Volume I

The Role of Executive Functions in Suggestibility

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I owe my greatest thanks to my husband Keith – thank you for sharing my vision and supporting me 150% all the way for many years – I dedicate this work to you xx.
Abstract

Clinical psychologists are frequently instructed by the courts to assess the ability of witnesses or of the accused to give reliable evidence. Many studies have reported an inverse relationship between IQ and memory and suggestibility (as measured by the Gudjonsson Suggestibility Scale: GSS 1 & 2; Gudjonsson 1984a, 1987b). This relationship has, however, generally been examined in diagnostically mixed samples of forensic psychiatric patients, court referrals and groups simply referred to as ‘forensic’. Such mixed, and indeed unspecified, sampling of forensic psychiatric patients could lead to increased heterogeneity and partly explain the difficulty with replicating some findings. The aim of the present study was to examine the relationship of cognitive deficits to suggestibility in a well-defined homogenous sample of forensic patients with a diagnosis of psychotic disorder. In particular, a major focus was to examine the relationship of specific executive functions to suggestibility – an area previously unexamined.

Thirty-two subjects were divided into two groups (15 low and 17 high suggestible) as defined by their non-overlapping scores on the GSS 1 Yield 1 measure. This measure captures what might be termed pure suggestibility since it reflects the tendency of subjects to endorse false statements when under no interrogative pressure. The groups were tested on several measures of executive function, immediate and delayed memory (as measured by the GSS 1), and the Wechsler Abbreviated Scale of Intelligence (WASI).
Between-group comparison revealed that this measure of pure suggestibility was associated with a particular cognitive profile. Contrary to previous findings, the results revealed no significant differences between the high and low suggestibility groups in their IQ, or immediate and delayed memory scores. On tests of executive function, the high and low suggestibility groups did not differ in their working memory and response-inhibition performance, but the high suggestibility group did perform worse on tasks tapping rule-attainment, Theory of Mind and speed of decision-making. Moreover, two of the executive tasks that did produce differences between the groups (speed of decision-making and theory of mind) correlated with IQ and when this was partialled-out, the differences in these measures became non-significant. However, the differences in rule-attainment remained significant after covarying for IQ.

It is proposed that the link between the rule-attainment task and high suggestibility reflects the greater tendency to guess in highly suggestible subjects. One important implication of this finding for clinicians is that another cognitive vulnerability (other than IQ and memory) may bring about susceptibility to suggestion. In future, when courts refer cases for issues concerning reliability of evidence, then not only is a detailed history required to detect any past episodes of mental illness, but certain cognitive tasks – especially measures of executive function such as the Brixton test -- may highlight a susceptibility to suggestion that is independent of and possibly precedes any suggestibility in response to interrogative pressure.
Introduction

The introduction will consist of three chapters. Chapter one will discuss the theoretical background to interrogative suggestibility and the development of the Gudjonsson Suggestibility Scales (GSS1 & 2, Gudjonsson 1984a, 1987b). The emphasis will be on describing the interrogative situation and the key components drawn from this by the author in the development of the scales. Chapter two reviews the literature on those factors thought to affect performance on the suggestibility scales: these include both personality and cognitive variables. Following on from the section reporting the relationship between cognitive variables and suggestibility, a novel and previously unexamined role for executive functions in suggestibility is discussed. In chapter three, specific attention is given to describing the forensic population diagnostically, with further consideration given to the likely cognitive deficits in the patient group that may affect performance on the suggestibility scales. The introduction concludes with the rationale for the study and experimental hypotheses.

Chapter 1

Suggestibility in context

Suggestibility refers to the tendency of an individual to respond in a particular way to a suggestion i.e. they are being incited to respond. The suggestion has the potential to elicit a response; however, whether it does or not depends on the susceptibility of the individual, the nature and characteristics of the suggestion, and the person offering the suggestion. Gheorghiu (1989b) provided the distinction between direct and indirect suggestion: the former is overt and the participant is aware of the suggestion and the
latter is implicit, subtle and the person offering the suggestion does not make it obvious that they are attempting to influence the response of the participant. This definition of suggestibility forms the primary focus of this thesis -- what factors underlie suggestibility?

