0.58
C6	0.29	C8	0.57	C8	0.49
C13	0 .26	C3	0.52	C2	0.49
C2	0.24	C11	0.46	C14	0.27
C10	0.18	C2	0.43	C11	0.22
C12	0.18	C12	0.37	C3	0.18

TABLE III.11 - D

ITEM DISCRIMINATION :- RANK ORDER ACCORDING TO AGE GROUP

RECOGNITION OF RECESS :

< = 36 mths		37-48 mths		49-60 mths	
ITEM	IDI	ITEM	IDI	ITEM	IDI
BUCKET	0.72	CHAIR	0.62	BABY	0.36
GIRL	0.68	STOVE	0.54	CHAIR	0.23
TREE	0.68	GIRL	0.40	DOG	0.21
CYCLE	0.65	BABY	0.33	LADY	0.18
CLOCK	0.61	DOG	0.28	STOVE	0.13
LADY	0.58	FAN	0.23	CYCLE	0.10
DOG	0.50	LADY	0.21	GIRL	0.10
FAN	0.44	BUCKET	0.26	FAN	0.08
BOY	0.43	CYCLE	0.15	CLOCK	0.08
STOVE	0.43	CLOCK	0.13	BUCKET	0.05
BED	0.40	BED	0.08	BOY	0.00
CHAIR	0.34	BOY	0.08	BED	0.00
BABY	0.30	TREE	0.00	TREE	0.00

TABLE III.11 - E

ITEM DISCRIMINATION :- RANK ORDER ACCORDING TO AGE GROUP

ORIENTATION OF PIECE

< = 36 mths		37-48 mths		49-60 mths	
ITEM	IDI	ITEM	IDI	ITEM	IDI -
LADY	0.68	CHAIR	0.51	STOVE	0.67
BUCKET	0.65	STOVE	0.47	FAN	0.46
CHAIR	0.61	FAN	0.36	DOG	0.36
BABY	0.58	BABY	0.36	CHAIR	O.28
BOY	0.58	GIRL	0.36	BABY	0.28
CYCLE	0.58	LADY	0.31	BUCKET	0.23
GIRL	0.57	CYCLE	0.28	LADY	0.18
FAN	0.55	DOG	0.26	BED	0.18
STOVE	0.55	BED	0.26	GIRL	0.15
DOG	0.55	BOY	0.26	CYCLE	0.13
TREE	0.47	BUCKET	0.24	BOY	0.08
BED	0.43	CLOCK	0.10	CLOCK	0.03
CLOCK	0.25	TREE	0.08	TREE	0.00

ITEM DISCRIMINATION - FURTHER ANALYSIS

Items falling In the first 5 ranks for any age group were tabulated.

TABLE III.12 - A

ITEM DISCRIMINATION OF VERBAL LABELS -list of items falling in first five ranks in each age group

EXPRESSION				COMPREHENSION			
ITEM	Age (mths)			ITEM	Age (mths)		
	< = 36	37-48	49-60		< = 36	37-48	49-60
FAN	*	-	-	CHAIR	*	-	*
CYCLE	*	-	-	BED	*	-	-
BABY	*	-	-	BUCKET	*	*	-
BOY	*	-	-	KITE	*	-	-
GIRL	*	*+	-	FAN	*	-	-
TAP	-	*	*	MIRROR	-	*	*
TREE	-	*	*	TAP	-	*	-
CLOCK	-	*	-	STOVE	-	*	*
CHAIR	-	*+	*	LIGHT	-	*	-
BUCKET	-	*	*	POSTMAN	-	-	*
MIRROR	-	-	*	STEPS	-	*	*

-KEY:- * within first 5 ranks; - not present in first 5

\+ ' CHAIR' and 'GIRL' ranked equal fifth are therefore both included

TABLE III.12 - B

COMPREHENSION OF QUESTIONS ON ILLUSTRATED SITUATIONS -

List of questions falling in first five ranks in each age group

QUESTION		AGE (mths)		
		< = 36	37 - 48	49 - 60
1. C1 -	WHAT iS MUMMY DOING (Bathing baby)	*	*	*
2. C3 -	WHAT iS GIRL DOING (Sleeping)	*	-	-
3. C8 -	WHAT IS DOG DOING (Eating)	*	-	-
4. C13 -	WHAT IS BOY DOING (Retrieving kite)	-	*	-
5. C4 -	WHAT IS BOY DOING (Reading)	*	*	-
6. C5 -	WHAT IS LADY DOING (Combing hair)	-	*	*
7. C10 -	WHAT IS CLOCK FOR	-	-	*
8. C9 -	WHY DO WE HAVE STEPS	-	-	*
9. C14 -	WHAT MIGHT BE IN THE SCHOOL BAG	*	*	-
10. C7 -	WHAT IS A FAN FOR	-	-	*

KEY:- * Within first 5 ranks; - Not present in first 5

TABLE III.12 - C

RECOGNITION OF RECESS AND ORIENTATION OF PIECE - list of items

falling in first five ranks in each age group:

ITEM	RECOGNITION OF RECESS AGE mths.			ITEM	ORIENTATION OF PIECE AGE mths.		
	< = 36	37-48	49-60		< = 36	37-48	49-60
BUCKET	*	-	-	LADY	*	-	-
GIRL	*	*	-	BUCKET	*	-	-
TREE	*	-	-	CHAIR	*	*	*
CYCLE	*	-	-	BABY	*	*	*
CLOCK	*	-	-	BOY	*	-	-
STOVE	-	*	*	STOVE	-	*	*
BABY	-	*	*	FAN	-	*	*
CHAIR	-	*	*	GIRL	-	*	-
DOG	-	*	*	DOG	-	-	*
LADY	-	*	-	-	-	-	-

KEY:- * within first 5 ranks; - not in first 5 ranks

.

TABLE III.14 - A

SUMMARY OF CHI SQUARE ANALYSIS FOR ITEM BIAS BETWEEN SOCIOECONOMIC GROUPS

AT 5 % SIGNIFICANCE LEVEL

EXPRESSIVE VERBAL LABELS :

Maximum score = 38

VERBAL LABEL	BIAS AT ABILITY LEVELS (SCORE INTERVALS)			
	FIRST	SECOND	THIRD	FOURTH
Fan	NS (0-16)	NS (17-22)	NS (23-26)	NS (=26)
Light	S (0-21)	NS (22-26)	NS (27-30)	NS (=30)
Clock	NS (0-18)	NS (19-24)	NS (25-26)	NS (=27)
Mirror	NS (0-15)	NS (16-23)	NS (24-27)	NS (=28)
Step	NS (0-16)	NS (17-22)	NS (23-26)	NS (=27)
Chair	S (0-24)	S (25-28)	NS (29-31)	NS (=32)
Stove	NS (0-25)	NS (26-29)	NS (30-32)	NS (=32)
Dog	NS (0-16)	NS (17-22)	NS (23-27)	NS (=28)
Bed	NS (0-20)	NS (21-24)	NS (25-26)	NS (=27)
Tap	NS (0-23)	NS (24-27)	NS (28-32)	NS (=33)
Bucket	NS (0-21)	NS (22-24)	NS (25-27)	NS (=28)
Boy	NS (0-17)	NS (18-23)	NS (24-26)	S (=26)
Girl	NS (0-16)	NS (17-22)	NS (23-26)	NS (=27)
Lady	NS (0-16)	S (17-22)	NS (23-26)	NS (=27)
Baby	NS (0-19)	NS (20-25)	NS (26-28)	NS (=29)
Tree	NS (0-23)	NS (24-26)	NS (27-31)	NS (=32)
Kite	S (0-18)	NS (19-23)	NS (24-26)	NS (=27)
Cycle	S (0-15)	NS (16-23)	NS (24-27)	NS (=28)
Postman	Err(0-15)	Err (16-23)	Err (24-27)	S (=28)

Key: S - Significant; NS - Not significant; Err - Error due to too few children in each ability groups.

TABLE III.14 - B

SUMMARY OF CHI SQUARE ANALYSIS FOR ITEM BIAS BETWEEN

SOCIOECONOMIC GROUPS AT 5 % SIGNIFICANCE LEVEL

COMPREHENSION OF VERBAL LABELS :

Maximum score = 19

VERBAL LABEL	BIAS AT ABILITY LEVELS (SCORE INTERVAL)	
	FIRST	SECOND
FAN	NS (0-14)	NS (= 15)
LIGHT	NS (0-15)	NS (= 16)
CLOCK	NS (0-14)	NS (= 15)
CHAIR	S (0-14)	NS (= 15)
MIRROR	NS (0-16)	NS (= 16)
STOVE	NS (0-15)	NS (= 16)
STEPS	NS (0-16)	NS (= 16)
DOG	NS (0-14)	NS (= 15)
BED	NS (0-14)	NS (= 15)
BUCKET	NS (0-14)	NS (= 15)
TAP	NS (0-15)	S (= 16)
BOY	NS (0-14)	NS (= 15)
GIRL	NS (0-14)	S (= 15)
LADY	NS (0-13)	NS (= 14)
BABY	NS (0-14)	NS (= 15)
TREE	NS (0-14)	S (= 15)
KITE	NS (0-14)	NS (= 15)
CYCLE	NS (0-13)	NS (= 14)
POSTMAN	S (0-13)	S (= 14)

Key: S - Significant; NS - Not significant

TABLE III.14 - C

SUMMARY OF CHI SQUARE ANALYSIS FOR ITEM BIAS BETWEEN

SOCIOECONOMIC GROUPS AT 5 % SIGNIFICANCE LEVEL

COMPREHENSION OF QUESTIONS ON ILLUSTRATED SITUATIONS :

Maximum score = 14

QUESTION		BIAS AT ABILITY LEVELS (SCORE INTERVALS)			
		FIRST	SECOND	THIRD	FOURTH
C1	What is mummy doing (Bathing baby)	S (0-4)	S (5-8) S	(9-10)	NS (=11)
C2	What are taps for (For water)	NS (0-5)	NS (6-8)	NS (= 9)	NS (=10)
C3	What is girl doing (Sleeping)	NS (0-4)	NS (5-6)	NS (7-9)	NS (=10)
C4	What is boy doing (Reading)	NS (0-5)	NS (6-8)	NS (=9)	NS (=10)
C5	What is lady doing (Combing hair)	S (0-6)	NS (7-8)	NS (=9)	NS (=10)
C6	What are mirrors for (to see reflection)	NS (0-8)	NS (=9)	NS (=10)	NS (=11)
C7	What is a fan for	NS (0-6)	NS (7-8)	NS (=9)	NS (=10)
C8	What is dog doing (Eating)	NS (0-5)	NS (6-7)	NS (8-9)	NS (=10)
C9	What are steps for (To go up)	S (0-6)	NS (7-8)	NS (=9)	NS (=10)
C10	What is a clock for	NS (0-6)	NS (7-8)	NS (=9)	NS (=10)
C11	What is mummy doing (Cooking)	NS (0-6)	NS (7-8)	NS (=9)	NS (=10)
C12	What does a postman do	NS (0-5)	NS (6-7)	NS (8-9)	NS (=10)
C13	What is boy doing (Retrieving kite)	NS (0-6)	NS (7-8)	NS (=9)	NS (=10)
C14	What might be in the schoolbag	NS (0-6)	NS (7-8)	NS (=9)	NS (=10)

Key S - Significant; NS - Not significant

TABLE III.14 - D

SUMMARY OF CHI SQUARE ANALYSIS FOR ITEM BIAS BETWEEN

SOCIOECONOMIC GROUPS AT 5 % SIGNIFICANCE LEVEL

RECOGNITION OF RECESS

Maximum score 13

-LIFT OUT PIECE	BIAS AT ABILITY LEVEL (SCORE INTERVAL)	
	FIRST	SECOND
FAN	NS (0-11)	NS (11)
LOCK	NS (0-11)	NS (11)
HAiR	NS (0-11)	NS (11)
STOVE	NS (0-10)	NS (10)
DOG	NS (0-10)	NS (10)
BED	NS (0-11)	NS (11)
BUCKET	NS (0-11)	NS (11)
BOY	NS (0-11)	NS (11)
GIRL	NS (0-11)	NS (11)
LADY	NS (0-11)	NS (11)
BABY	NS (0-11)	NS (11)
TREE	NS (0-11)	NS (11)
CYCLE	NS (0-11)	NS (11)

Key: S - Significant; NS - Not significant

TABLE III.14 - E

SUMMARY OF CHI SQUARE ANALYSIS FOR ITEM BIAS BETWEEN

SOCIOECONOMIC GROUPS AT 5 % SIGNIFICANCE LEVEL

ORIENTATION OF LIFT OUT PIECE

Maximum score 13

LIFT OUT PIECE	BIAS AT ABILITY LEVEL (SCORE INTERVAL)	
	FIRST	SECOND
FAN	NS (0-11)	NS (11)
CHAIR	NS (0-10)	NS (10)
CLOCK	NS (0-11)	NS (11)
STOVE	NS (0-11)	NS (11)
DOG	NS (0-10)	NS (10)
BED	NS (0-11)	NS (11)
BUCKET	NS (0-10)	NS (10)
BOY	NS (0-11)	NS (11)
GIRL	NS (0-10)	NS (10)
LADY	NS (0-11)	NS (11)
BABY	NS (0-11)	NS (11)
TREE	NS (0-11)	NS (11)
CYCLE	NS (0-11)	NS (11)

Key: S - Significant; NS - Not significant

TABLE III.16 A

TEST OF SIGNIFICANCE OF EACH ITEM OF CATEGORY 2 / CATEGORY 3 RESPONSES IN DISADVANTAGED CHILDREN (ALL AGE) - AT 5 % LEVEL OF SIGNIFICANCE)

Item	Chi square value	Significance
Fan	4.13	S
Clock	5.00	S
Chair	11.36	S
Mirror	30.00	S
Stove	5.58	S
Bed	2.63	NS
Dog	4.58	S
Bucket	20.00	S
Boy	6.44	S
Girl	7.2	S
Lady	7.6	S
Baby	14.6	S
Tree	6.62	S
Cycle	7.29	S

Key: S - Significant; NS - Not significant.

TABLE III.16 B

TEST OF SIGNIFICANCE OF EACH ITEM OF CATEGORY 2 / CATEGORY 3 RESPONSES IN DISADVANTAGED CHILDREN (ALL AGE) - AT 5 % LEVEL OF SIGNIFICANCE)

Item	Chi square value	Significance
Fan	0.05	NS
Ciock	0.09	NS
Chair	0.72	NS
Mirror	0.02	NS
Stove	2.77	S
Bed	3.17	S
Dog	0.37	NS
Bucket	0.01	NS
Boy	1.59	S
Girl	0.14	NS
Lady	0.05	NS
Baby	0.05	NS
Tree	1.59	S
Cycle	1.35	S

Key: S - Significant; NS - Not significant.

TABLE III.17

TYPES OF RESPONSES IN EXPRESSION VERBAL LABELS IN ADULTS LOWER AND RURAL GROUP

SES	ITEMS														
	CLOCK	FAN	MIRROR	CHAIR	STOVE	DOG	BED	BUCKET	TREE	KITE	CYCLE	GIRL	BOY	LADY	BABY
LOWER															
T0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
T1A	0	0	6	0	5	1	0	2	0	0	0	0	0	0	2
T1B	1	1	1	1	1	1	1	5	1	1	1	2	2	1	1
T2	16	16	8	16	10	15	16	10	16	16	16	15	15	16	14
RURAL															
T0	0	0	6	1	2	1	0	1	0	4	0	0	0	0	0
T1A	3	1	2	0	1	1	0	1	0	1	1	1	1	0	2
T1B	0	0	0	2	0	1	0	1	0	0	1	4	3	0	0
T2	8	10	3	8	8	8	11	8	11	6	9	6	7	11	9

* SES : SOCIOECONOMIC GROUP

* TO , TIA, TIB, T2 : TYPES OF RESPONSES

TABLE III.18

LEVELS OF RESPONSES IN COMPREHENSION OF ILLUSTRATED SITUATIONS IN ADULTS OF LOWER URBAN AND RURAL GROUPS

		Number of responses										
		Q.1	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.10	Q.11	Q.13	Q.14
LOWER	T0	0	0	0	0	0	0	0	0	0	0	0
	T1	0	0	2	1	0	0	0	0	0	0	0
	T2	3	0	0	1	0	1	2	0	0	1	0
	T3	14	17	15	15	17	16	15	17	17	16	17
RURAL	T0	0	0	1	3	2	0	1	0	2	0	1
	T1	0	2	5	1	0	0	1	0	1	1	0
	T2	8	1	1	0	1	0	1	0	0	3	1
	T3	3*	8*	4*	7*	8*	11	8*	11	8*	7*	9

* Significantly lower than lower urban adults

TABLE III.19

DISTRIBUTION OF RAW SCORES, RANGE, MEAN () AND STANDARD DEVIATION

{ } IN ADULTS ON THE INDIAN PICTURE PUZZLE TEST ACCORDING TO SOCIOECONOMIC GROUPS.

Sectors of IPPT	Urban		Rural
	advantaged	Lower	
Expressive verbal labels	29-30(30){0.24}	25-30(28){1.64}	20-30(25){3.74}
Comprehension verbal labels	15-15(15){0}	14-15(14.8){0.38}	11-15(13.6){1.3}
Expression on questions	31-35(33){1.32}	31-36(33.4){1.68}	24-33(28.7){3.5}
Comprehension of illustrated situation	32-33(32.8){0.42}	29-33(32){1.25}	20-33(26.8){4.91}

TABLE III.20

TEST OF SIGNIFICANCE BETWEEN AVERAGE SCORES IN VARIOUS SOCIOECONOMIC GROUP

			T	DF	RESULTS
EXPRESSION VERBAL LABELS					
Advantaged	vs	Lower group	3.99	32	S (0.001)
Lower	vs	Rural group	3.99	26	S (0.001)
Advantaged	vs	Rural group	8.36	26	S (0.001)
COMPREHENSION OF ILLUSTRATED SITUATIONS.					
Advantaged	vs	Lower group	1.35	32	NS (0.2)
Lower	vs	Rural group	6.41	26	S (0.001)
Advantaged	vs	Rural group	8.27	26	S (0.001)

TABLE III. 22

CLASSIFICATION OF RESPONES ON IPPT EXPRESSIVE VERBAL LABELS

1- Fan

T2->	Fan,	पंखा					
T1A->	Light,	हवा देने का	(That which gives air)				
T1B->	फूल	(Flower)	चिड़िया	(Bird)	चकरी	( )	Butterfly तितली

2- Light

T2->	Bulb,	लट्टू,	Light ,	बिजली			
T1A->	Fan,	Lamp					
T1B->	घंटी,	(bell)	छत्री,	(umberlla)	गुब्बारा,	(balloon)	टोकरी (basket)

3- Chair

T2->	कुर्सी,	Chair			
T1A->	स्टूल,	(Stool)	Table,	बैठने का मुड्डा	(something to sit on)
T1B->	Nil				

4- Clock

T2->	घड़ी,	घड़ियाल,	Clock,	Watch		
T1A->	That which shows time					
T1B->	गोला,	(ball)	डायल	(telephone dial)	नम्बर,	(number)
	पैसा,	(coin)	फूल	(Flower)		

5- Stove

T2->	Gas,	चुल्हा,	stove,			
T1A->	आग, (fire)		भगोना, (utensil to cook)		बर्तन	तवा (Pan)
T1B->	बाल्टी, (Bucket),		मुड्डा	(stool)		

6- Steps

T2->	सीढ़ियां, सीढ़ी,	पंगतियां,	ज़ीना,	stairs,	ladder	
T1A->	ऊपर जाने का, (To go up)		जमीन			
T1B->	दीवार, (wall)		Line,	sofa,	bench	

Key

T1B-> Physical Resemblence

T1A-> Functional Term

T2-> Actual Term

7- Dog

T2->	कुत्ता, doggie,	dog	
T1A->	Rabbit, Rat , (Domestic Animal)	pig,	चूहा
T1B->	मगरमच्छ (crocodile), (Wild Animal)	Lion,	Zebra

8- Bed

T2->	पलंग, खाट,	खटिया,	बिस्तर
T1A->	सोने का, (To sleep on)	बिस्तरबंद (Mattress)	
T1B->	Table,	net	

9- Tree

T2->	पैड़,	Tree
T1A->	जंगल, (Jungle),	पत्ती (Leaf)
T1B->	पं खा, (Fan),	लक्कड़ (Wood)

10- Kite

T2->	पतंग,	Kite
T1A->	(no response encountered which would fall in this category)	
T1B->	चिड़िया, (Bird)	फूल (Flower)

11- Taps

T2->	tap, नल,	नलका
T1A->	wash basin,	मग्गा (mug to wash with)
T1B->	बंदूक, pistol,	snake
	(the pipe and tap in the picture resembles this (atleast 20 % of the answers given)	

12- Bucket

T2->	Bucket,	बाल्टी	
T1A->	मग्गा, (mug),	tub	
T1B->	गमला (pot),	रंग,	glass

13- Woman

T2->	औरत, Aunty, (sex and age right)	बाई,	Mummy				
T1A->	लड़की, (girl),	रानी, (queen),	आदमी, (man),	लड़का, (boy),	बच्चा	(child)	
	(either sex or age correct)						
T1B->	भगवान जी, (God),	monkey,	लड़का,	बच्चा			
	(neither sex nor age correct)						

14- Baby

T2-> बच्चा, baby, लड़का, बेटा, लड़की

T1A-> छोटा आदमी, (a small man)

T1B-> बंदर (monkey)

15- Girl

T2-> लड़की, girl, दीदी, जीजी
(both sex and age right)

T1A-> मोसी (aunty), बुआ (aunty), लड़का, औरत, (woman), बच्चा, आदमी (man)
(either sex or age right)

T1B-> आदमी
(neither sex or age correct)

16- Boy

T2-> boy, लड़का, भैया
(sex and age right)

T1A-> आदमी (man), लड़की (girl)
(either sex or age right)

T1B-> औरत
(neither sex nor age right)

17- Cycle

T2-> bicycle, cycle, motor cycle

T1A-> गाड़ी, scooter

T1B-> पहिया (wheels)

18- Postman

T2-> डाकिया, (postman)

T1A-> Police, paperwala (News paper boy)

T1B-> लड़का, पापा (pappa), आदमी, भैया (brother)

19- Mirror

T2-> शीशा, कांच, दर्पण (Mirror)

T1A-> देखने का

T1B-> खिड़की, T. V. चकौर
(window) (square)
डिब्बा (box), ball

TABLE III. 23

CLASSIFICATION OF RESPONES ON IPPT

COMPREHENSION OF ILLUSTRATED SITUATIONS

Q. 1 What is mummy doing?

A. 1 Bathing baby.

Level III (actual activity named correctly)

T3-> १- बच्चा नहला रही है
२- बच्चे को नहला रही है
३- स्नान करा रही है
४- नहा रही है

Level II (Describes mother's action associated with bathing but does not name it)

T2-> १- पानी डाल रही है (throwing water on body)
२- मग्गा है (using mug)
३- पानी है (water is there)

Level I (Describes action incorrectly i.e. not associated with bathing but relates with baby)

T1-> १- दूध पिला रही है (she is feeding baby)
२- गोदी में ले रही है (baby is with mummy)
३- बैठी है (they are sitting together)

Level 0 1. N. R.
2. Meaningless response

Q-2 नल से क्या होता है?
What is a tap for?