Clinical psychologists are often instructed by the courts to assess the ability of witnesses or the accused to give reliable evidence. The susceptibility of some people to succumb to leading questions and interrogative pressure during interviewing is well documented and this type of vulnerability may, in exceptional circumstances, result in false confession to a criminal offence (Gudjonsson, 1992a, 1992b). It is within this context that the concept of suggestibility developed within the legal system. The concept, however, has existed in other aspects of the psychological literature – most notably the hypnosis literature (Gheorghiu 1989b; Bernheim, 1888 cited in Gudjonsson, 1992a). These works generally refer to a person’s susceptibility to become hypnotized and thus open to suggestion. The focus of the current review, however, will be to provide an overview of suggestibility within the framework of legal processes and will therefore focus on ‘interrogative suggestibility’, which is regarded as a distinct type of suggestibility (Gudjonsson, 1987a).
What is interrogative suggestibility?

Questioning by police often involves considerable stress with important consequences for the witness, victim and suspect. Interrogative suggestibility refers to the social situation where the police 'interrogate' or interview a suspect or witness and is defined as “...the extent to which, within [this] closed social interaction, people come to accept messages communicated during formal questioning, as the result of which their subsequent behavioural response is affected” (Gudjonsson and Clark, 1986, p.84). This definition encompasses a number of features that the authors consider crucial when deconstructing the police interviewing process. When teased apart, these components highlight that the process involves:

A closed social interaction: By a closed interaction, Irving and Hilgendorf (1980, p.123) state that “…the room is closed, the participants close to each other and interruptions are avoided as far as possible.”

A procedure that involves questioning: At least two participants are involved, one questioning and the other responding. The questions are commonly factual in nature and often refer to memory recollections of what the person has seen or heard.

A suggestive piece of information: This refers to leading questions, where the questions are phrased in a manner to elicit an affirmative response bias.

Acceptance of that piece of information by the interviewee: A crucial part of the suggestion process is that it must be perceived by the respondent to be plausible and credible.
A behavioural response: The respondent has to display by observable behaviour that they accept the suggestion and not simply believe it mentally, or indeed, that they do not accept the suggestion.

These components of interrogative suggestibility are illustrated by referring to a case (the case of Mary) reported by Gudjonsson and Gunn (1982). Mary was a 22-year-old learning-disabled woman who appeared at the Old Bailey claiming that she had been sexually assaulted by a group of young men and women. It was alleged that Mary had been forced into an empty building and was held down by several men and sexually assaulted while two girls stood by laughing. She gave a clear account of having to take a bath at the beginning of the incident and being forced to wear a short black nightie. Mary's statement was the main prosecution evidence, thus establishing the reliability of her evidence was important. Briefly, her history was that Mary lived with her father, an older sister and two brothers; her mother had left home 15 years before. Her father had difficulty coping with her and relied on his older daughter to look after Mary. Mary relied on her family for day-to-day care and had difficulty looking after herself.

Gudjonsson and Gunn's (1982) involvement in this case was to determine whether: a) Mary would be classified as 'severely subnormal' under the Mental Health Act (1959), b) Mary was a competent witness in a court of law and c) if competent, whether her evidence was reliable. The authors determined that Mary had a full scale IQ of 47 on the Wechsler Adult Intelligence Scale (1981) and that in the Mental Health Act she would be defined as 'severely subnormal' indicative of an arrested or incomplete development of mind, which includes subnormality of intelligence. The judge ruled that
she was fit to stand trial, as she was able to indicate that she understood the concepts of ‘truth’ and ‘God’. As to whether Mary’s evidence was reliable, Gudjonsson and Gunn (1982) tested this by informing Mary that the purpose of the afternoon session was to test her memory for the morning’s session. Mary was required to provide an account of the tests that she had conducted in the morning so they could ascertain whether she could report information accurately. Furthermore, by attempting to induce false sense perceptions (both olfactory and tactile, e.g., feeling a pencil become increasingly hot to the point of burning her fingers) in Mary, Gudjonsson and Gunn (1982) assessed her general level of suggestibility. Mary uncritically accepted both false sense perceptions and is reported to have dropped the pencil on the floor claiming it had burned her finger. The authors then asked a number of suggestive questions and challenged her replies to encourage her to alter her statements (e.g., “Do you remember when I tested your blood pressure?” “Do you remember the man who came into the office this morning, what was his name?” – Mary’s blood pressure was never checked and no one had entered the room).

The outcome of this investigation was that Mary proved to be highly suggestible to many, but not all of the questions. The authors noted that when confronted with sophisticated or abstract ideas, she became highly suggestible giving observations that had no basis in her own experience. Furthermore, when she was uncertain about the questions being asked, she tended to confabulate. Despite this, the interesting and most notable finding was that Mary resisted attempts to alter her account of events she had experienced and remembered clearly. The authors concluded that although Mary had limited mental capacity, she was able to disentangle fact from fantasy when facts were
clear to her. When the difference between these two was less obvious, she became highly suggestible. In conclusion, they suggested to the jury that although Mary would be seen as moderately 'mentally handicapped'; she was able to give reliable evidence about simple and basic facts and that her responses would not alter under cross-examination. When unsure about events, her evidence was unreliable and likely to change under cross-examination. This led to an important legal distinction regarding witness competence and evidence reliability. Furthermore, this case provided the conceptual framework for assessing reliability of evidence by means of a standardized psychological test — the Gudjonsson Suggestibility Scales (GSS1 & 2: Gudjonsson 1984a, 1987b) and later a theoretical model of suggestibility proposed by Gudjonsson and Clarke (1986).

Gudjonsson Suggestibility Scales (GSS1 & 2: Gudjonsson 1984a, 1987b)
The Gudjonsson Suggestibility Scale (GSS 1) and the parallel form (GSS 2) were developed for research, forensic and clinical applications. The test is described to the participant as a memory test consisting of a short story that is read aloud, immediately followed by a request to free-recall as much as possible. Immediately following this, the administrator reads out 20 questions relating to the story. Only 5 of these questions are 'true', while the remaining 15 are leading questions. Finally, after 45-minutes, the participant is again required to recall all they can remember.

The test provides measures of verbal memory recall, both immediate and delayed, and 'interrogative suggestibility', which has been shown to have two distinct
components - 'Yield' and 'Shift'. The 'Yield' measure refers to the participants' propensity to 'give-in' to leading questions both before and after negative feedback from the interviewer. Within the interrogative context, this feedback can be implicit (e.g. head shaking) or as in the GSS, explicit (e.g. questions repeated until the required answer is obtained). After all of the questions have been asked in the GSS, negative feedback is provided in the form of "you have made a number of errors and we need to go through the questions again." Hence, the 'Shift' response refers to the change in response following this feedback when the questions have been re-administered. It has been proposed that yield scores relate to the reliability of testimony and closely reflects memory processes whereas the shift scores relate more to coping processes, being particularly affected by personality characteristics (anxiety, self esteem) and experience (previous convictions) (Gudjonsson, 1984a, 1988, 1992a). Furthermore, Gudjonsson (1984a) suggests that the Yield score has greater reliability whereas "the shift measure is somewhat less homogeneous and is more situationally determined than Yield" (p.311). In this respect, it is understandable why the Yield 1 score is construed as the purer measure of suggestibility as it reflects 'giving in' to leading questions when there is no pressure.