Level III (Actual function of tap giving water)

A. 2 To give water.

T3-> १- पानी आता है
२- पानी भरते हैं
३- पानी देता है
४- खोलते हैं, तो पानी आता है

Level II (Describes activities done with tap but does not name function)

T2-> १- हाथ धोते हैं (We wash hands)
२- कपड़े धोते हैं (Wash cloths)
३- बाल्टी भरते हैं (Fill bucket with water)
४- नहाते हैं (Bath)

Level 0 Nil

Q. 3 यह दीदी क्या कर रही है? (What is girl doing?)

A. 3 (Sleeping)

Level III (Names actual function correctly)

T3-> १- सो रही है

२- लेटी है

Level II (Describes action as he sees it, not naming the actual activity but the one associated with)

T2-> १- ऊपर चढ़ी है (is on the bed)

२- तकिया लगा रही है (has placed head on pillow)

Level 1. (Decribes an action as percieved in the picture but not associated with sleeping)

T1-> १- नमस्ते कर रही है (is doing namaste i. e. joining hands together)

२- पापा को देख रही है (is looking at father/boy)

३- पढ़ रही है (is reading)

Level 0. N. R. /meaningless.

Q. 4 यह लड़का क्या कर रहा है? What is boy doing?

A. Reading.

Level III (Names actual or related activity)

T3-> १- पढ़ रहा है / पढ़ ाई कर रहा है

२- Home work कर रहा है

३- लिख रहा है

४- Painting कर रहा है

५- चिट्ठी पढ़ रहा है

Level II Describes what he percieves the boy doing with an object in his hand. (i. e. does not recognise book & does not describe action)

T2-> १- Paper को देख रहा है (is looking at paper)

२- Calculator चला रहा है (is using a calculator)

३- Video चला रहा है (is using remote control of a video player)

Level 1 (no detailed or specific action described)

T1-> १- लैटा है (is lying down)

२- खेल रहा है (is playing)

३- काम कर रहा है (is doing some work)

Level 0 N. R. /कुछ नहीं कर रहा/पता नहीं

Q-5 यह मम्मी क्या कर रही है? What is mummy doing?

A. 5 Combing her hair.

Level III (Actual activity correctly named)

T3-> १- बाल बना रही है
२- चोटी बना रही है
३- कंघी कर रही है

Level II (Associates action of combing with hair but does not name the activity)

T2-> १- कंघी (comb)
२- बाल खींच रही है (She is pulling her hair)
३- बाल को यूं कर रही है (She is doing some thing with her hair)
४- शीशा देख रही है (She is looking at her self in the mirror)

Level I (Describes the action percieved but not naming combing)

T1-> १- खड़ी है/अभी है (She is standing)
२- दुकान जा रही है (She is going shopping)
३- टी . वी . /खिड़की देख रही है (She is looking out of window or at T. V.)
४- नाम को ले रही है (** She has a name in her hand)

** This is a very interesting common answer. A comb looks like a name in Hindi - नाम

Q-6 What are mirrors for?

A. 6 To see oneself.
कांच से क्या करते / शीशा क्यूं होता हैं ?

Level III (Actual function)

T3- १- देखने के लिए
२- देखते हैं, मुंह शक्ल
३- देख के बाल बनाने के लिए
४- जब चोटी बनाने हैं, तो ठीक है कि नहीं

Level II (The activities that are carried out infront of a mirror without knowing why)

T2-> १ . चोटी बनाते हैं (She is plaiting her hair)
२- मांग ठीक करते हैं (Combing hair)
३- बिन्दी लगाते हैं (to put make-up or Bindi)

Level I (Mistakes it for glass or bottle as bottle in Hindi is शीशी
and glass in Hindi is also कांच)

TI-> १- शीशी से दवाई पीते हैं (We drink medicine from bottle)
२- तेल लगाते हैं (We apply oil from bottle)
३- लगती है (glass can hurt me)
४- टूट जाती है (glass can break)

Level 0. 1. N. R. Meaningless response.

Q-7 पंखे से क्या होता है?

What is a fan for?

A. 7 Cools us/gives breeze.

Level III (Actual function)

T3-> १- हवा आती है
२- ठंड लगती है
३- गर्मी लगती है
४- चलाते हैं- गर्मी होती है
५- जब पसीना होता है, तो चलते हैं

Level II (other outcome thing caused by rotation of a fan)

T2->	१- पसीना सुखाते हैं	(dries perspiration)
	२- मच्छर भगाते हैं	(mosquitoes fly off)
	३- सोते हैं, तो चलाते हैं	(when we sleep we put it on)
	४- उंगली कट जाती है	(will cut my finger in a fan)

Level I (Describes the rotation of a fan)

T1->	१- घूमता है	(it rotates)
	२- चलाते हैं	(we put it on)
	३- Ligñ जलाते हैं	(the light comes on)

Q-8 What is dog doing?

A.8 eating/licking/drinking

कुत्ता क्या कर रहा है?

Level III (Actual activity named)

T3-> १- चाट रहा है
२- रोटी/मांस/कुछ खा रहा है
३- दूध पी रहा है

Level II (Describes what he percieves the dog doing but does not name eating)

T2->	१- जीभ निकाल रहा है	(is putting out his toungue)
	२- सूंघ रहा है	(it smelling ground)
	३- उलटी कर रहा है	(is vomating)

Level I (other actions of the dog, but not connected with eating)

T1->	१- भौंक रहा है	(is barking)
	२- भौं-भौं कर रहा है	(is barking)
	३- लेट रहा है	(is sitting)
	४- देख रहा है	(is watching girl)
	५- चल रहा है	(walking)

Q-9 Why do we have steps?

A. 9 To go up.

Level III (Actual function)

T3-> १- चढ़ने के लिए/चढ़ने का/उतरने का
२- छत पर जाते हैं।

Level II (other activities done on steps which are specific to Indian culture)

T2-> १- बैठने के लिए (we sit on steps)
२- बैठने का (we sit on steps)
३- खेलने का /उस पर खेलते हैं (we play on the steps)
४- कपड़े सुखाना (dry cloths on steps)

Level I (Activities on steps which are non specific)

T1-> १- पौचा लगाना (We clean the steps)
२- दूकान जाते हैं (We go to shops)
३- चलते हैं (We walk on steps)

Q10 Why do we have a Clock?

A.10 Shows time

Level III (Associated with time, clock or having to reach some where)

T3-> १- समय देखते हैं (we see time)
२- Time देखते हैं कि कितना बजा है (to see what time it is)
३- Time कितना हुआ है?
४- देखते हैं कि स्टेशन/स्कूल जाना है (to see when we have to reach school or station)
५- कि छ: या सात बजे (to see if it is 6 or 7 O'clock)

Level II (Associated with actual handling of the clock)

T2- १- देखते हैं (we look at it)
२- बांधते हैं/पहनते हैं (we wear it/on the wrist)
३- अलार्म बजाती है। (The alarm goes off)
४- Time भरने के लिए (We wind it up)
५- चलती है/टिन-टिन करती है (It goes tic toc tic toc)

Level I (Describes the clock as he sees it)

T1- १- ** telephone से बात करते हैं (I dial the phone)
२- मेरे पास घड़ी है/घर में है (I have a watch/ we have a clock at home)
३- * मेरे पास पैसा है (I have money)

** clock face resembles telephone dial

* clock face resembles a coin

Q. 11 What is mummy doing?

A. 11 Cooking

Q. 11 मम्मी क्या कर रही है

Level III (Associated with cooking)

T3-> १- रोटी बना रही है (Cooking chappati)
२- परांठा बना रही है
३- खाना बना रही है (Cooking food)
४- रोटी सेक रही है
५- रोटी
६- चावल बना रही है

Level II (Associated with working in the kitchen or utensils other than cooking)

T2-> १- बर्तन मांज रही है (She is washing utensils)
२- काम कर रही है (She is working)
३- प्लेटें धो रही है (She is washing plates)
४- बर्तन साफ कर रही है * (She is washing utensils)
* When the chappati is mistaken for a plate

Level I (Describes the picture but not associated with kitchen or cooking)
* Kind of drum played with hands.

T1-> १- * डम-डम बजा रही है (She is playing a * dum-dum)
२- बाजा बजा रही है (She is playing an instrument)
३- प्लेट देख रही है (She is looking at a plate)
४- चंदा मामा है। हाथ में (She has a moon in her hand)
५- हाथ जोड़ रही है (She is joining her hands)

T0-> १- N. R.
२- हाथ धो रही है (She is washing her hands)
३- मेहंदी लगा रही है (She is putting * Mehndi on her hands)
* a red dye.

Q. 11A Where she will put it (roti)?

A. 11 On the stove.

Level III (Associated with stove or chakli)*

T3-> १- तवे पे रखेगी (on the * tava)
* a flat utensil to cook chappti/roti
२- चूल्हा पर रखेगी (will put it on the stove)
३- चकली पर रखेगी (on the * chakli)
* A small block on which the roti/chappati is rolled
(Pointing to चकली)

T2/T1 1- No responses

T0- (Points to any other place or indicate jabbing at the picture)

Q-12 डाकिया क्या करता है? What does a postman do?

A. Delivers letters

Level III (Actual job)

T3->- १- चिट्ठी बांटता है
२- चिट्ठी देता है

Level II (Associated with letters but uses wrong verb)

T2-> १- चिट्ठी बेचता है (sells letters)
२- चिट्ठी भेजता है (sends letters)

Level I (i) describes picture with reference to postman.
(ii) or mistakes postman for policeman or paper boy or just a man.

T1-> १- किताब देता है (is giving books)
२- calculator चलाता है (* is using calculator)

* When child mistakes the letters in postman hand for a calculator

३- साईकल चलाता है/गाड़ी चलाता है (he is cycling)
४- ध्यान रखता है (looks after us)
५- paper डालता है (delivers news papers)

Q. 13 यह लड़का क्या कर रहा है? What is boy doing?

A. Fetching kite/climbing tree to fetch kite)

Level III (Associates the boy's desire for kite)

T3-> १- पतंग उतार रहा है (fetching kite)
२ - पतंग चाहिए (wants kite)
३- पैड़ पर चढ़ रहा है, पतंग लेने के लिए (climbing tree to get kite)
४- ऊपर चढ़ रहे हैं/पतंग
५- ऊपर चढ़ रहा है (and points to kite)

Level II (Associated with climbing tree, but does not indicate boy's desire for the kite)

T2-> १- ऊपर चढ़ रहा है, पैड़ पर चढ़ रहा है (is climbing tree)
२- ऊपर जा रहा है।आम के लिए। अमरुद के लिए (is climbing tree for mango/guava/flower)

Level I (Associates boy with the tree, but does not name 'climbing' or the boy's desire for the kite.

T1-> १- पैड़ को छू रहा है / इसको छू रहा है (boy is touching the tree)
२- पैड़ तोड़ रहा है (is cutting the tree)
३- पैड़ पकड़ रहा है (is holding the tree)

T0- १ - N. R.
२ - खेल रहा है (is playing)
३ - खड़ा है (is standing)

Q. 14 What does the boy have in his school bag?

A. Yes if child answers even one object correctly.

A. No if no objects named or those named which are not associated with school

CONSTUCTION OF NORMS

TABLE III.24

CONSTRUCTION OF NORMS - EXPRESSIVE VERBAL LABELS (COMPUTED AGE = 28.5 MONTHS

ADVANTAGED CHILDREN):

Scores	No. of children	%Frequency	Cumulative Frequency
0.00	1.00	3.70	3.70
1.00	0.00	0.00	3.70
2.00	**2.00**	**7.41**	**11.11**
3.00	0.00	0.00	11.11
4.00	**2.00**	**7.41**	**18.51**
5.00	**1.00**	**3.70**	**22.22**
6.00	1.00	3.70	25.92
7.00	1.00	3.70	29.63
8.00	0.00	0.00	29.63
9.00	0.00	0.00	29.63
10.00	1.00	3.70	33.33
11.00	3.00	11.11	44.44
12.00	**2.00**	**7.41**	**51.85**
13.00	0.00	0.00	51.85
14.00	1.00	3.70	55.55
15.00	2.00	7.41	62.96
16.00	**3.00**	**11.11**	**74.07**
17.00	0.00	0.00	74.07
18.00	2.00	7.41	81.48
19.00	1.00	3.70	85.18
20.00	0.00	0.00	85.18
21.00	**1.00**	**3.70**	**88.89**
22.00	**2.00**	**7.41**	**96.29**
23.00	0.00	0.00	96.29
24.00	0.00	0.00	96.29
25.00	**1.00**	**3.70**	**100.00**
26.00	0.00	0.00	100.00
27.00	0.00	0.00	100.00
28.00	0.00	0.00	100.00
29.00	0.00	0.00	100.00
30.00	0.00	0.00	100.00
	TOTAL (27.00)	TOTAL (100.00)	

19.5,22.5,25.5,28.5,31.5,34.5,37.5,40.5,43.5,46.5,49.5, 52.5,55.5,58.5 & 61.5
for advantaged, slum and rural groups in each section of the test.

TABLE V.1

RAW SCORES ON IPPT : BEFORE AND AFTER INTERVENTION

Case	Age1	Age2	RAW SCORES											
no.	mth	mth	EVL1	EVL2	CVL1	CVL2	CQ1	CQ2	EQ1	EQ2	RR1	RR2	OP1	OP2
1.	44	51	3	27	10	14	9	30	10	33	13	13	12	10
2.	39	46	0	27	8	13	0	30	0	33	10	13	8	13
3.	60	67	24	27	13	14	13	30	17	33	12	13	12	13
4.	36	43	0	20	3	13	0	11	0	10	4	13	7	13
5.	42	49	16	27	15	12	24	29	30	33	10	12	12	11
6.	36	42	13	25	8	12	0	27	0	31	8	13	8	13
7.	58	64	30	30	14	15	26	31	29	33	9	12	8	12
8.	26	32	0	22	12	12	0	19	0	24	11	12	12	12
9.	47	53	19	26	15	12	24	28	23	30	13	13	12	12
10.	60	66	22	29	15	13	22	31	27	31	13	13	13	13
11.	36	42	9	24	6	13	0	29	0	31	10	10	8	9
12.	30	36	0	0	2	5	0	0	0	0	8	5	12	6
13.	57	63	17	27	9	13	7	26	5	30	12	12	10	12
14.	29	35	0	16	9	7	0	6	0	6	9	2	8	1
15.	42	47	0	18	10	10	5	8	9	15	11	13	11	13

KEY: EVL = Expression verbal labels CVL = Comprehension of verbal labels
CQ = Comprehension of illustrated situations EQ = Expression on questions on situations
RR = Recognition of recess OP = Orientation of piece

1 denotes the tests done before the start of the programme and 2 those done after a period of 5 to 7 months.

TABLE V.2

CENTILE SCORES ON THE IPPT - BEFORE AND AFTER INTERVENTION:

Case no.	Age1	Age2	CENTILE SCORE											
			EVL1	EVL2	CVL1	CVL2	CQ1	CQ2	EQ1	EQ2	RR1	RR2	OP1	OP2
1.	44	51	20	90	>20	90	20	90	20	90	90	90	90	90
2.	39	46	10	90	50	90	50	90	50	90	50	90	50	90
3.	60	67	75	90	50	90	20	90	20	90	75	90	75	90
4.	36	43	20	75	10	>75	50	>50	50	50	10	90	50	90
5.	42	49	75	>90	90	50	90	>90	90	>90	50	75	90	>75
6.	36	42	75	>90	>20	75	<50	90	<50	>90	<50	>90	50	>90
7.	58	64	>90	>90	90	>90	75	90	<90	>90	20	90	<20	90
8.	26	32	20	>90	90	90	75	>90	75	>90	90	>90	>90	>90
9.	47	53	>50	>90	90	50	90	>90	>50	90	90	90	90	90
10.	60	66	50	90	90	50	50	>90	<75	75	90	90	90	90
11.	36	42	75	>90	20	>75	<50	>90	<50	>90	75	<75	50	50
12.	30	36	20	>20	20	20	50	<50	50	<50	50	<20	90	<50
13.	57	63	>20	90	>10	75	<20	75	10	75	75	75	<75	90
14.	29	35	<50	>90	>75	50	<75	75	<75	<75	<90	20	<75	<10
15.	42	47	20	>75	75	50	50	50	50	50	75	90	75	>90

KEY: EVL = Expression verbal labels
CVL = Comprehension of verbal labels
CQ = Comprehension of illustrated situations
EQ = Expression on questions on situations
RR = Recognition of recess
OP = Orientation of piece

1 marked the tests done before the start of the programme

and 2 were done after a period of 6 to 7 months.

SCORES AT EACH CENTILE RANK

TABLE 1V.3A

SCORES AT EACH CENTILE RANK - EXPRESSION VERBAL LABELS

ADVANTAGED GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	1.00	6.50	7.25	11.50	13.50	17.00	17.75
25.50	0.00	0.67	2.00	2.17	8.00	8.83	15.50	14.33	18.50	18.83
28.50	2.00	1.17	4.50	3.83	12.00	11.33	16.00	16.83	21.00	21.50
31.50	1.50	2.83	5.00	6.17	14.00	15.50	19.00	19.83	25.00	24.00
34.50	5.00	4.67	9.00	9.00	20.50	19.17	24.50	23.00	26.00	26.00
37.50	7.50	8.83	13.00	13.17	23.00	22.17	25.50	25.33	27.00	26.67
40.50	14.00	12.50	17.50	16.83	23.00	23.00	26.00	25.67	27.00	27.00
43.50	16.00	15.67	20.00	19.33	23.00	23.33	25.50	26.00	27.00	27.33
46.50	17.00	17.67	20.50	20.83	24.00	24.00	26.50	26.33	28.00	27.67
49.50	20.00	19.00	22.00	21.83	25.00	25.00	27.00	27.00	28.00	28.17
52.50	20.00	20.67	23.00	23.00	26.00	25.67	27.50	27.33	28.50	28.33
55.50	22.00	20.67	24.00	23.67	26.00	26.17	27.50	27.67	28.50	28.50
58.50	20.00	20.33	24.00	24.00	26.50	26.33	28.00	27.83	28.50	28.50
61.50	19.00	19.50	24.00	24.00	26.50	26.50	28.00	28.00	28.50	28.50

TABLE IV.3B

SCORES AT EACH CENTILE RANK - EXPRESSION VERBAL LABELS - LOWER GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	7.20	7.35	13.00	13.10
25.50	0.00	0.00	0.00	0.00	0.00	0.73	7.50	7.50	13.20	13.73
28.50	0.00	0.00	0.00	0.00	2.20	2.07	7.80	9.17	15.00	15.40
31.50	0.00	0.00	0.00	0.00	4.00	4.47	12.20	12.83	18.00	19.17
34.50	0.00	0.00	0.00	0.00	7.20	8.07	18.50	16.73	24.50	22.50
37.50	0.00	0.00	0.00	0.33	13.00	12.07	19.50	19.33	25.00	24.63
40.50	0.00	0.00	1.00	1.00	16.00	15.33	20.00	20.50	24.40	24.80
43.50	0.00	0.17	2.00	3.33	17.00	17.67	22.00	22.17	25.00	25.47
46.50	0.50	0.50	7.00	5.33	20.00	19.67	24.50	23.83	27.00	26.50
49.50	1.00	1.83	7.00	8.33	22.00	21.33	25.00	25.17	27.50	27.33
52.50	4.00	3.33	11.00	10.50	22.00	22.00	26.00	25.83	27.50	27.67
55.50	5.00	7.67	13.50	14.17	22.00	23.00	26.50	26.50	28.00	28.17
58.50	14.00	11.00	18.00	16.33	25.00	24.00	27.00	26.83	29.00	28.67
61.50	14.00	14.00	17.50	17.75	25.00	25.00	27.00	27.00	29.00	29.00

TABLE IV.3C

SCORES AT EACH CENTILE RANK - EXPRESSION VERBAL LABELS - RURAL GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
25.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.90
28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	7.20	6.23
31.50	0.00	0.00	0.00	0.00	0.00	1.07	5.00	4.50	10.00	10.67
34.50	0.00	0.00	0.00	0.00	3.20	3.13	8.50	9.17	14.80	13.93
37.50	0.00	0.00	0.00	0.00	6.20	5.80	14.00	12.67	17.00	17.60
40.50	0.00	0.00	0.00	0.00	8.00	7.73	15.50	16.00	21.00	20.00
43.50	0.00	0.00	0.00	0.00	9.00	9.67	18.50	17.40	22.00	22.00
46.50	0.00	0.00	0.00	0.67	12.00	12.33	18.20	18.57	23.00	23.33
49.50	0.00	0.33	2.00	2.67	16.00	15.00	19.00	18.90	25.00	24.00
52.50	1.00	3.00	6.00	7.33	17.00	17.00	19.50	20.17	24.00	25.33
55.50	8.00	5.33	14.00	10.67	18.00	18.33	22.00	22.00	27.00	26.00
58.50	7.00	6.33	12.00	12.50	20.00	19.83	24.50	23.83	27.00	27.00
61.50	4.00	5.50	11.50	11.75	21.50	20.75	25.00	24.75	27.00	27.00

TABLE IV.3D

SCORES AT EACH CENTILE RANK- EXPRESSION VERBAL LABELS
TOTAL SAMPLE (n = 616)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	7.00	6.90	13.00	13.00
25.50	0.00	0.00	0.00	0.00	0.00	2.67	6.80	9.20	13.00	14.47
28.50	0.00	0.00	0.00	0.00	8.00	4.50	13.80	11.87	17.40	17.47
31.50	0.00	0.00	0.00	0.00	5.50	7.50	15.00	15.93	22.00	21.47
34.50	0.00	0.00	0.00	0.33	9.00	9.77	19.00	19.00	25.00	24.33
37.50	0.00	0.00	1.00	2.67	14.80	14.27	23.00	22.27	26.00	26.27
40.50	0.00	0.00	7.00	5.60	19.00	18.27	24.80	24.27	27.80	27.20
43.50	0.00	0.00	8.80	7.93	21.00	20.50	25.00	25.20	27.80	27.87
46.50	0.00	1.67	8.00	10.60	21.50	21.67	25.80	25.67	28.00	28.20
49.50	5.00	3.50	15.00	12.50	22.50	22.17	26.20	26.13	28.80	28.27
52.50	5.50	7.67	14.50	15.50	22.50	23.00	26.40	26.53	28.00	28.43
55.50	12.50	9.83	17.00	15.83	24.00	23.50	27.00	26.77	28.50	28.17
58.50	11.50	12.17	16.00	16.67	24.00	24.07	26.90	27.03	28.00	28.17
61.50	12.50	12.00	17.00	16.50	24.20	24.10	27.20	27.05	28.00	28.00

TABLE IV.4A

SCORES AT EACH CENTILE RANK - COMPREHENSION OF VERBAL LABELS

ADVANTAGED GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	1.00	1.25	3.00	3.10	4.50	5.75	8.00	9.25	12.00	12.10
25.50	1.50	2.00	3.20	4.13	7.00	7.17	10.50	10.10	12.20	12.33
28.50	3.50	3.67	6.20	5.90	10.00	9.40	11.80	11.77	12.80	13.07
31.50	6.00	5.83	8.30	8.33	11.20	11.13	13.00	12.87	14.20	13.93
34.50	8.00	7.67	10.50	9.87	12.20	12.13	13.80	13.60	14.80	14.60
37.50	9.00	9.00	10.80	10.83	13.00	12.80	14.00	14.07	14.80	14.87
40.50	10.00	9.83	11.20	11.33	13.20	13.23	14.40	14.20	15.00	14.87
43.50	10.50	10.57	12.00	11.80	13.50	13.40	14.20	14.27	14.80	14.87
46.50	11.20	11.30	12.20	12.33	13.50	13.60	14.20	14.27	14.80	14.87
49.50	12.20	11.87	12.80	12.67	13.80	13.83	14.40	14.37	15.00	14.93
52.50	12.20	12.40	13.00	13.00	14.20	14.07	14.50	14.57	15.00	15.00
55.50	12.80	12.60	13.20	13.23	14.20	14.20	14.80	14.70	15.00	15.00
58.50	12.80	8.53	13.50	8.90	14.20	14.20	14.80	14.80	15.00	15.00
61.50		6.40		6.75	14.20	14.20	14.80	14.80	15.00	15.00

TABLE IV.4B

SCORES AT EACH CENTILE RANK - COMPREHENSION OF VERBAL LABELS - LOWER GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.70	0.85	4.60	5.05	6.40	6.80	7.80	7.90
25.50	0.00	0.33	1.00	1.73	5.50	5.43	7.20	7.53	8.00	9.27
28.50	1.00	0.43	3.50	2.83	6.20	6.97	9.00	9.00	12.00	10.83
31.50	0.30	0.70	4.00	4.17	9.20	8.53	10.80	10.50	12.50	12.57
34.50	0.80	1.70	5.00	5.67	10.20	10.03	11.70	11.63	13.20	13.17
37.50	4.00	3.60	8.00	7.10	10.70	10.70	12.40	12.37	13.80	13.60
40.50	6.00	5.93	8.30	8.63	11.20	11.37	13.00	12.87	13.80	13.87
43.50	7.80	7.67	9.60	9.30	12.20	12.07	13.20	13.27	14.00	14.00
46.50	9.20	8.90	10.00	10.27	12.80	12.67	13.60	13.53	14.20	14.13
49.50	9.70	9.57	11.20	10.80	13.00	13.00	13.80	13.80	14.20	14.33
52.50	9.80	9.43	11.20	11.13	13.20	13.13	14.00	13.93	14.60	14.43
55.50	8.80	9.33	11.00	11.13	13.20	13.30	14.00	14.03	14.50	14.60
58.50	9.40	9.40	11.20	11.33	13.50	13.40	14.10	14.10	14.70	14.67
61.50	10.00	9.70	11.80	11.50	13.50	13.50	14.20	14.15	14.80	14.75

TABLE IV.4C

SCORES AT EACH CENTILE RANK - COMPREHENSION OF VERBAL LABELS - RURAL GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.50	2.50	3.50	5.00	6.75	9.00	9.60
25.50	0.00	0.00	1.00	0.73	4.50	3.93	8.50	7.33	10.20	9.73
28.50	0.00	0.33	1.20	1.73	4.80	5.43	8.50	8.50	10.00	10.07
31.50	1.00	0.80	3.00	2.47	7.00	6.60	8.50	9.00	10.00	10.73
34.50	1.40	2.07	3.20	4.13	8.00	8.00	10.00	9.90	12.20	11.67
37.50	3.80	3.07	6.20	5.63	9.00	9.07	11.20	11.00	12.80	12.73
40.50	4.00	4.27	7.50	7.23	10.20	10.00	11.80	11.67	13.20	13.33
43.50	5.00	4.33	8.00	7.90	10.80	10.73	12.00	12.20	14.00	13.80
46.50	4.00	4.33	8.20	8.13	11.20	11.17	12.80	12.67	14.20	14.07
49.50	4.00	4.67	8.20	8.13	11.50	11.50	13.20	13.17	14.00	14.07
52.50	6.00	6.33	8.00	8.73	11.80	12.00	13.50	13.40	14.00	14.00
55.50	9.00	8.07	10.00	9.60	12.70	12.33	13.50	13.50	14.00	14.00
58.50	9.20	9.07	10.80	10.53	12.50	12.47	13.50	13.50	14.00	14.00
61.50	9.00	9.10	10.80	10.80	12.20	12.35	13.50	13.50	14.00	14.00

TABLE IV.4D

SCORES AT EACH CENTILE RANK- COMPREHENSION OF VERBAL LABELS
TOTAL SAMPLE (n = 616)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	1.40	1.40	4.00	4.00	6.70	6.60	11.50	11.45
25.50	0.00	0.00	1.40	1.93	4.00	5.13	6.50	8.07	11.40	11.63
28.50	0.00	0.67	3.00	3.20	7.40	6.90	11.00	9.67	12.00	12.30
31.50	2.00	1.40	5.20	4.80	9.30	9.03	11.50	11.67	13.50	13.10
34.50	2.20	3.40	6.20	6.47	10.40	10.23	12.50	12.47	13.80	13.90
37.50	6.00	5.40	8.00	7.90	11.00	11.13	13.40	13.13	14.40	14.23
40.50	8.00	7.50	9.50	9.10	12.00	11.87	13.50	13.57	14.50	14.47
43.50	8.50	8.50	9.80	9.77	12.60	12.47	13.80	13.70	14.50	14.50
46.50	9.00	9.03	10.00	10.40	12.80	12.90	13.80	13.93	14.50	14.60
49.50	9.60	9.37	11.40	10.97	13.30	13.17	14.20	14.13	14.80	14.70
52.50	9.50	9.70	11.50	11.63	13.40	13.40	14.40	14.33	14.80	14.80
55.50	10.00	9.83	12.00	11.67	13.50	13.43	14.40	14.33	14.80	14.53
58.50	10.00	10.00	11.50	11.63	13.40	13.37	14.20	14.27	14.00	14.53
61.50	10.00	10.00	11.40	11.45	13.20	13.30	14.20	14.20	14.80	14.40

Table IV.5A

SCORES AT EACH CENTILE RANK - RECOGNITION OF RECESS - ADVANTAGED GROUP

AGE	Scores at each centile rank (CENT -centile; SM - smoothed centile									
mths.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
19.50	0.00	0.00	0.00	0.60	4.00	4.00	6.20	6.20	7.20	7.50
22.50	0.00	0.27	1.20	1.33	4.00	4.93	6.20	6.73	7.80	8.17
25.50	0.80	0.27	2.80	2.67	6.80	6.00	7.80	7.60	9.50	9.03
28.50	0.00	2.27	4.00	4.43	7.20	7.40	8.80	8.87	9.80	10.50
31.50	6.00	4.10	6.50	5.93	8.20	8.20	10.00	10.10	12.20	11.50
34.50	6.30	6.50	7.30	7.47	9.20	9.53	11.50	11.23	12.50	12.40
37.50	7.20	7.50	8.60	8.57	11.20	10.63	12.20	12.03	12.50	12.60
40.50	9.00	8.47	9.80	9.47	11.50	11.57	12.40	12.37	12.80	12.70
43.50	9.20	9.13	10.00	9.90	12.00	11.90	12.50	12.47	12.80	12.83
46.50	9.20	9.20	9.90	9.97	12.20	12.13	12.50	12.50	12.90	12.87
49.50	9.20	9.47	10.00	10.37	12.20	12.20	12.50	12.50	12.90	12.90
52.50	10.00	10.07	11.20	10.90	12.20	12.20	12.50	12.50	12.90	12.90
55.50	11.00	10.67	11.50	11.40	12.20	12.20	12.50	12.60	12.90	12.93
58.50	11.00	ERR	11.50	11.67	12.20	12.30	12.80	12.70	13.00	12.97
61.50	-	ERR	12.00	11.75	12.50	12.35	12.80	12.80	13.00	13.00

Table IV.5B

SCORES AT EACH CENTILE RANK - RECOGNITION OF RECESS - LOWER URBAN GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.40	3.20	4.60	7.80	8.40	10.50	10.15
25.50	0.00	0.00	0.80	0.87	6.00	5.47	9.00	8.77	9.80	10.43
28.50	0.00	0.83	1.80	2.70	7.20	7.40	9.50	9.57	11.00	10.87
31.50	2.50	2.50	5.50	4.77	9.00	8.73	10.20	10.40	11.80	11.67
34.50	5.00	4.77	7.00	7.23	10.00	9.93	11.50	11.23	12.20	12.17
37.50	6.80	6.60	9.20	8.47	10.80	10.53	12.00	11.83	12.50	12.40
40.50	8.00	7.43	9.20	9.13	10.80	11.13	12.00	11.93	12.50	12.50
43.50	7.50	7.77	9.00	9.13	11.80	11.60	11.80	12.10	12.50	12.60
46.50	7.80	8.10	9.20	9.80	12.20	12.07	12.50	12.37	12.80	12.77
49.50	9.00	8.93	11.20	10.53	12.20	12.20	12.80	12.70	13.00	12.93
52.50	10.00	9.73	11.20	11.13	12.20	12.20	12.80	12.80	13.00	13.00
55.50	10.20	10.07	11.00	11.07	12.20	12.20	12.80	12.80	13.00	13.00
58.50	10.00	10.07	11.00	11.07	12.20	12.20	12.80	12.80	13.00	13.00
61.50	10.00	10.00	11.20	11.10	12.20	12.20	12.80	12.80	13.00	13.00

Table IV.5C

SCORES AT EACH CENTILE RANK - RECOGNITION OF RECESS - RURAL GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
mths.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.50	1.00	2.80	4.90	7.20	8.20	9.20	10.20
25.50	0.00	0.33	1.50	1.33	7.00	5.67	9.20	8.63	11.20	10.40
28.50	1.00	1.27	2.00	2.77	7.20	7.67	9.50	9.57	10.80	11.07
31.50	2.80	2.10	4.80	3.60	8.80	8.07	10.00	9.77	11.20	11.07
34.50	2.50	2.60	4.00	4.93	8.20	8.67	9.80	10.10	11.20	11.47
37.50	2.50	2.93	6.00	6.27	9.00	9.00	10.50	10.60	12.00	11.80
40.50	3.80	4.27	8.80	7.93	9.80	9.87	11.50	11.27	12.20	12.23
43.50	6.50	5.77	9.00	8.93	10.80	10.60	11.80	11.83	12.50	12.50
46.50	7.00	6.50	9.00	9.33	11.20	11.27	12.20	12.17	12.80	12.70
49.50	6.00	7.00	10.00	9.60	11.80	11.53	12.50	12.30	12.80	12.80
52.50	8.00	7.67	9.80	10.10	11.60	11.73	12.20	12.40	12.80	12.80
55.50	9.00	8.73	10.50	10.27	11.80	11.80	12.50	12.40	12.80	12.80
58.50	9.20	9.23	10.50	10.67	12.00	12.00	12.50	12.50	12.80	12.80
61.50	9.50	9.35	11.00	10.75	12.20	12.10	12.50	12.50	12.80	12.80

TABLE IV.5D

SCORES AT EACH CENTILE RANK- RECOGNITION OF RECESS
TOTAL SAMPLE (n = 525)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	1.20	1.60	4.20	5.50	7.00	8.00	9.80	10.30
25.50	0.00	0.00	2.00	2.00	6.80	6.17	9.00	8.47	10.80	10.47
28.50	0.00	1.40	2.80	3.60	7.50	7.60	9.40	9.47	10.80	11.13
31.50	4.20	2.67	6.00	5.10	8.50	8.47	10.00	10.13	11.80	11.67
34.50	3.80	4.73	6.50	6.83	9.40	9.43	11.00	10.83	12.40	12.23
37.50	6.20	5.73	8.00	7.77	10.40	10.20	11.50	11.57	12.50	12.57
40.50	7.20	7.13	8.80	8.73	10.80	10.80	12.20	12.07	12.80	12.70
43.50	8.00	7.80	9.40	9.23	11.20	11.17	12.50	12.40	12.80	12.80
46.50	8.20	8.40	9.50	9.80	11.50	11.63	12.50	12.50	12.80	12.80
49.50	9.00	8.90	10.50	10.33	12.20	11.97	12.50	12.53	12.80	12.80
52.50	9.50	9.50	11.00	10.90	12.20	12.20	12.60	12.53	12.80	12.80
55.50	10.00	9.83	11.20	11.07	12.20	12.20	12.50	12.57	12.80	12.80
58.50	10.00	10.00	11.00	11.20	12.20	12.20	12.60	12.53	12.80	12.80
61.50	10.00	10.00	11.40	11.20	12.20	12.20	12.50	12.55	12.80	12.80

Table IV.6A

SCORES AT EACH CENTILE RANK - ORIENTATION OF THE PIECE - ADVANTAGED GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
19.50	0.00	0.00	0.00	1.60	4.20	4.00	5.80	5.40	8.00	8.40
22.50	0.00	0.33	3.20	1.90	3.80	4.83	5.00	6.20	8.80	8.77
25.50	1.00	0.33	2.50	2.50	6.50	5.10	7.80	7.10	9.50	9.43
28.50	0.00	0.93	1.80	2.83	5.00	6.43	8.50	8.77	10.00	10.23
31.50	1.80	2.20	4.20	4.07	7.80	7.00	10.00	9.63	11.20	10.90
34.50	4.80	4.20	6.20	5.80	8.20	8.60	10.40	10.47	11.50	11.57
37.50	6.00	5.87	7.00	7.23	9.80	9.40	11.00	10.97	12.00	12.00
40.50	6.80	7.00	8.50	8.23	10.20	10.17	11.50	11.43	12.50	12.33
43.50	8.20	7.73	9.20	8.83	10.50	10.40	11.80	11.77	12.50	12.57
46.50	8.20	8.13	8.80	8.93	10.50	10.67	12.00	12.00	12.70	12.63
49.50	8.00	8.13	8.80	9.13	11.00	11.10	12.20	12.23	12.70	12.73
52.50	8.20	8.47	9.80	9.67	11.80	11.53	12.50	12.40	12.80	12.77
55.50	9.20	9.07	10.40	10.33	11.80	11.87	12.50	12.50	12.80	12.80
58.50	9.80	ERR	10.80	ERR	12.00	12.00	12.50	12.50	12.80	12.80
61.50		ERR		ERR	12.20	12.10	12.50	12.50	12.80	12.80

Table IV.6B

SCORES AT EACH CENTILE RANK - ORIENTATION OF THE PIECE -
LOWER URBAN GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
mths.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.50	5.50	5.50	8.00	8.10	9.50	9.20
25.50	0.00	0.00	1.00	1.27	5.50	5.60	8.20	8.33	8.90	9.53
28.50	0.00	1.00	2.80	3.03	5.80	6.17	8.80	8.83	10.20	10.03
31.50	3.00	2.83	5.30	4.77	7.20	7.33	9.50	9.50	11.00	10.67
34.50	5.50	4.90	6.20	6.17	9.00	8.57	10.20	10.03	10.80	11.00
37.50	6.20	5.97	7.00	6.73	9.50	9.43	10.40	10.37	11.20	11.17
40.50	6.20	6.27	7.00	7.07	9.80	9.73	10.50	10.63	11.50	11.50
43.50	6.40	6.53	7.20	7.47	9.90	9.97	11.00	10.97	11.80	11.93
46.50	7.00	7.20	8.20	8.07	10.20	10.23	11.40	11.40	12.50	12.27
49.50	8.20	8.00	8.80	8.83	10.60	10.60	11.80	11.67	12.50	12.50
52.50	8.80	8.80	9.50	9.43	11.00	10.93	11.80	11.80	12.50	12.50
55.50	9.40	9.23	10.00	9.90	11.20	11.27	11.80	12.03	12.50	12.60
58.50	9.50	9.63	10.20	10.23	11.60	11.53	12.50	12.27	12.80	12.70
61.50	10.00	9.75	10.50	10.35	11.80	11.70	12.50	12.50	12.80	12.80