The scales were developed to measure objectively the vulnerabilities or proneness of people to give erroneous accounts when interviewed. The GSS 1 and GSS 2 provide measures of 'confabulation' (i.e. when there is evidence of either distortion or fabrication) reflecting the fact that participants sometimes replace gaps in their memory with imaginary recollections that they believe to be true (sometimes referred to as *honest lying*). In this respect, the type of questions asked has an important influence on
suggestibility. Richardson, Dohrenwend and Klein (1965) suggest that questions contain premises that can either be well informed (allowing an interviewer to build knowledge) or incorrect and uninformed (which can lead to distorted responses by the interviewee). The better informed the premise the more likely it is to be valid, which is why the GSS (1&2) uses uninformed and incorrect premises to assess the susceptibility of an individual to distortion. The tendency of some people to confabulate when reporting an alleged event is clearly relevant to the reliability of testimony given by suspects, victims and witnesses. Judith Ward’s successful appeal in 1992 against her conviction for the 1974 bombing of a coach on the M62 was in part based on her vulnerability to confabulation (Kennedy, 1992). During the psychological assessment, the extreme extent to which her free recall contained confabulations was presented in court to indicate her vulnerability to giving erroneous accounts of events.

The GSS scales are designed for particular application in police interviewing contexts and can be used with forensic populations, victims and witnesses to crime, mentally disordered persons, and children and adolescents. The scales have been extensively standardised and validated on a variety of populations (Gudjonsson, 1984b; Tully and Cahill, 1984; Gudjonsson and Singh, 1992; Clare and Gudjonsson, 1993). Previous data shows high intercorrelations between the two scales within the same testing session for normal and forensic participants (0.90 and 0.92 respectively). For a group of forensic patients, the reliability across two separate occasions is also high (0.81: Gudjonsson, 1987b). The GSS 2 is reported to have higher internal consistencies on both the ‘Yield’ and ‘Shift’ scales and the narrative passage and questions are less complex to understand (Gudjonsson, 1992b). The GSS2 has been factor analyzed and
two distinct factors emerge: Yield and Shift, with a coefficient alpha of 0.87 for Yield and 0.79 for Shift, the two factors. Statistically, the scale is functioning as it was designed and is a valid measure of the construct it was designed to identify with good internal consistency. The test also has good face validity (Gudjonsson, 1987b; Singh and Gudjonsson, 1987; Gudjonsson, 1992a). Inter-rater reliability of GSS2 is good (Clare et al, 1994) with correlation coefficients of 0.99 for Yield, 0.99 for Shift, and 0.99 for Total. Test-retest reliability coefficients range from 0.82 to 0.92 between the two forms of the instrument (GSS1 and GSS2). For a guideline on general mean performance on the memory recall, yield, shift and total suggestibility scores, see Table 1.

Table 1. Mean and standard deviations for normal controls, court referrals and Icelandic prisoners on the GSS1 (Gudjonsson, 1992a)

<table>
<thead>
<tr>
<th></th>
<th>Immediate Recall (Max =40)</th>
<th>Delayed Recall (Max =40)</th>
<th>Yield 1 (Max =15)</th>
<th>Shift (Max =20)</th>
<th>Total Suggestibility (Max =15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Court Referrals (N=258)</td>
<td>12 [sd=7.4]</td>
<td>10.2 [sd=7.1]</td>
<td>5.9 [sd=3.7]</td>
<td>4.3 [sd=3.2]</td>
<td>10.2 [sd=5.7]</td>
</tr>
<tr>
<td>Icelandic Prisoners (N=251)</td>
<td>15.5 [sd=6.1]</td>
<td>no data</td>
<td>4.4 [sd=3]</td>
<td>4.9 [sd=2.8]</td>
<td>9.4 [sd=4.5]</td>
</tr>
</tbody>
</table>
A Social Psychological Model of Interrogative Suggestibility (Gudjonsson and Clark 1986)

Gudjonsson and Clark (1986) developed a model to account for the processes underlying interrogative suggestibility. They suggest that during police interrogation, a respondent is in a dynamic relationship with the interviewer, the environment and significant others within the environment. These factors set up the situational expectations and coping strategies that allow for 'leading questions' and feedback to give rise to suggestibility. The authors state that the respondent has a general 'cognitive set' for the interrogative situation, which leads them to adopt a particular coping style, either 'resistant' or 'suggestible' (i.e., that their perception of events is biased by their expectations, desires and needs and this is affected by past experiences, attitudes, motives and beliefs). For example, Gudjonsson and Singh (1984b) suggest that an individual who is familiar with police procedures has a different 'cognitive set' and therefore has different expectations from a person unfamiliar with this context (i.e., a person with a negative hostile attitude towards the police may have a cognitive set characterized by the expectation of negative outcome for themselves). Within this framework, a particular cognitive set and coping style is adopted when responding to the questions offered by the police; questions that require cognitive processing. This processing involves uncertainty and interpersonal trust on the one hand and expectation on the other. The respondent’s cognitive appraisal of the question leads to a suggestible or resistant response.