Table IV.6C

SCORES AT EACH CENTILE RANK - ORIENTATION OF THE PIECE -
RURAL GROUP

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS"	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.40	1.40	1.80	3.50	4.25	6.40	7.10	8.50	9.50
25.50	0.80	0.73	2.20	2.07	5.00	4.97	7.80	7.73	10.50	10.07
28.50	1.40	1.47	2.60	2.77	6.40	6.00	9.00	8.60	11.20	10.70
31.50	2.20	2.20	3.50	3.43	6.60	6.73	9.00	8.83	10.40	10.93
34.50	3.00	3.07	4.20	4.23	7.20	7.10	8.50	9.00	11.20	10.87
37.50	4.00	3.83	5.00	5.00	7.50	7.73	9.50	9.40	11.00	11.13
40.50	4.50	4.83	5.80	6.20	8.50	8.60	10.20	10.23	11.20	11.33
43.50	6.00	5.50	7.80	7.20	9.80	9.50	11.00	10.90	11.80	11.73
46.50	6.00	6.60	8.00	8.27	10.20	10.33	11.50	11.43	12.20	12.17
49.50	7.80	7.10	9.00	8.50	11.00	10.57	11.80	11.70	12.50	12.40
52.50	7.50	ERR	8.50	8.67	10.50	10.50	11.80	11.87	12.50	12.50
55.50		ERR	8.50	8.60	10.00	10.57	12.00	11.93	12.50	12.50
58.50	6.50	ERR	8.80	8.70	11.20	10.80	12.00	12.00	12.50	12.50
61.50	6.00	6.25	8.80	8.80	11.20	11.20	12.00	12.00	12.50	12.50

TABLE IV.6D

SCORES AT EACH CENTILE RANK- ORIENTATION OF THE PIECE
TOTAL SAMPLE (n = 525)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.20	1.20	1.85	4.20	4.50	6.50	7.50	9.20	9.50
25.50	0.40	0.47	2.50	2.17	4.80	4.93	8.50	7.93	9.80	9.83
28.50	1.00	1.63	2.80	3.37	5.80	6.03	8.80	9.10	10.50	10.57
31.50	3.50	2.83	4.80	4.37	7.50	7.03	10.00	9.67	11.40	10.97
34.50	4.00	4.33	5.50	5.60	7.80	8.10	10.20	10.23	11.00	11.30
37.50	5.50	5.10	6.50	6.33	9.00	8.77	10.50	10.50	11.50	11.43
40.50	5.80	6.03	7.00	7.23	9.50	9.57	10.80	10.77	11.80	11.60
43.50	6.80	6.60	8.20	7.90	10.20	10.07	11.00	11.10	11.50	11.93
46.50	7.20	7.33	8.50	8.57	10.50	10.50	11.50	11.50	12.50	12.17
49.50	8.00	7.80	9.00	8.97	10.80	10.83	12.00	11.90	12.50	12.53
52.50	8.20	8.23	9.40	9.30	11.20	11.07	12.20	12.13	12.60	12.63
55.50	8.50	8.43	9.50	9.57	11.20	11.30	12.20	12.30	12.80	12.73
58.50	8.60	8.37	9.80	9.77	11.50	11.40	12.50	12.40	12.80	12.80
61.50	8.00	8.30	10.00	9.90	11.50	11.50	12.50	12.50	12.80	12.80

TABLE IV.7A

SCORES AT EACH CENTILE RANK-

COMPREHENSION OF ILLUSTRATED SITUATIONS - ADVANTAGED GRP.

Age mth	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
	10CENT	10 SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
19.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	6.75	
22.50	0.00	0.00	0.00	0.00	0.00	3.00	3.00	8.50	13.50	14.75
25.50	0.00	0.00	0.00	1.00	6.00	5.50	14.00	10.67	16.00	15.83
28.50	0.00	1.17	3.00	2.67	10.50	10.33	15.00	17.33	18.00	19.67
31.50	3.50	2.67	5.00	6.67	14.50	15.83	23.00	21.33	25.00	24.00
34.50	4.50	4.33	12.00	11.33	22.50	20.33	26.00	25.67	29.00	28.33
37.50	5.00	8.17	17.00	16.83	24.00	24.33	28.00	27.67	31.00	30.33
40.50	15.00	11.33	21.50	20.50	26.50	25.83	29.00	28.83	31.00	31.33
43.50	14.00	15.33	23.00	22.50	27.00	27.00	29.50	29.33	32.00	31.50
46.50	17.00	17.67	23.00	23.33	27.50	27.67	29.50	30.00	31.50	31.83
49.50	22.00	20.50	24.00	23.67	28.50	28.33	31.00	30.67	32.00	32.00
52.50	22.50	22.50	24.00	24.67	29.00	29.17	31.50	31.50	32.50	32.33
55.50	23.00	23.17	26.00	26.00	30.00	30.00	32.00	31.83	32.50	32.67
58.50	24.00	25.17	28.00	27.83	31.00	30.83	32.00	32.17	33.00	32.83
61.50	28.50	26.25	29.50	28.75	31.50	31.25	32.50	32.25	33.00	33.00

TABLE IV.7B

SCORES AT EACH CENTILE RANK -

COMPREHENSION OF ILLUSTRATED SITUATIONS - LOWER URBAN GROUP

AGE	Scores at each centile rank (CENT - Centile; SM - smoothed centile)									
MTHS.	10CENT	10 SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.75	3.00	5.00
25.50	0.00	0.00	0.00	0.00	0.00	0.00	2.50	2.17	7.00	6.00
28.50	0.00	0.00	0.00	0.00	0.00	0.17	3.00	4.00	8.00	11.67
31.50	0.00	0.00	0.00	0.00	0.50	1.17	6.50	8.83	20.00	17.50
34.50	0.00	0.00	0.00	0.00	3.00	3.17	17.00	15.17	24.50	23.50
37.50	0.00	0.00	0.00	0.00	6.00	7.00	22.00	20.50	26.00	25.33
40.50	0.00	0.00	0.00	0.00	12.00	10.83	22.50	22.50	25.50	25.83
43.50	0.00	0.00	0.00	1.00	14.50	15.33	23.00	23.83	26.00	26.83
46.50	0.00	0.50	3.00	3.67	19.50	19.00	26.00	25.33	29.00	29.00
49.50	1.50	1.50	8.00	7.33	23.00	22.17	27.00	27.00	32.00	31.00
52.50	3.00	3.50	11.00	11.33	24.00	23.83	28.00	27.67	32.00	32.00
55.50	6.00	7.50	15.00	14.67	24.50	24.83	28.00	28.17	32.00	31.83
58.50	13.50	11.17	18.00	17.00	26.00	25.83	28.50	28.50	31.50	31.83
61.50	14.00	13.75	18.00	18.00	27.00	26.50	29.00	28.75	32.00	31.75

TABLE IV.7C

SCORES AT EACH CENTILE RANK - COMPREHENSION OF ILLUSTRATED SITUATIONS

RURAL GRP.

AGE	Scores at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10 SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
25.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.17
28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.50	4.17
31.50	0.00	0.00	0.00	0.00	0.00	0.00	3.00	2.33	9.00	9.00
34.50	0.00	0.00	0.00	0.00	0.00	1.00	4.00	6.33	15.50	14.50
37.50	0.00	0.00	0.00	0.00	3.00	2.33	12.00	10.00	19.00	18.17
40.50	0.00	0.00	0.00	0.00	4.00	4.33	14.00	14.33	20.00	20.83
43.50	0.00	0.00	0.00	0.00	6.00	6.00	17.00	17.33	23.50	22.83
46.50	0.00	0.00	0.00	0.00	8.00	10.17	21.00	20.33	25.00	24.50
49.50	0.00	0.00	0.00	0.67	16.50	13.17	23.00	22.00	25.00	25.33
52.50	0.00	1.33	2.00	2.67	15.00	15.83	22.00	23.33	26.00	26.00
55.50	4.00	2.50	6.00	6.33	16.00	16.67	25.00	24.50	27.00	27.33
58.50	3.50	3.50	11.00	9.00	19.00	18.83	26.50	26.17	29.00	28.33
61.50	3.00	3.25	10.00	10.50	21.50	20.25	27.00	26.75	29.00	29.00

TABLE IV.7D

SCORES AT EACH CENTILE RANK- COMPREHENSION OF ILLUSTRATED SITUATIONS
TOTAL SAMPLE (n = 616)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	7.25
25.50	0.00	0.00	0.00	0.00	0.00	0.00	7.00	5.17	14.50	10.00
28.50	0.00	0.00	0.00	0.00	0.00	1.33	8.50	10.00	15.50	18.00
31.50	0.00	0.00	0.00	0.00	4.00	3.67	14.50	15.00	24.00	22.00
34.50	0.00	0.00	0.00	0.00	7.00	9.00	22.00	20.23	26.50	26.33
37.50	0.00	0.00	0.00	0.00	16.00	13.73	24.20	24.07	28.50	28.00
40.50	0.00	0.00	0.00	1.00	18.20	18.73	26.00	25.90	29.00	29.33
43.50	0.00	0.00	3.00	2.00	22.00	20.90	27.50	27.00	30.50	29.83
46.50	0.00	0.83	3.00	5.67	22.50	23.00	27.50	28.00	30.00	30.83
49.50	2.50	1.83	11.00	9.00	24.50	23.83	29.00	28.57	32.00	31.33
52.50	3.00	5.50	13.00	13.33	24.50	25.17	29.20	29.73	32.00	32.17
55.50	11.00	8.00	16.00	14.67	26.50	25.67	31.00	30.07	32.50	32.17
58.50	10.00	10.00	15.00	15.83	26.00	26.17	30.00	30.33	32.00	32.17
61.50	9.00	9.50	16.50	15.75	26.00	26.00	30.00	30.00	32.00	32.00

TABLE IV.8A

SCORES AT EACH CENTILE RANK - EXPRESSION ON QUESTIONS - ADVANTAGED GROUP

AGE	Score at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	3.00	6.00	11.00	19.00	19.25
25.50	0.00	0.00	0.00	0.67	6.00	7.00	16.00	13.67	19.50	20.50
28.50	0.00	0.67	2.00	3.33	15.00	13.00	19.00	20.67	23.00	24.33
31.50	2.00	3.33	8.00	8.67	18.00	19.67	27.00	25.33	30.50	28.50
34.50	8.00	6.33	16.00	14.33	26.00	24.00	30.00	29.67	32.00	31.83
37.50	9.00	12.00	19.00	20.00	28.00	28.00	32.00	31.50	33.00	32.67
40.50	19.00	16.67	25.00	23.33	30.00	29.67	32.50	32.50	33.00	33.33
43.50	22.00	21.33	26.00	25.67	31.00	30.67	33.00	32.67	34.00	33.33
46.50	23.00	23.17	26.00	27.00	31.00	31.17	32.50	32.83	33.00	33.67
49.50	24.50	24.17	29.00	28.00	31.50	31.50	33.00	32.83	34.00	33.67
52.50	25.00	25.83	29.00	29.17	32.00	31.83	33.00	33.00	34.00	34.17
55.50	28.00	27.00	29.50	29.67	32.00	32.17	33.00	33.00	34.50	34.33
58.50	28.00	28.83	30.50	30.67	32.50	32.33	33.00	33.00	34.50	34.67
61.50	30.50	29.25	32.00	31.25	32.50	32.50	33.00	33.00	35.00	34.75

TABLE IV.88

SCORES AT EACH CENTILE RANK - EXPRESSION ON QUESTIONS

LOWER URBAN GROUP

AGE	Score at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.50	5.50	6.75
25.50	0.00	0.00	0.00	0.00	0.00	0.00	4.00	3.33	8.00	8.17
28.50	0.00	0.00	0.00	0.00	0.00	0.17	5.00	5.50	11.00	14.33
31.50	0.00	0.00	0.00	0.00	0.50	1.33	7.50	11.17	24.00	21.67
34.50	0.00	0.00	0.00	0.00	3.50	4.00	21.00	18.17	30.00	28.00
37.50	0.00	0.00	0.00	0.00	8.00	8.17	26.00	24.50	30.00	30.00
40.50	0.00	0.00	0.00	0.00	13.00	13.67	26.50	26.50	30.00	30.00
43.50	0.00	0.00	0.00	1.00	20.00	18.67	27.00	27.50	30.00	30.67
46.50	0.00	0.67	3.00	4.00	23.00	23.00	29.00	28.67	32.00	31.33
49.50	2.00	1.50	9.00	8.83	26.00	25.67	30.00	30.00	32.00	32.33
52.50	2.50	5.50	14.50	14.00	28.00	27.67	31.00	31.00	33.00	32.67
55.50	12.00	9.83	18.50	19.00	29.00	29.00	32.00	31.67	33.00	33.00
58.50	15.00	14.00	24.00	22.17	30.00	29.67	32.00	32.00	33.00	33.00
61.50	15.00	15.00	24.00	24.00	30.00	30.00	32.00	32.00	33.00	33.00

TABLE IV.8C

SCORES AT EACH CENTILE RANK - EXPRESSION ON QUESTIONS
RURAL GROUP

AGE	Score at each centile rank (CENT - centile; SM - smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
25.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	2.50	6.33
31.50	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.00	16.00	12.50
34.50	0.00	0.00	0.00	0.00	0.00	1.00	7.00	8.67	19.00	20.33
37.50	0.00	0.00	0.00	0.00	3.00	3.00	17.00	14.67	26.00	24.00
40.50	0.00	0.00	0.00	0.00	6.00	6.00	20.00	20.00	27.00	27.33
43.50	0.00	0.00	0.00	0.00	9.00	9.33	23.00	23.00	29.00	28.67
46.50	0.00	0.00	0.00	0.00	13.00	14.00	26.00	25.33	30.00	30.00
49.50	0.00	0.00	0.00	1.50	20.00	17.67	27.00	26.67	31.00	30.67
52.50	0.00	1.67	4.50	5.83	20.00	20.33	27.00	27.33	31.00	31.00
55.50	5.00	3.33	13.00	10.17	21.00	21.67	28.00	28.17	31.00	31.33
58.50	5.00	4.67	13.00	12.83	24.00	23.67	29.50	29.17	32.00	31.67
61.50	4.00	4.50	12.50	12.75	26.00	25.00	30.00	29.75	32.00	32.00

TABLE IV.8D

SCORES AT EACH CENTILE RANK- EXPRESSION ON QUESTIONS
TOTAL SAMPLE (n = 616)

AGE	Scores at each centile rank (CENT - centile; SM- smoothed centile)									
MTHS.	10CENT	10_SM	20 CENT	20 SM	50 CENT	50 SM	75 CEN	75 SM	90 CENT	90 SM
22.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.75	11.00	14.25
25.50	0.00	0.00	0.00	0.00	0.00	0.00	5.50	6.00	17.50	15.83
28.50	0.00	0.00	0.00	0.00	0.00	1.50	12.50	11.83	19.00	22.00
31.50	0.00	0.00	0.00	0.00	4.50	4.50	17.50	18.67	29.50	26.23
34.50	0.00	0.00	0.00	0.00	9.00	11.00	26.00	23.83	30.20	30.57
37.50	0.00	0.00	0.00	0.00	19.50	17.17	28.00	27.93	32.00	31.57
40.50	0.00	0.00	0.00	2.00	23.00	23.00	29.80	29.77	32.50	32.33
43.50	0.00	0.00	6.00	4.00	26.50	25.33	31.50	30.77	32.50	32.50
46.50	0.00	1.00	6.00	9.00	26.50	27.33	31.00	31.50	32.50	32.50
49.50	3.00	3.00	15.00	12.33	29.00	27.83	32.00	31.83	32.50	32.67
52.50	6.00	8.00	16.00	17.33	28.00	29.00	32.50	32.33	33.00	32.83
55.50	15.00	11.67	21.00	19.00	30.00	29.17	32.50	32.50	33.00	33.00
58.50	14.00	13.83	20.00	20.33	29.50	29.67	32.50	32.33	33.00	32.93
61.50	12.50	13.25	20.00	20.00	29.50	29.50	32.00	32.25	32.80	32.90

INTERMEDIATE RESPONSES

Table IV.16 EXAMPLES OF INTERMEDIATE RESPONSES

EXPRESSIVE VERBAL LABELS:-

1. Fan:

T1A Perceptual similarity	:	flower, bird, chakery (pinwheel) Butterfly.
T1B Functional term	:	"that which gives breeze",
T1C Generic term	:	light

2. Chair:-

T1A Perceptual similarity	:	no such responses
T1B Functional term	:	" something to sit on "
T1C Generic term	:	sofa, stool, table

3. Clock:-

T1A Perceptual similarity	:	ball, coin,
T1B Functional term	:	"that shows time"
T1C Generic term	:	watch
T1D Part of object	:	telephone (dial), numbers

4. Stove:-

T1A Perceptual similarity	:	bucket, stool
T1B Functional term	:	utensil, tava, to cook on, to make chappti on
T1C Generic term	:	oven, fire
T1D Part of object	:	fire, 'danda'(firewood)

5.Dog:-

T1A Wild animals	:	zebra, lion, crocodile
T1B domesticated animals seen commonly on streets and fields	:	cow, rat, pig, rabbit.

.Bed:-

T1A Perceptual similarity	:	table, net (of the rope or string cot)
T1B Functional term	:	" to sleep on "
T1C Generic term	:	mattress, bedding
T1D Part of the object	:	net, lamp (for the bed post)

7. Tree:-

T1A Perceptual similarity	:	wood, fan (hand held)
T1C Generic term	:	jungle, leaf, bush, flower
T1D Part of object	:	'danda'(log), leaf, mango

8.Kite:-

T1A Perceptualsimilarity	:	Bird, flower,(since the kite is stuck in the branches)
T1D Part of object	:	colour 'red'

9.Bucket:-

T1A Perceptual similarity	:	pot, glass, angeti (a kind of warmer)
T1B Functional term	:	for water, water
T1C Generic term	:	tumbler, tub, basin
T1D Part of object	:	colour 'red'

10.Woman, Boy, Girl, Baby:

T1A	:	The response is a human being but neither the sex nor age is correct e.g. for girl response is man
T1B	:	Either the sex or age is right e.g. lady - girl, queen, man

11.Cycle:-

T1A Perceptual similarity	:	Wheel, round,
T1B Functional term	:	'to ride on'
T1C Generic term	:	car, scooter
T1D Part of object	:	spokes, wheel,

12. Mirror:

T1A Perceptual similarity	:	Window, box, television,
T1B Functional term	:	"to see in" or " combing hair"
T1D Part of the object	:	face (for the face reflected in the mirror), line

TABLE IV.17

EXAMPLES OF INTERMEDIATE RESPONSES IN COMPREHENSION OF ILLUSTRATED SITUATIONS

q.1 Mother is bathing baby (T3)

T1 : Describes activity incorrectly i.e. not associated with bathing but relates mummy with baby

e.g. She is feeding baby
Baby is with mummy
She is hitting baby

T2: Describes mother's action associated with bathing baby but does not name the actual event.

e.g. Throwing water on baby
Using a tumbler
There is water

Q.3 Girl is sleeping (T3)

T1: Describes an activity as child sees in the picture but not associated with sleeping.

e.g. She is doing namaste (Joining hands in greeting)
She is looking at the boy
She is looking through the net at the floor.

T2 : Describes an activity related to sleeping

e.g. She is on the bed
She has her head on the pillow

Q.4 Boy is reading (T3)

T1 : An intransitive verb is used, seen in the picture

e.g. Boy is lying down
Boy is playing
Boy is working

T2 : Describes what he sees boy doing with an object in hand -
transitive verb. Here the child does not recognize the book

e.g. Boy is using a calculator.
Boy is using a video remote control
Boy is holding a paper.

Q.5 She is combing hair (T3)

T1: Uses an intransitive verb to describe an activity in the picture or does not recognize the comb or the mirror.

e.g. She is standing
She is looking out of the window
She is looking at the television
She has a 'name' in her hand (This was an interesting commonly given response. A comb resembles a written Hindi word)

T2 : Names an activity related to combing hair or describes the act of combing without labeling it.

e.g. She is pulling her hair
She is doing something to her hair
She is putting on make-up/bindi
She is looking at the mirror

Q.6 Mirrors are to see one's own reflection (T3)

T1 : The child misunderstands the word mirror.
('Shisha' means mirror 'Shishi' means bottle.
Similarly "Kanch" means mirror as well as glass)

e.g. We drink medicine from the bottle
I apply oil from the bottle
I got cut with glass
Glass can break

T2 : Related activities done in front of the mirror

e.g. She is plaiting her hair
Mummy puts make-up/bindi.

Q.7 "Fan rotates to give a breeze" (T3)

T1 : Describes the actual rotation of the fan or its connection with a switch.

e.g. It rotates
We switch in on
The light comes on

T2 : Describes the effects of a rotating fan except cooling

e.g. Dries perspiration
Mosquitoes fly off
We put it on when we sleep
It will cut my finger

Q.8 "The dog is eating" (T3)

T1 : Describes other activities of a dog, except eating

e.g. He is barking
He is sitting/walking
He is iooking at the girl

T2 : Describes the action of eating but does not label the activity

e.g. He is putting his tongue out
He is vomiting.

Q.10 "To show us the time" (T3)

T1 : Describes the activity of an object which resembles a clock

e.g. I dial the phone
I have money
I have a watch at home
(the ciock'sface resembles a telephone dial and a coin.
Watch and clock are synonymous in Hindi).

T2 : Activities with a ciock/watch other than seeing time.

e.g. We wear it.
The alarm goes off
We wind it up
It goes tic-toc tic-toc.

Q.11 "Mummy is cooking/making a chapati" (T3)

T1 : Describes an activity whilst not recognizing the chapati in mother's hand and not taking the kitchen into context.

e.g. She is playing a dumdum (kind of a drum)
She is looking at a plate
She has a moon in her hand
She has a ball in her hand
She is joining her hands.

T2 : Describes an activity carried out in the kitchen besides cooking.

e.g. She is washing utensils
She is washing a plate
She washing her hands.

Q.13. "The boy is climbing the tree to fetch the kite (T3)

T1 : Describes an activity associating the boy with the tree without assimilating the situation.

e.g. Boy is touching the tree
Boy is cutting down the tree
Boy is holding the tree

T2 : Describes the action of climbing the tree but discounts the kite stuck in its branches.

e.g. Boy is climbing tree

Boy is climbing tree for a Mango/a flower.

Q.4,5,6,and 10 don't need decoding a picture to answer. The levels of responses yet are similar to the others.

Q.14 does not have levels of responses only yes or no.

APPENDIX
FIGURES

FIG.III.3

PERFORMANCE ON MODEL I IN VARIOUS SECTIONS OF THE TEST

N = 24

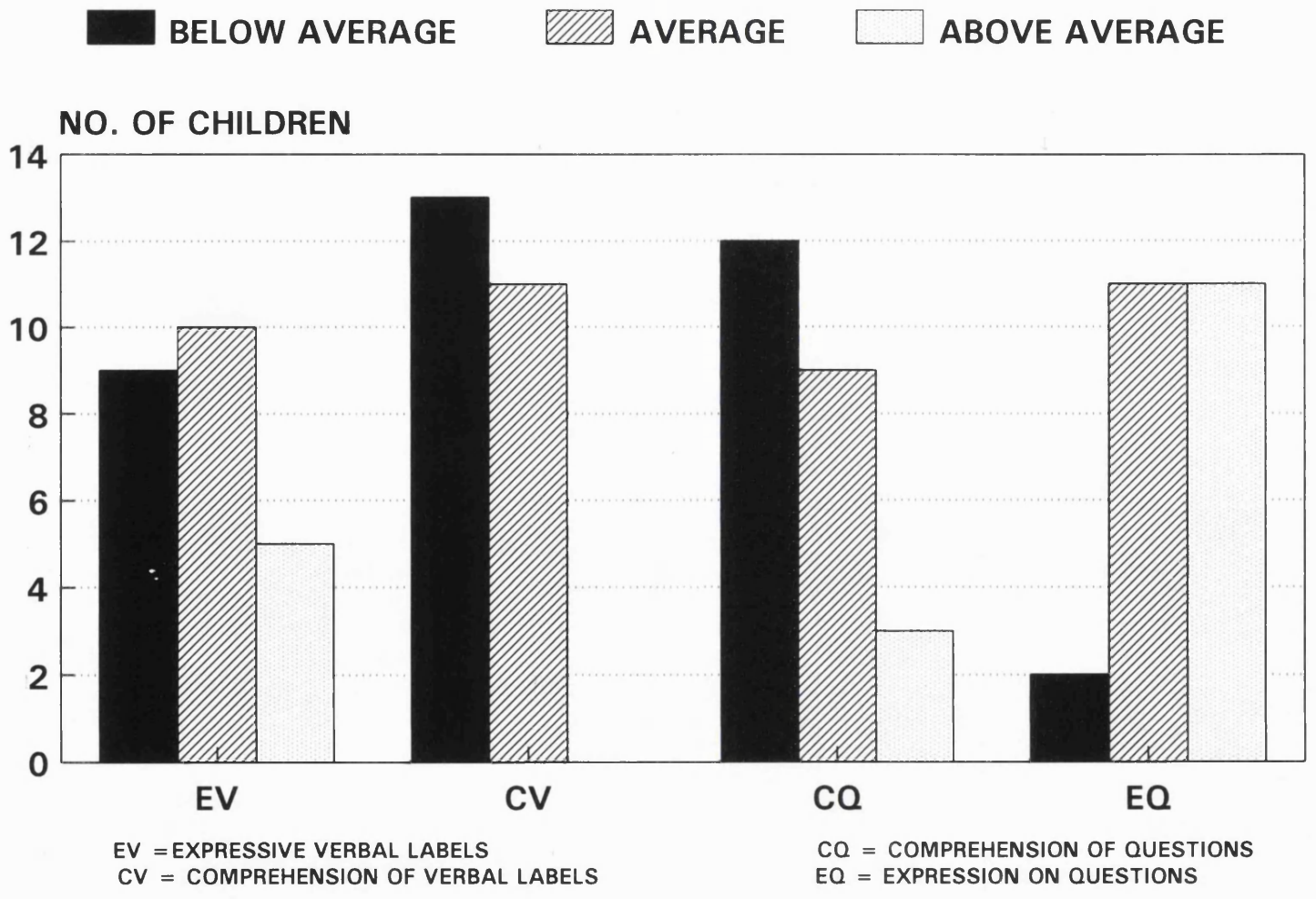
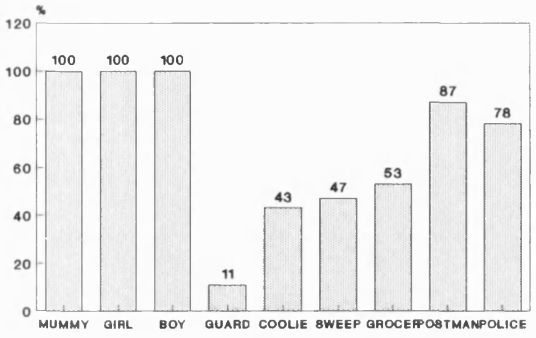


FIG.III.4

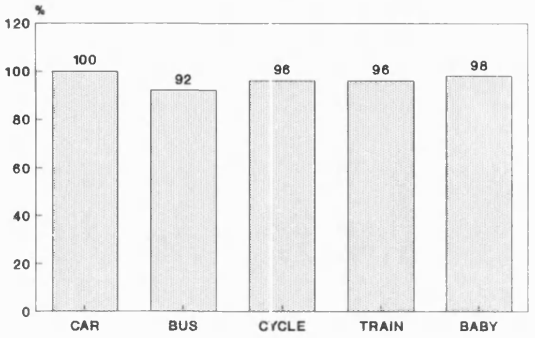
PERCENTAGE OF CORRECT ANSWERS - EXPRESSIVE VERBAL LABELS

MODEL II

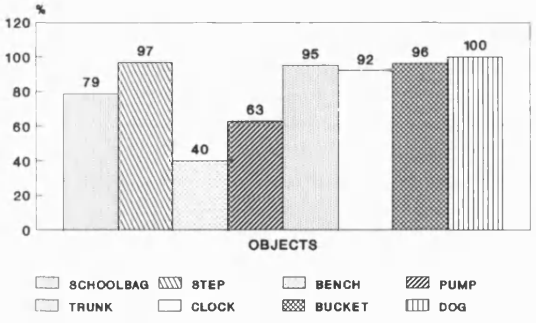
DISTRIBUTION OF CORRECT RESPONSES
EXPRESSIVE VERBAL LABELS - PEOPLE
N=66



PERCENTAGE OF CORRECT EXPRESSIVE LABEL
VEHICLES AND BABY
N=66



PERCENTAGE OF CORRECT EXPRESSIVE LABEL
OBJECTS - A
N=66



PERCENTAGE OF CORRECT EXPRESSIVE LABEL
OBJECTS - B
N=66

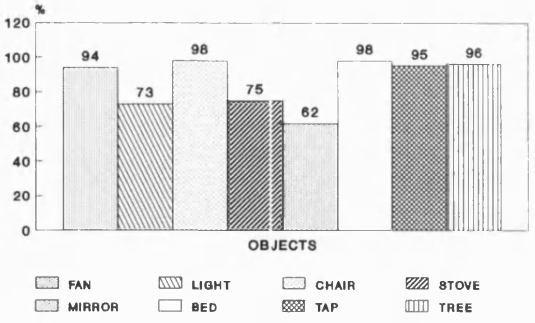
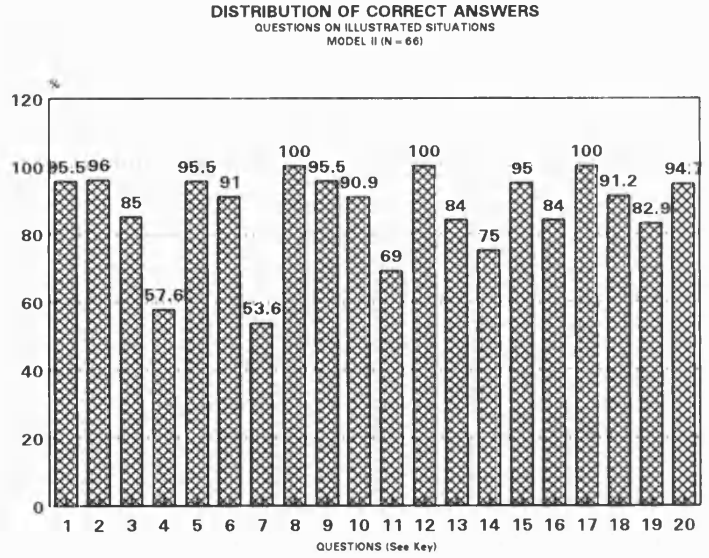


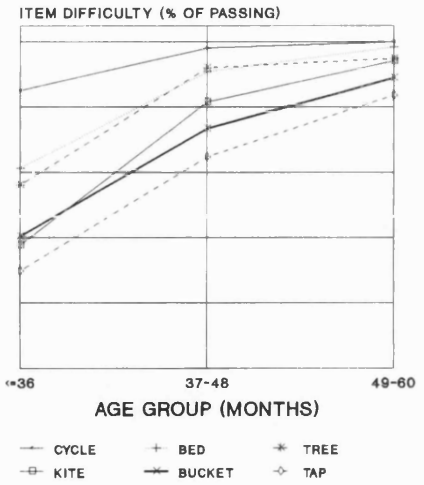
Fig. III.5



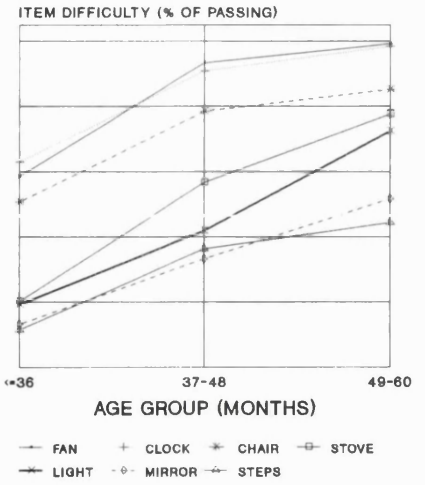
KEY

Q1. WHAT ARE STEPS FOR?
Q2. WHAT IS MUMMY DOING? (BATHING BABY)
Q3. WHAT IS THE COOLIE DOING?
Q4. WHAT IS THE POLICEMAN DOING?
Q5. WHAT IS THE MAN DOING? (DRAWING WATER)
Q6. WHAT IS THE GIRL DOING? (POINTING TO THE TOYS)
Q7. WHAT IS THE GUARD DOING?
Q8. WHAT IS THE BOY DOING? (READING0
Q9. WHAT IS THE FAMILY DOING?
Q10. WHAT IS THE MAN AT THE TEA-STALL DOING?
Q11. WHAT ARE TAPS FOR?
Q12. WHAT IS THE GIRL DOING? (SLEEPING)
Q13. WHAT IS THE LADY DOING? (COMBING HAIR)
Q14. WHAT IS A FAN FOR?
Q15. WHY DO WE HAVE CLOCKS?
Q16. WHAT IS MUMMY DOING? (COOKING)
Q17. WHAT IS THE BOY DOING? (RIDING A BIKE)
Q18. WHAT IS MUMMY DOING? (BUYING VEGETABLES)
Q19. WHAT IS SWEEPER DOING?
Q20. WHAT IS THE POSTMAN DOING?

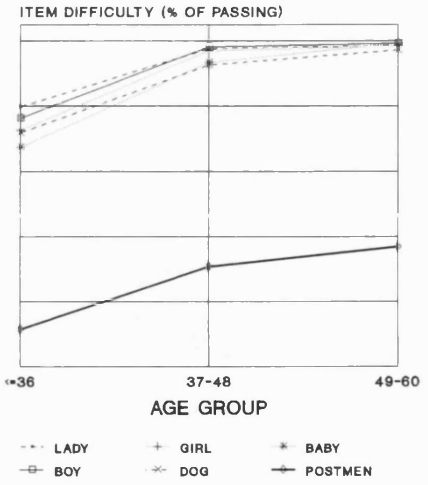
ITEM DIFFICULTY
VERBAL LABELS - COMPREHENSION



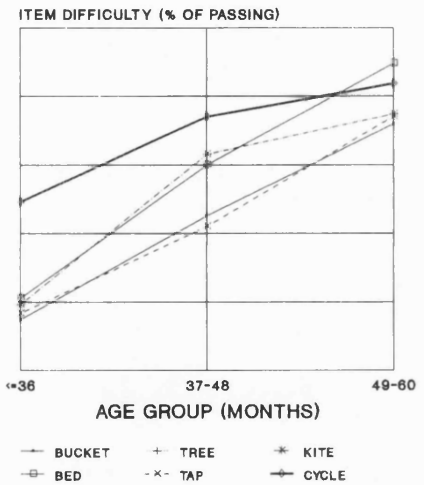
ITEM DIFFICULTY
VERBAL LABELS - COMPREHENSION



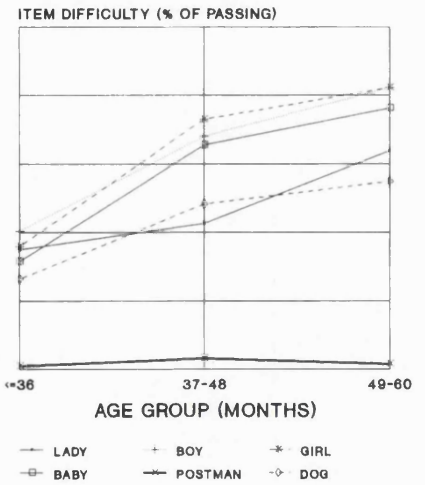
ITEM DIFFICULTY
VERBAL LABELS - COMPREHENSION



ITEM DIFFICULTY
VERBAL LABELS - EXPRESSION



ITEM DIFFICULTY
VERBAL LABELS - EXPRESSION



ITEM DIFFICULTY
VERBAL LABELS - EXPRESSION

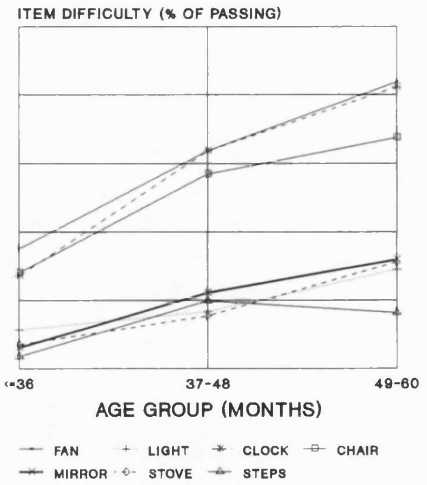
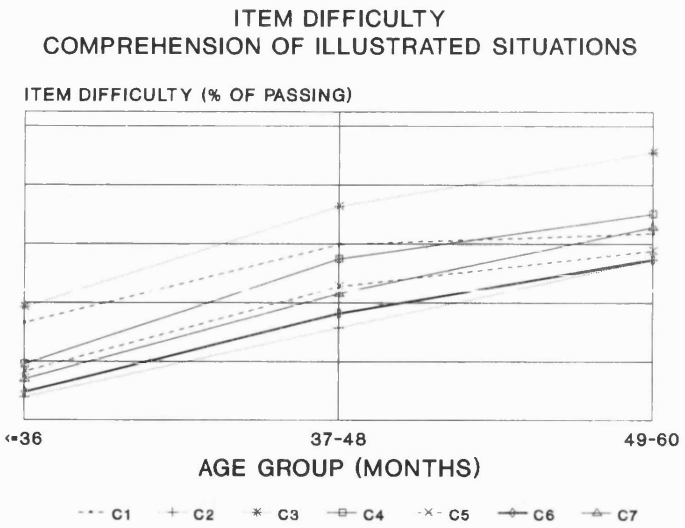
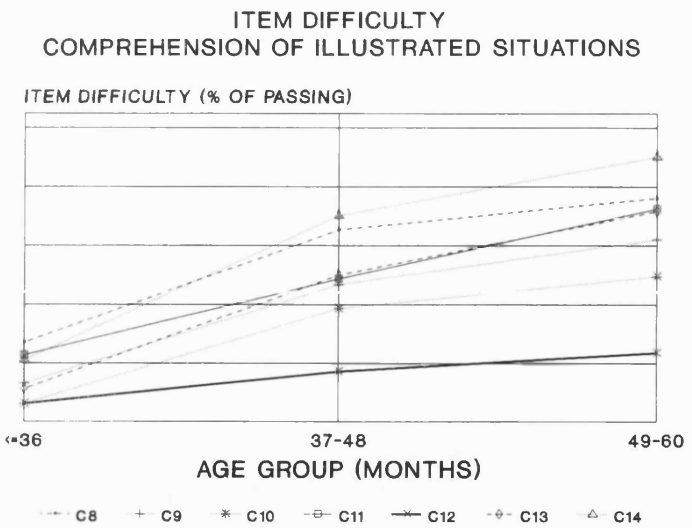


FIG. III.6

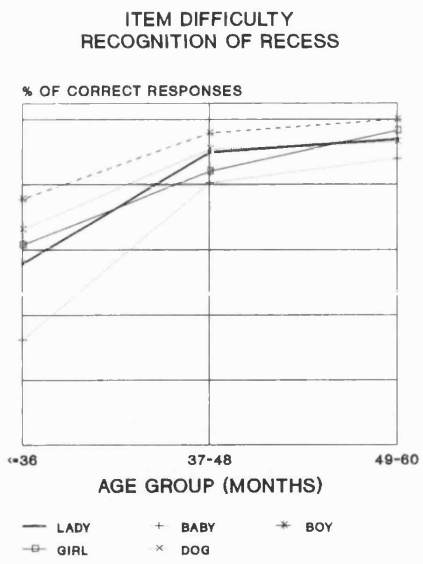


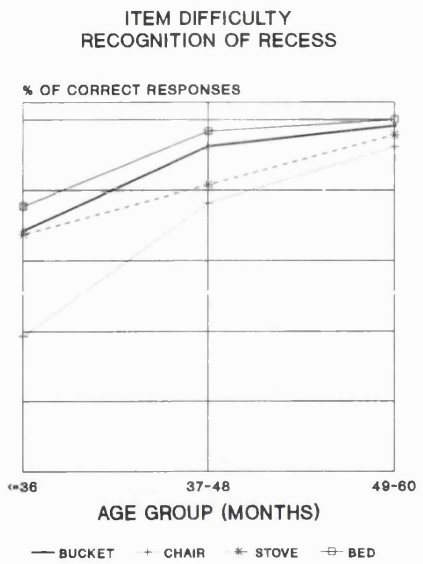


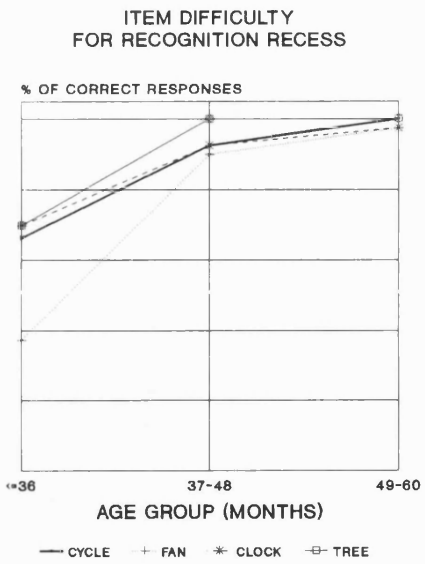
KEY

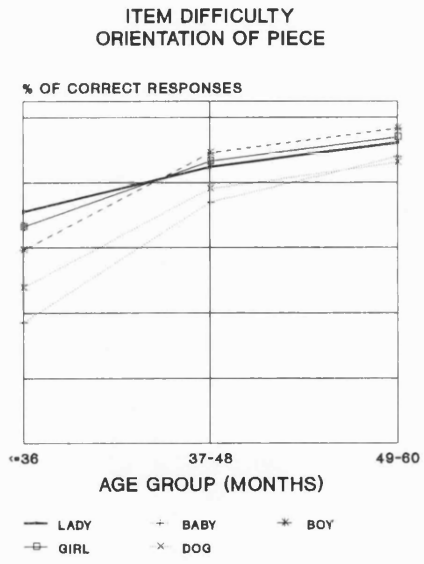
C1 What's mummy doing (bathing baby)
C2 What are taps for
C3 What's girl doing (sleeping)
C4 What's boy doing (reading)
C5 What's lady doing (combing hair)
C6 What's mirrors for
C7 What 's fans for
C8 What's the dog doing
C9 What are steps for
C10 What are clocks for
C11 What is mummy doing (cooking)
C12 What does a postman do
C13 What's boy doing (retrieving kite)
C13 What's boy doing (retrieving kite)
C14 What does a postman do

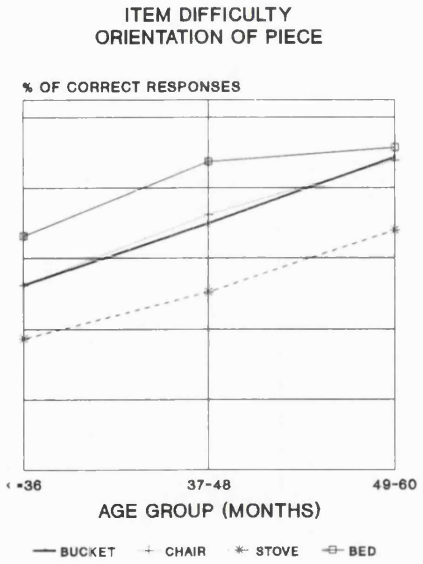
FIG. III.7


ITEM DIFFICULTY
RECOGNITION OF RECESS
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
LADY
BABY
BOY
GIRL
DOG


ITEM DIFFICULTY
RECOGNITION OF RECESS
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
BUCKET
CHAIR
STOVE
BED


ITEM DIFFICULTY
FOR RECOGNITION RECESS
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
CYCLE
FAN
CLOCK
TREE


ITEM DIFFICULTY
ORIENTATION OF PIECE
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
LADY
BABY
BOY
GIRL
DOG


ITEM DIFFICULTY
ORIENTATION OF PIECE
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
BUCKET
CHAIR
STOVE
BED

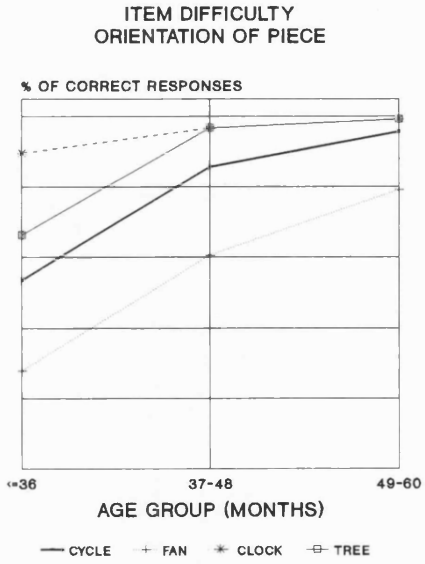
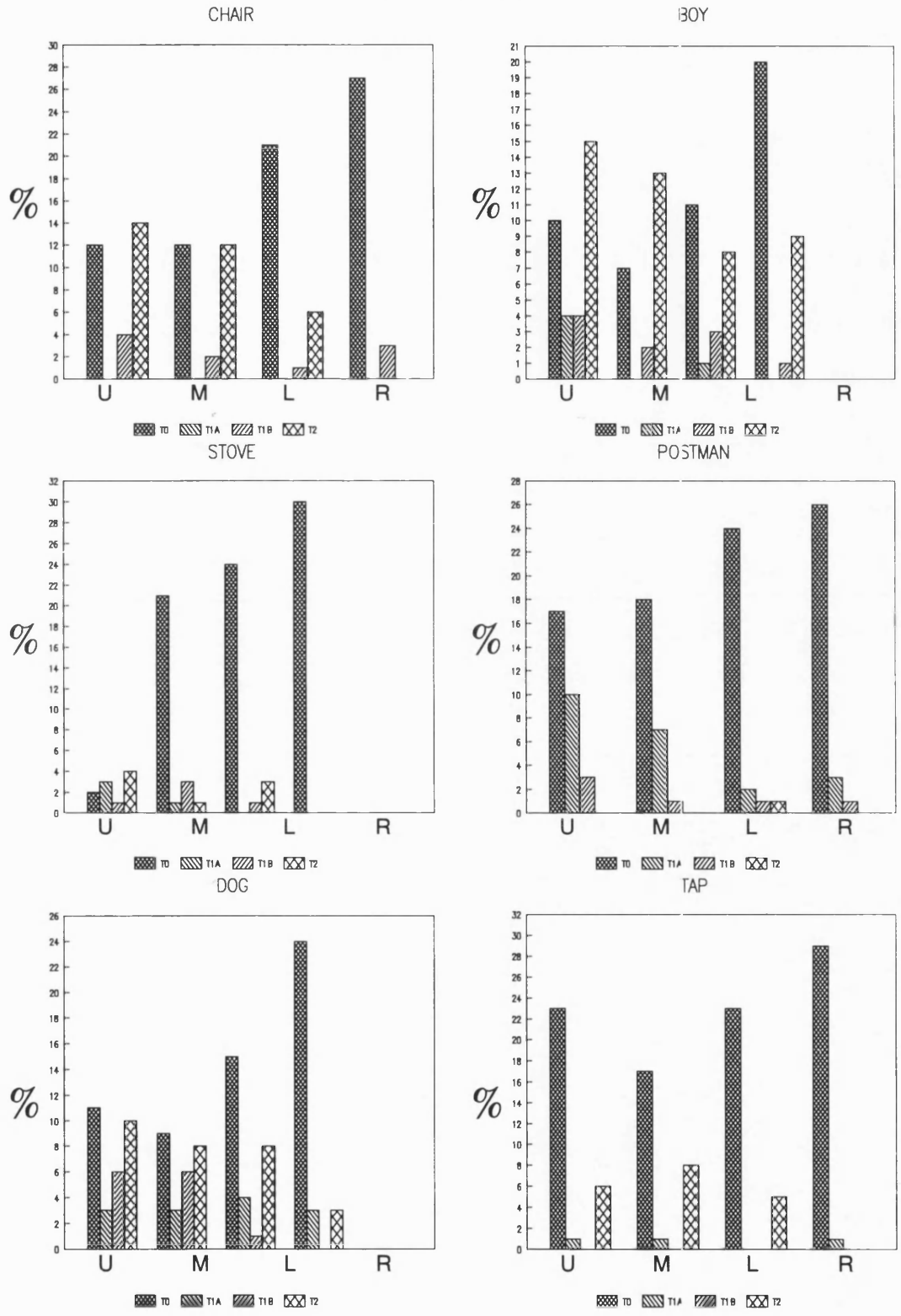

ITEM DIFFICULTY
ORIENTATION OF PIECE
% OF CORRECT RESPONSES
<=36
37-48
49-60
AGE GROUP (MONTHS)
CYCLE
FAN
CLOCK
TREE

FIG. III.8

Fig. IV.1 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS

AGE <=36 Mths.

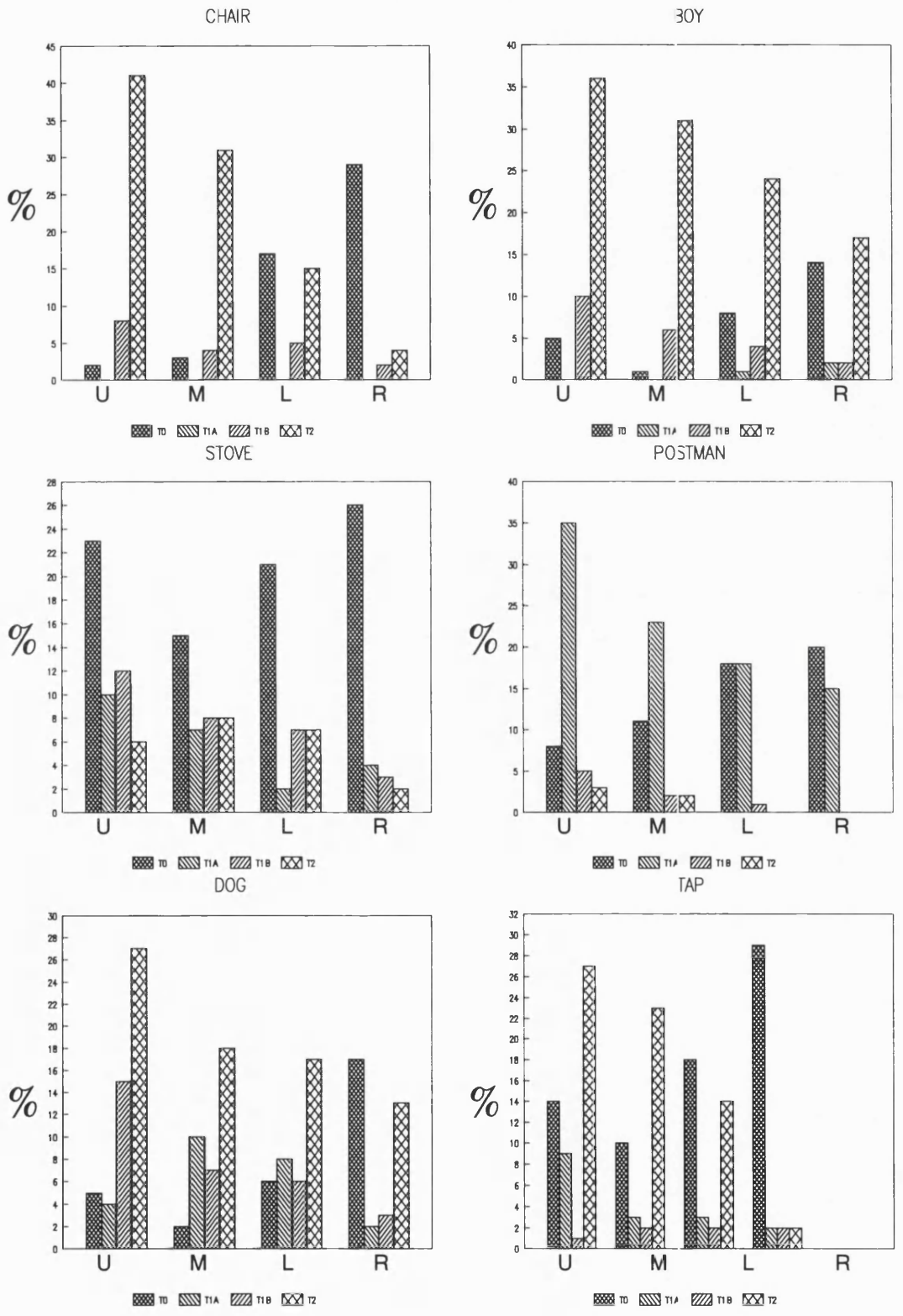


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.2 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE = 37 – 48

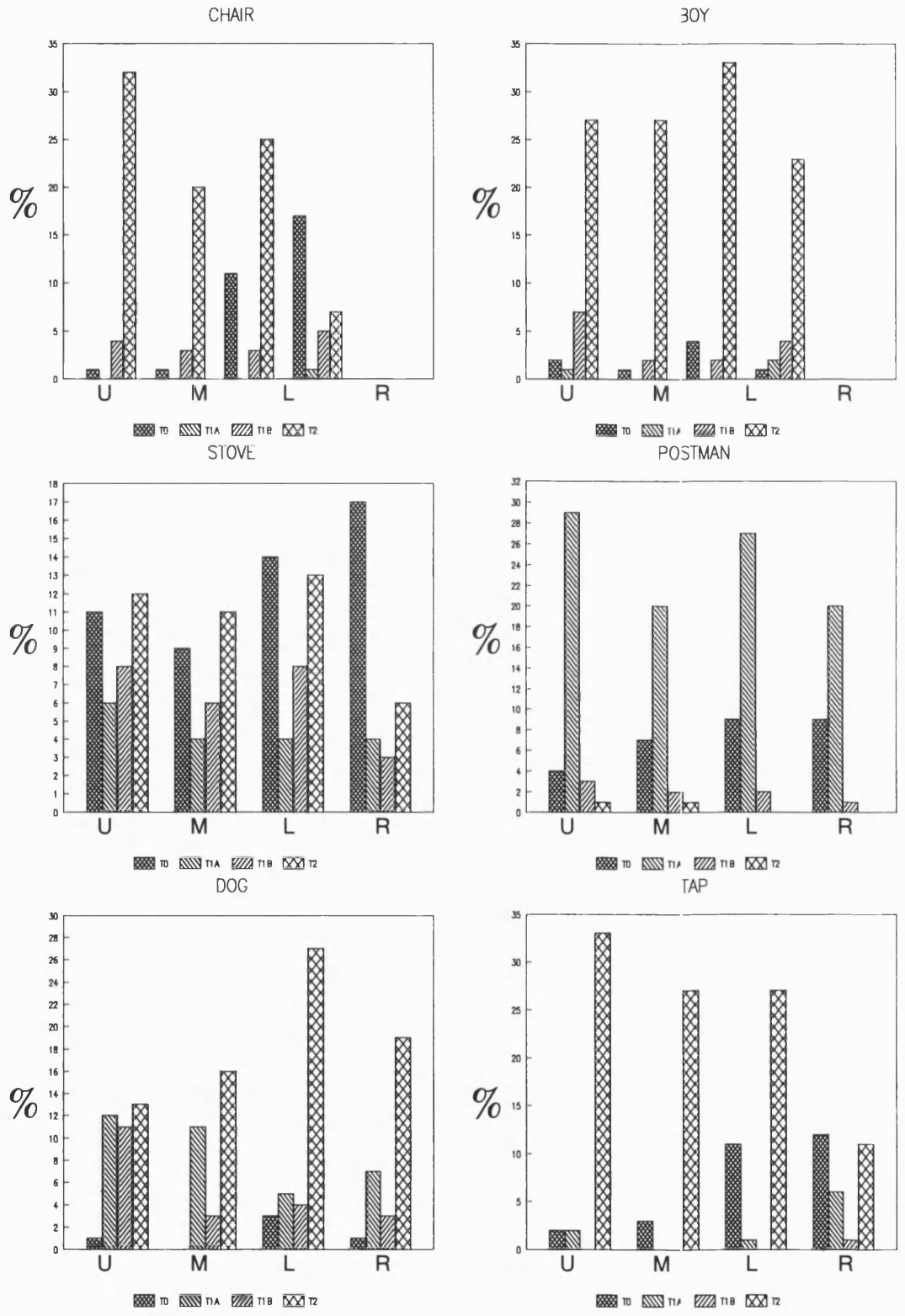


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.3 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE = 49 – 60 Mths.

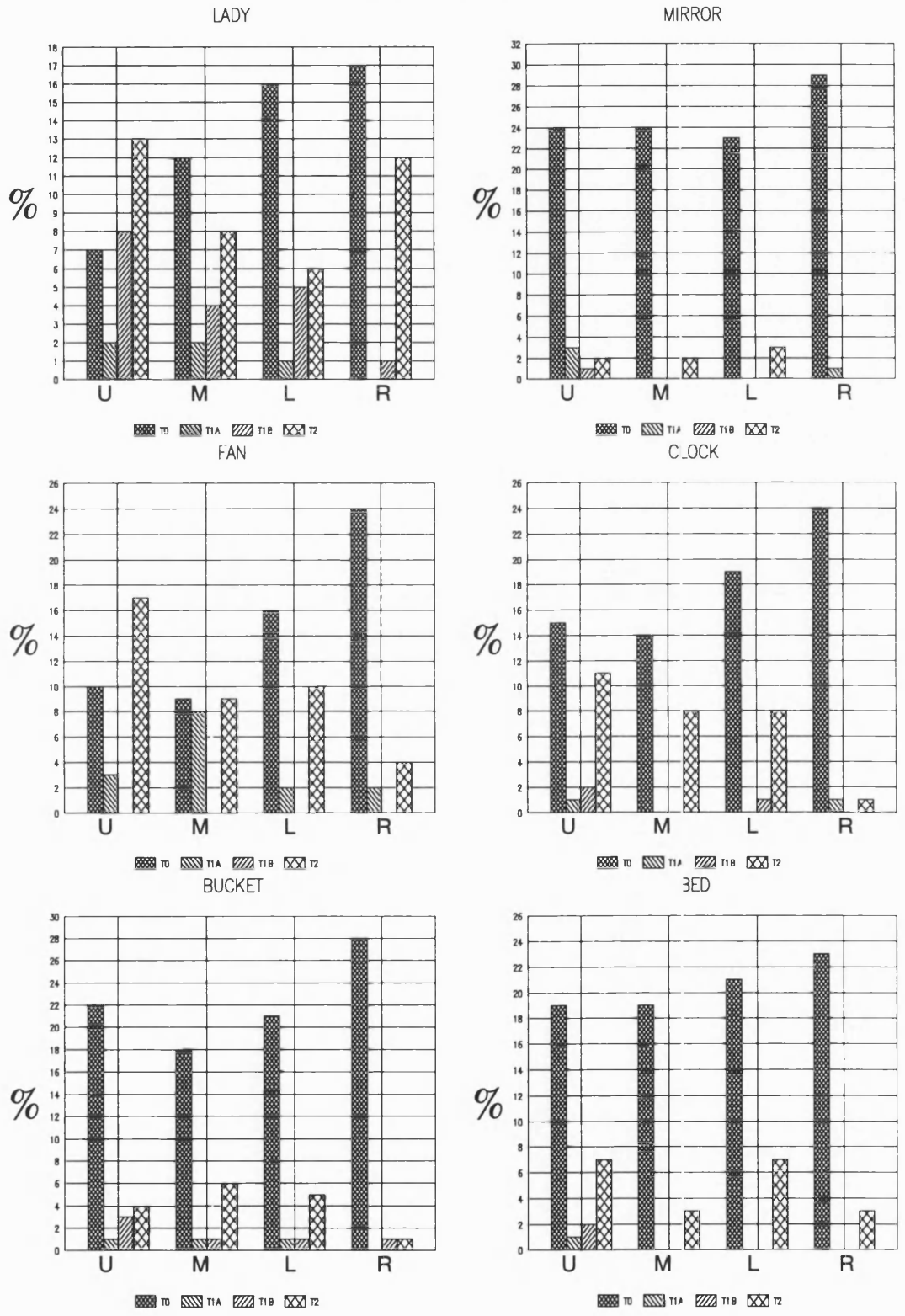


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.4 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE <=36 Mths.

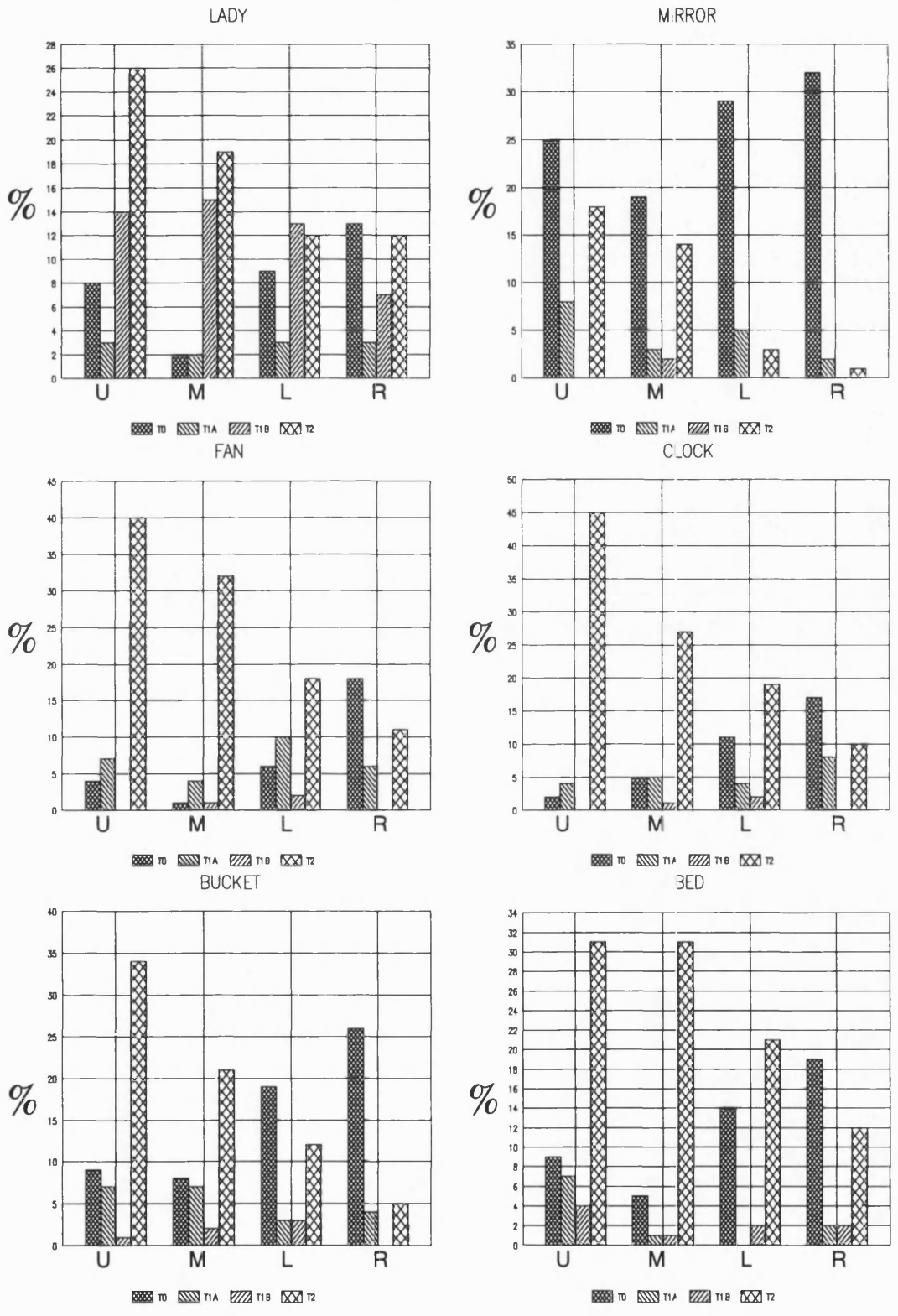


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
L1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.5 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE = 37 – 48

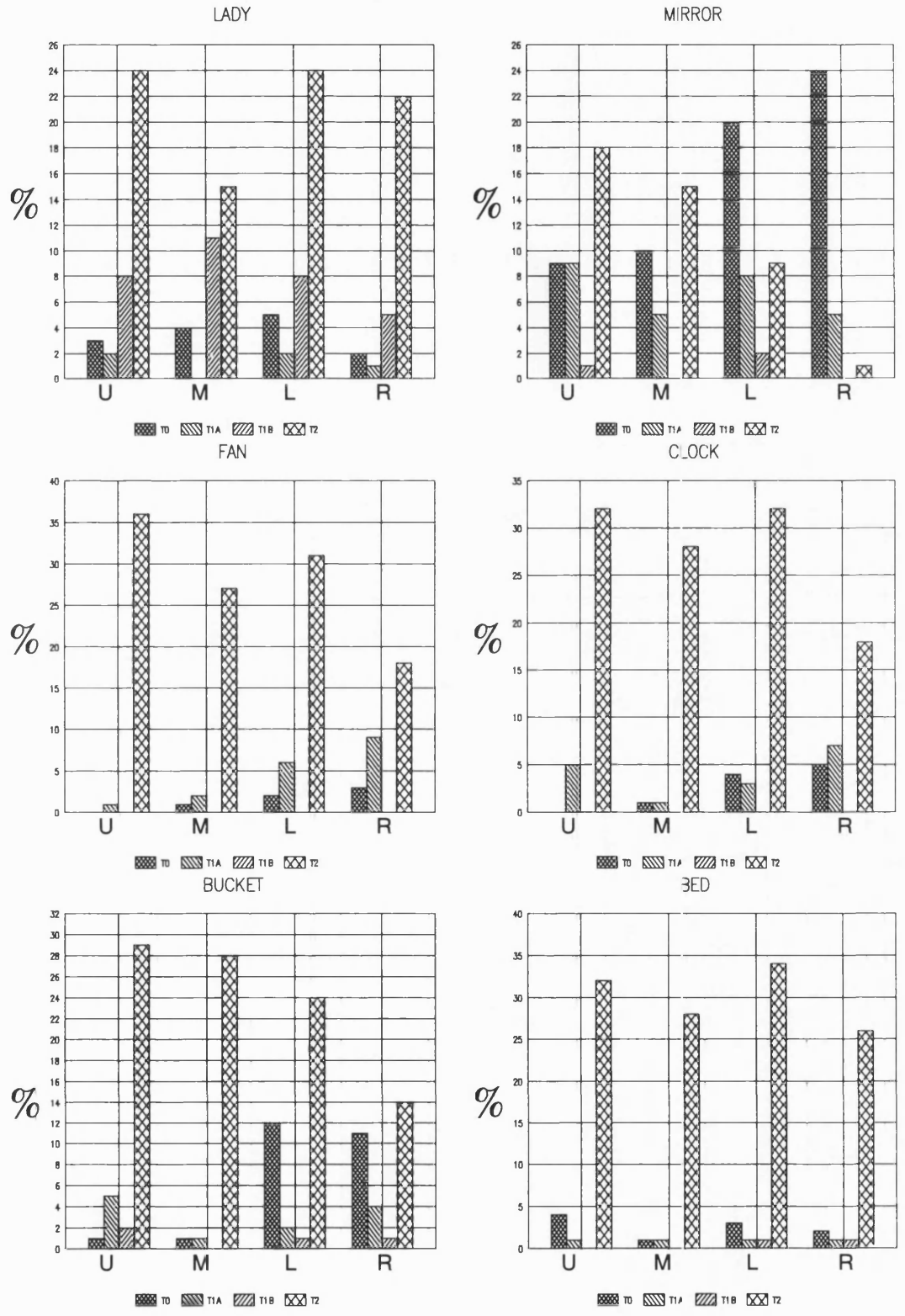


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.6 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE 49 – 60 Mths.

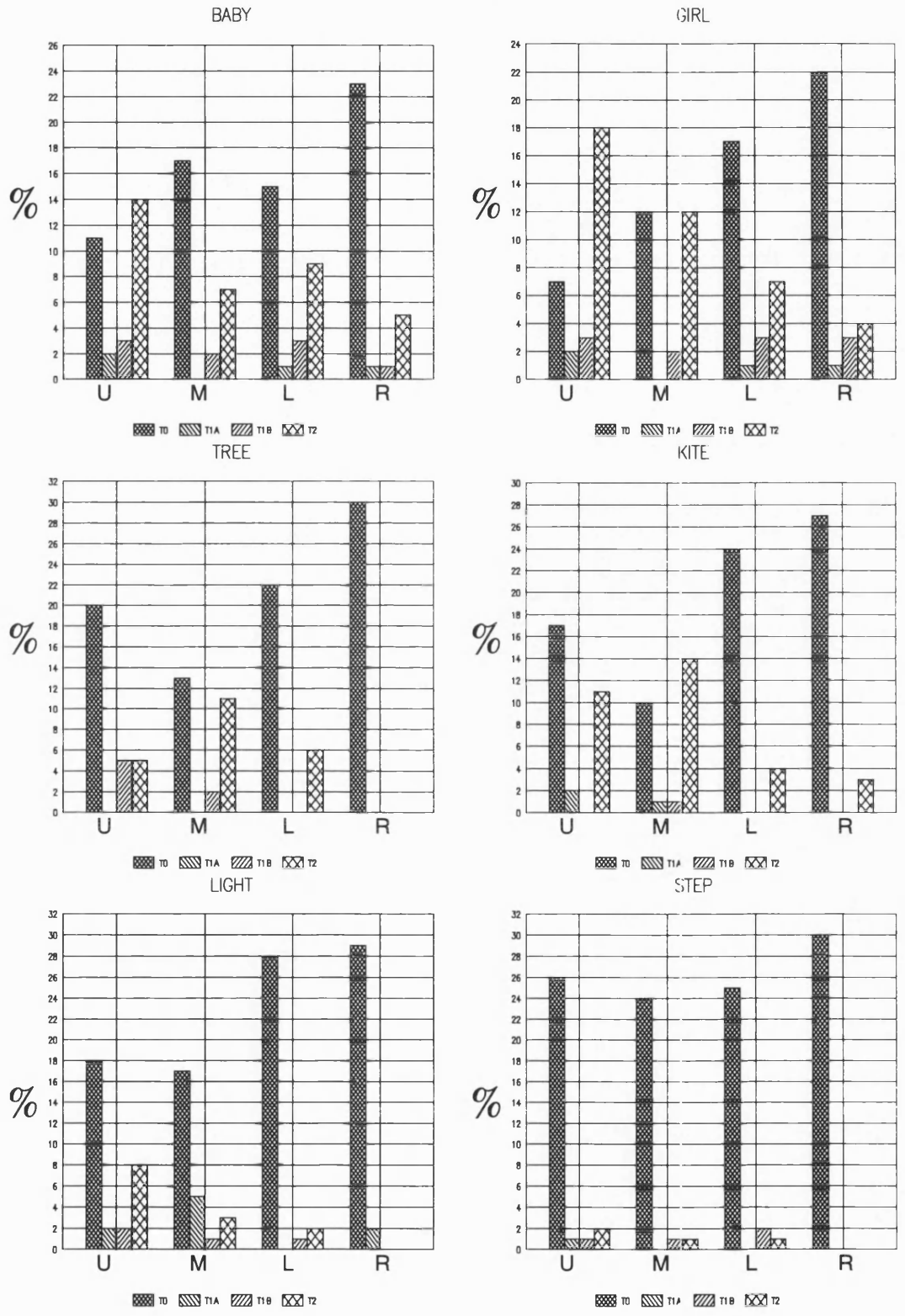


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.7 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE <=36 Mths.

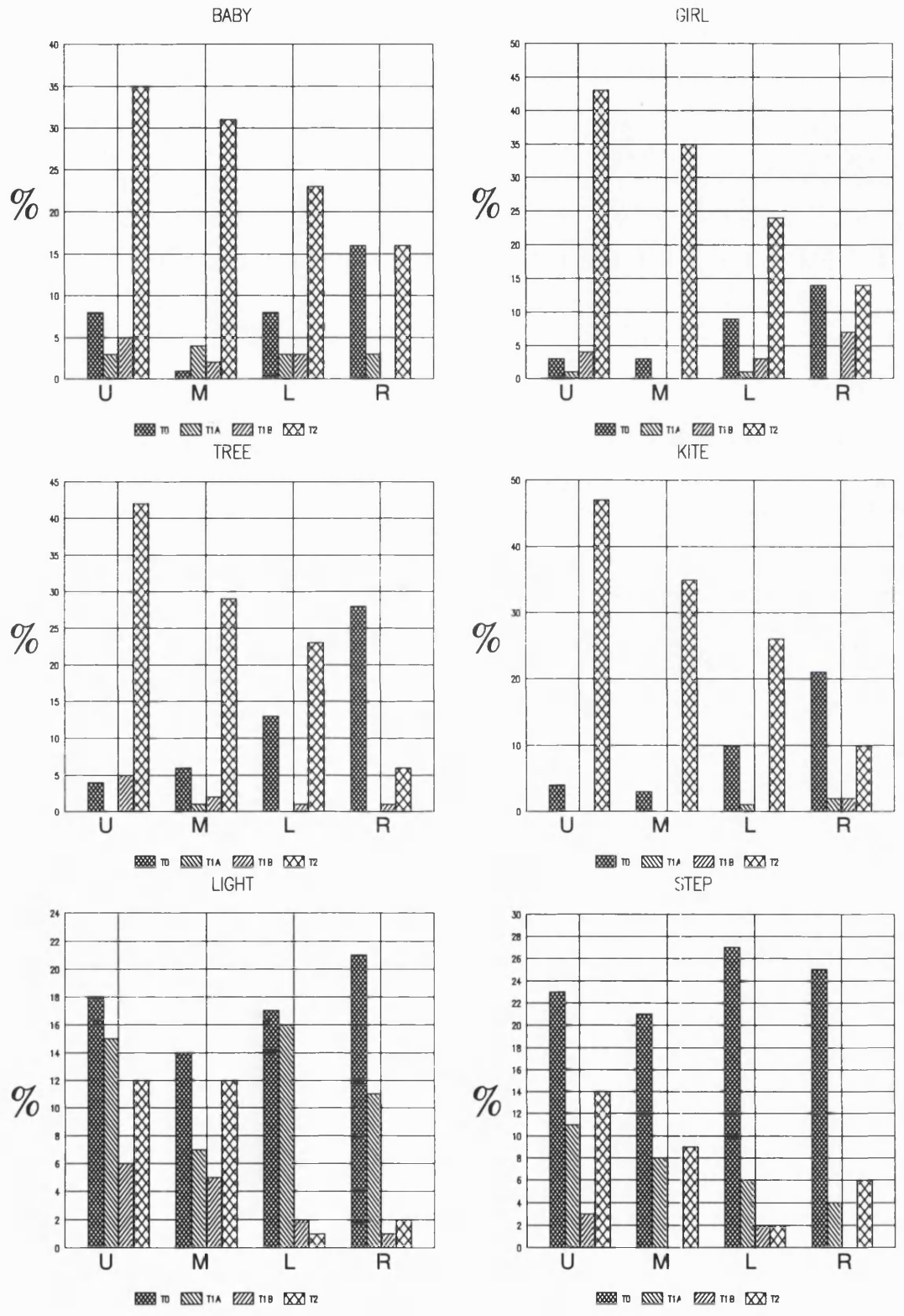


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
L1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.8 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE = 37 – 48



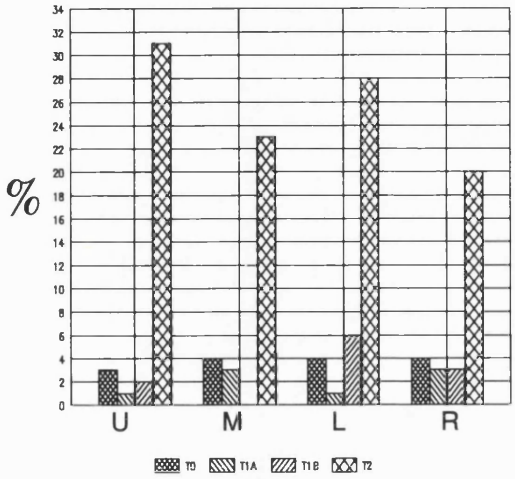
T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

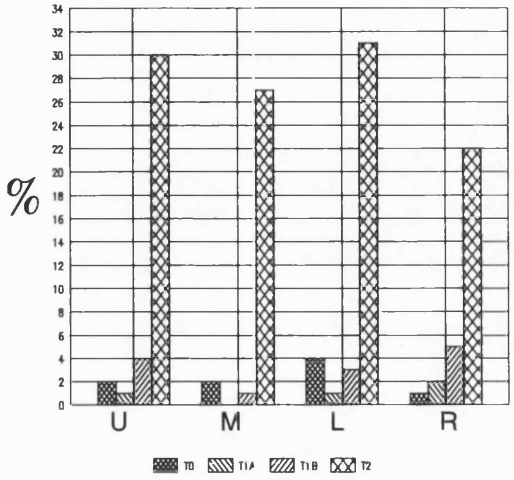
Fig. IV.9 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

AGE = 49 – 60 Mths.

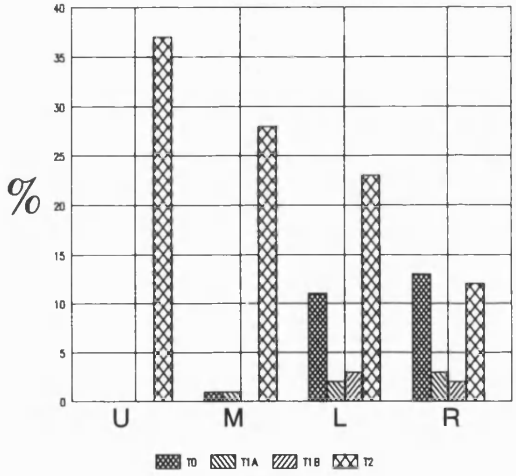
BABY



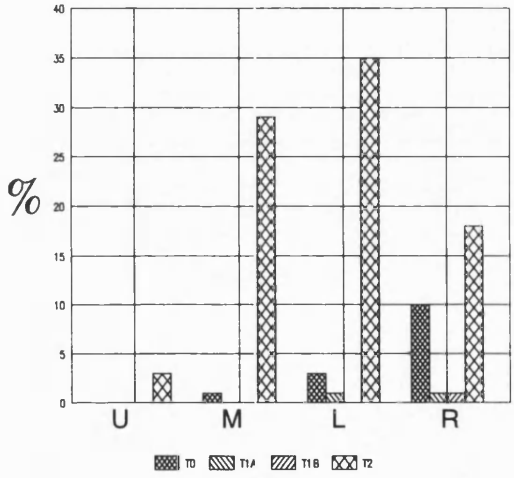
GIRL



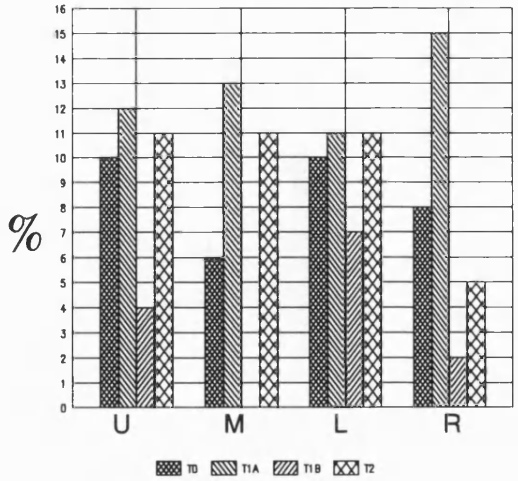
TREE



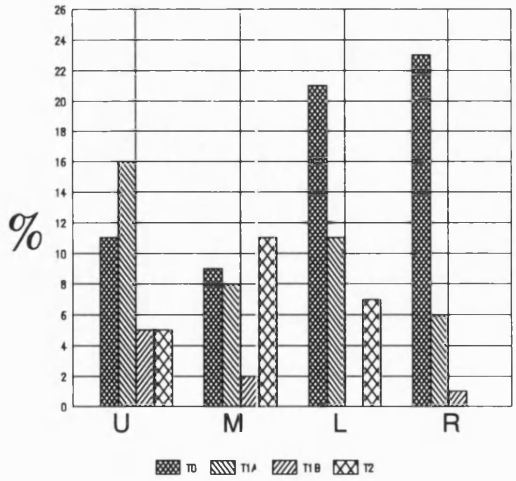
KITE



LIGHT



STEP

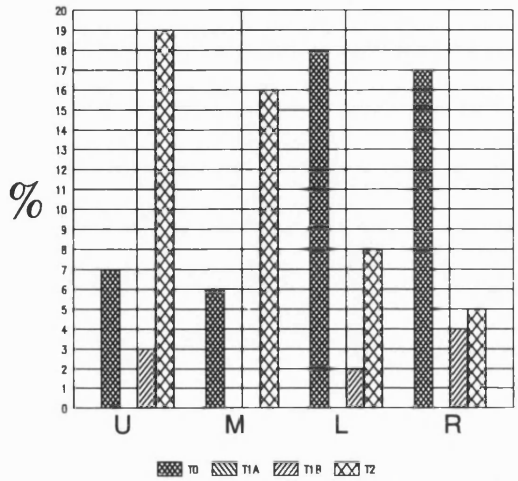


T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

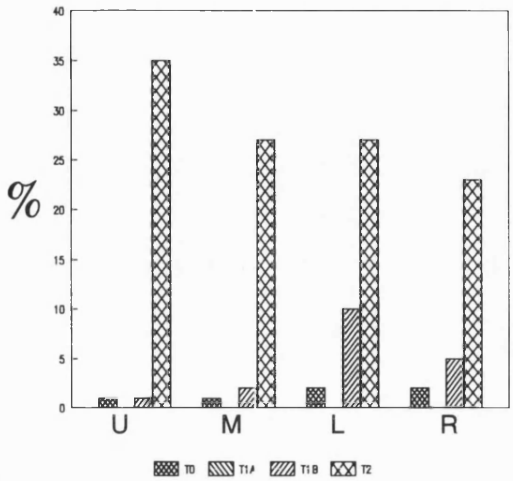
U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

Fig. IV.10 DISTRIBUTION OF TYPES OF RESPONSE FOR EACH OBJECT IN EXPRESSIVE VERBAL LABELS ACCORDING TO AGE AND SOCIO ECONOMIC GROUPS.

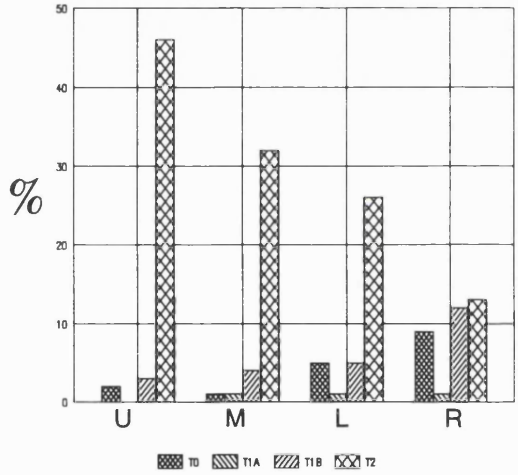
CYCLE (AGE <36) MTHS



CYCLE (AGE 49 – 60) MTHS



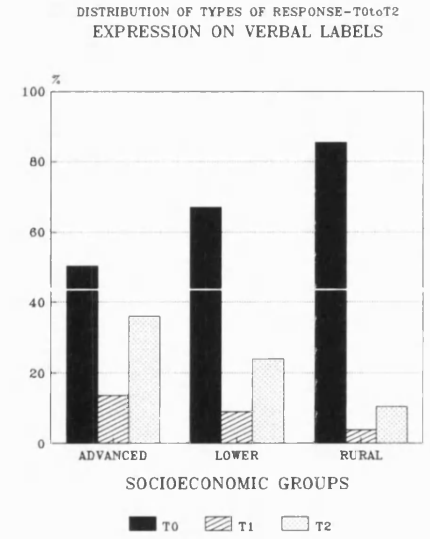
CYCLE (AGE 37 – 48) MTHS



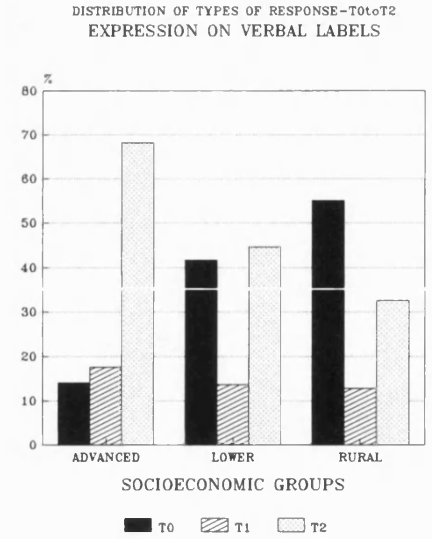
T0 = NO RESPONSE
T1A = TYPE ONE RESPONSE
T1B = TYPE TWO RESPONSE
T2 = TYPE THREE RESPONSE

U = UPPER URBON GROUP
M = MIDDLE URBON GROUP
L = LOWER URBON GROUP
R = RURAL GROUP

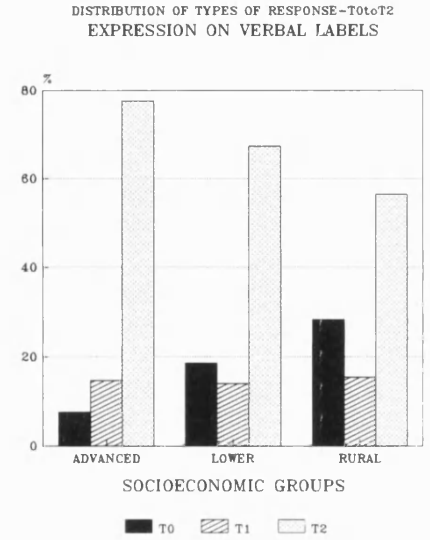
FIG. IV. 11 **DISTRIBUTION OF DIFFERENT TYPES OF RESPONSES IN EACH SOCIO ECONOMIC GROUP ACCORDING TO AGE**



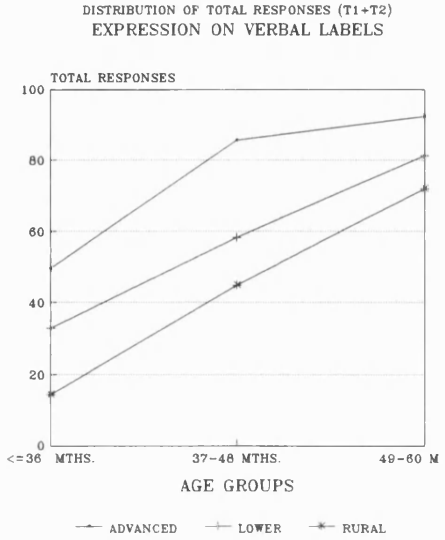
<= 36 MTHS.



37 -48 MTHS.



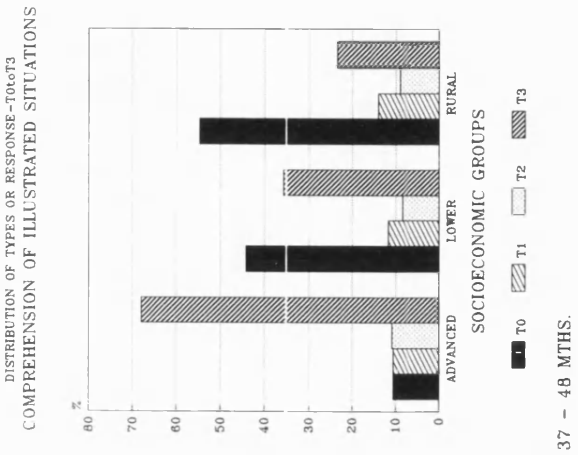
49 - 60 MTHS.

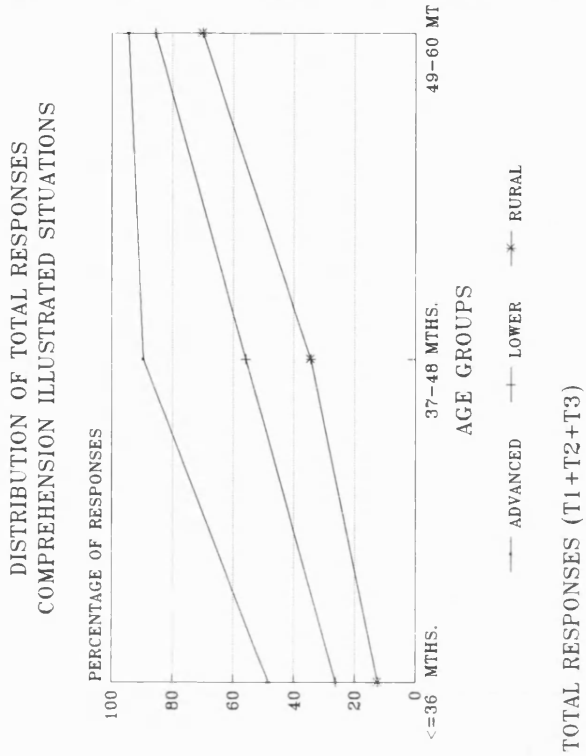


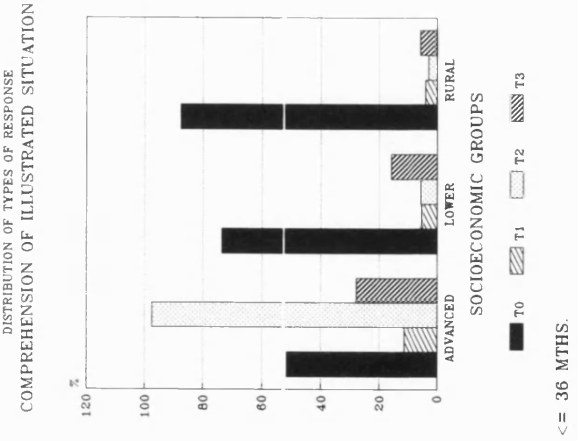
ACCORDING TO AGE AND SOCIOECONOMIC GRPS.

FIG. IV. 12

DISTRIBUTION OF DIFFERENT TYPES OF RESPONSES IN EACH SOCIO ECONOMIC GROUP ACCORDING (COMPREHENSION OF ILLUSTRATED SITUATIONS)







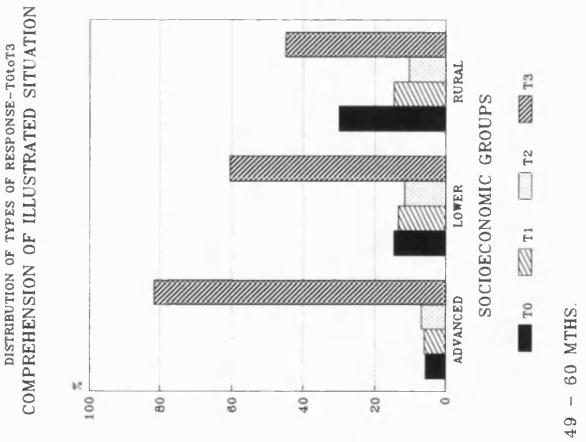
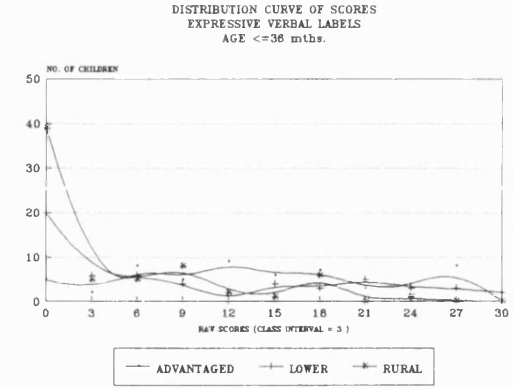
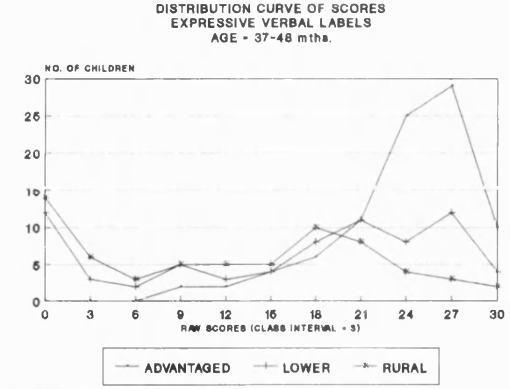


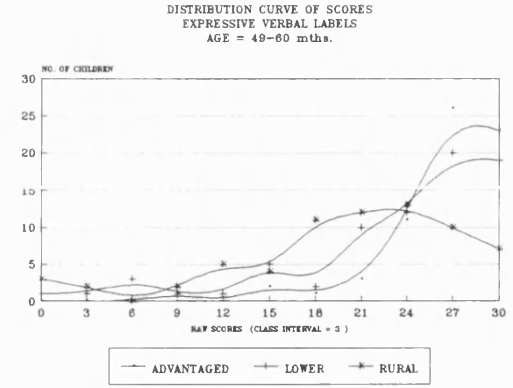
FIG.V.1



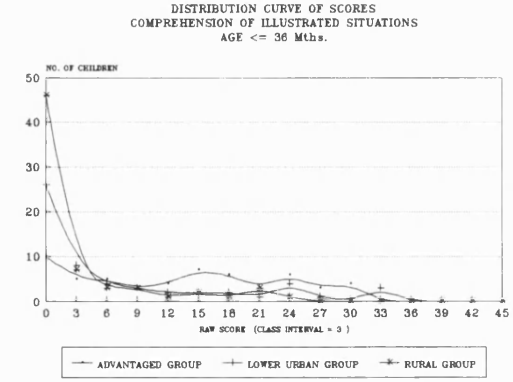
ALL SOCIOECONOMIC GROUPS



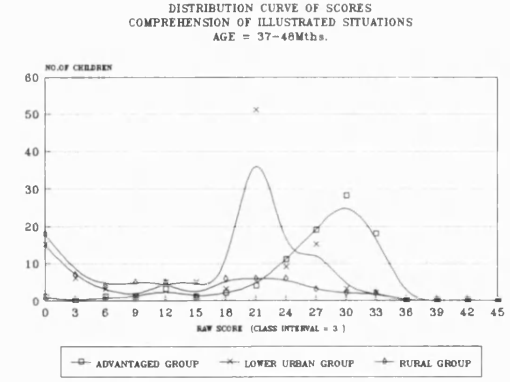
ALL SOCIOECONOMIC GROUPS



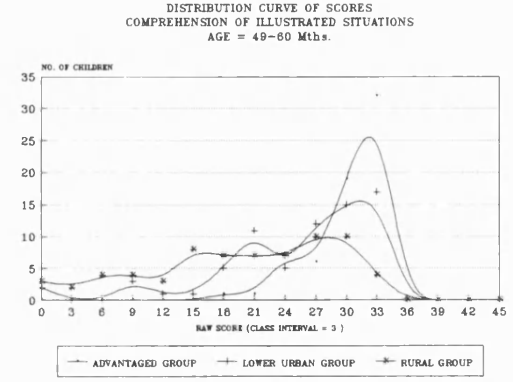
ALL SOCIOECONOMIC GROUPS



ALL SOCIOECONOMIC GROUPS



ALL SOCIOECONOMIC GROUPS

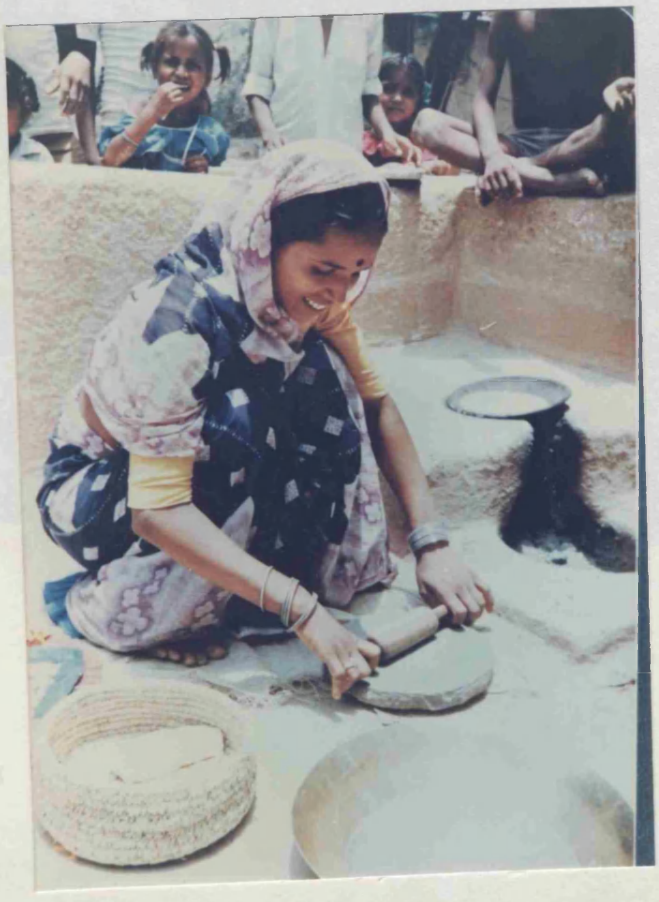


ALL SOCIOECONOMIC GROUPS

APPENDIX
PHOTOGRAPHS

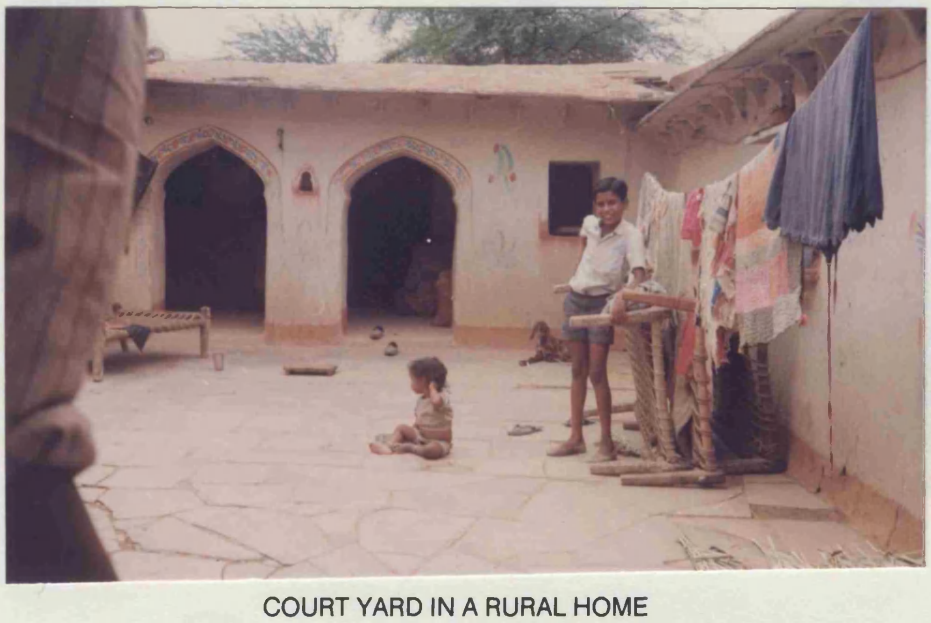
PHOTOGRAPHS - SOCIOCULTURAL ASPECTS .

PHOTO . II . 2



COOKING IN A
RURAL HOME

PHOTO . II . 3

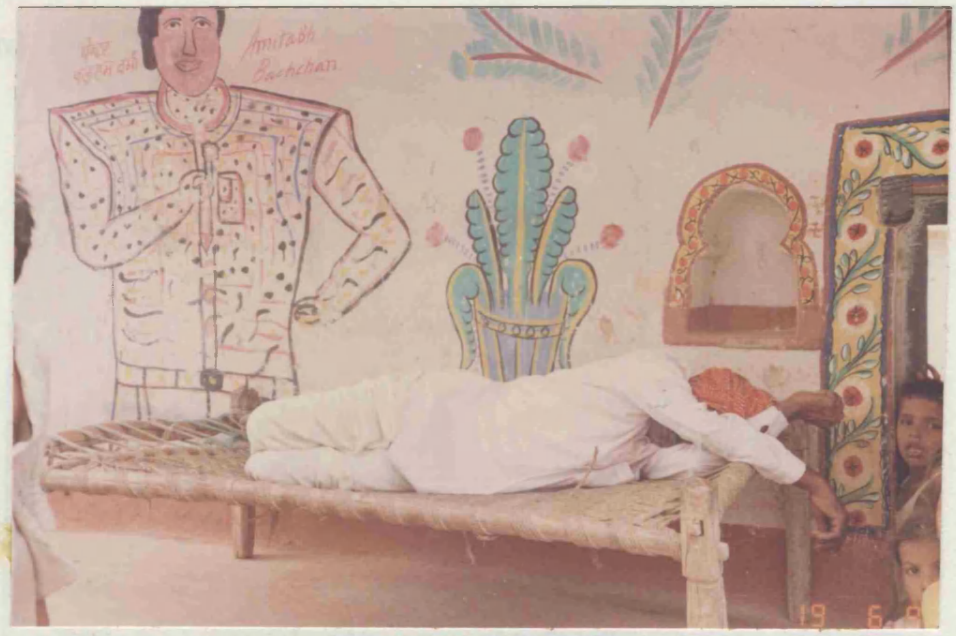


COURT YARD IN A RURAL HOME

PHOTO . II . 4

MUDHUT IN A VILLAGE

PHOTO . II . 5



FRESCOES IN A RURAL HOME

PHOTO . II . 6

SLUM

PHOTO . II .7

PHOTO . II . 8

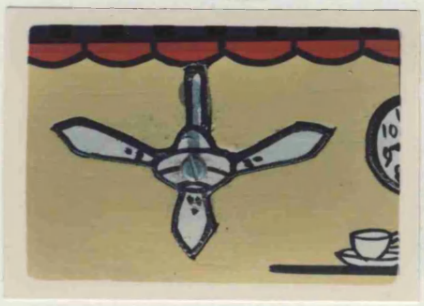
SLUM : CHILD CARETAKER

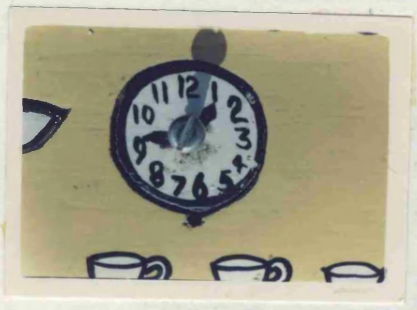
PHOTO . II . 9

ADVANTAGED HOME

IPPT - OBJECTS AND SITUATIONS

PHOTO.III. 8 TO 15





IPPT - OBJECTS AND SITUATIONS

PHOTO.III. 16 TO 20

MINIATURE TOYS

PHOTO . III . 21

PHOTO . III . 22

MINIATURE TOYS

PHOTO . III . 23

PHOTO III. 24