Moreover, Gudjonsson and Clark (1986) propose three important antecedents for eliciting a suggestible response: these are uncertainty, interpersonal trust and certain expectations. Each is discussed in turn below:
Uncertainty

They suggest that when a clear conflict emerges between what a respondent can remember and what is implied during questioning; their answers will remain unchanged unless the expectations and premises create doubt in their mind. In this respect, uncertainty refers to not definitely knowing the answer or rather, not having a strong 'internal frame of reference'. By this, the authors refer to cognitive factors such as the respondent having poor knowledge or memory about the question. The depth at which the original information was processed affects a respondent’s internal frame of reference. Gudjonsson and Clark (1986) cite the seminal work of Craik and Lockhart (1972) in describing this phenomenon suggesting that information processed at a shallow level (according to superficial characteristics) would produce much greater uncertainty and vice versa (than that processed at deeper i.e. semantic levels). To corroborate this notion, they also highlight Anderson’s (1983) work describing how specific memories are accessed by the spread of activation through associated pathways in long-term memory. This search continues until it eventually reaches the cognitive network containing the relevant information. In relation to uncertainty, the authors bring these two ideas together and propose that greater depths of processing would produce larger and more elaborate cognitive networks, making retrieval of information easier. Additionally, depth of processing is functionally related to a respondent’s information processing capacity, so that those with weak processing capacity have weaker encoding, thus weaker networks leading to poor retrieval of information – all of which increase uncertainty.
Interpersonal trust

For a respondent to ‘yield’ to questions, it is important that they feel that there is no trickery involved in the questioning and that interpersonal trust between themselves and the interviewer is present. The authors imply that suspiciousness reduces yielding to leading questions, even under increasing conditions of uncertainty. In this respect, the leading questions are required to be subtly leading (because being too obvious produces resistance to yielding). Gudjonsson and Clark (1986) propose that interpersonal trust and uncertainty are linked since the former is dependent on the extent to which the respondent realizes they are being misled during questioning. Furthermore, they state that these factors are linked to the strength of the respondent’s internal frame of reference, since the stronger a memory for an event, the easier it is to detect being misled.

Certain Expectations

The authors argue that within the interrogative context, people rarely declare their uncertainty. The situation brings about an expectation within the respondent to have an answer to questions that are asked. The authors suggest that this expectation phenomenon results from the influence of interpersonal social pressure within the interrogative context. With regard to the suggestibility scales, Gudjonsson (1983) argues that once respondents have recalled the narrative, it leads them to have an ‘expectation tendency’ whereby they are inclined to provide an answer even though they cannot recall the specifics of the questions asked. The authors argue that most people are suggestible provided these three necessary conditions are present; however, the
mediating variable in producing variations in these three factors is the person’s cognitive appraisal of the situation and the coping style they adopt (see Table 2.).

Table 2 Gudjonsson and Clark’s (1986) hypotheses on the different coping strategies associated with non-suggestible and suggestible responding

<table>
<thead>
<tr>
<th>A non-suggestible coping strategy</th>
<th>A suggestible coping strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involves a critical analysis of the situation, whereby the individual thinks carefully about the events and the questions asked before committing oneself to any answers.</td>
<td>Involves ‘cognitive avoidance’ whereby the person unrealistically appraises the situation and does not question the reliability of their memory of events and feels the need to always provide an answer.</td>
</tr>
</tbody>
</table>

Summary of interrogative suggestibility

In adopting an individual differences approach to investigation, the authors propose both cognitive and personality variables underlie interrogative suggestibility. It appears that the key cognitive variables are perhaps memory and information processing (relating to uncertainty); and that the key personality variables are anxiety and low self-esteem (underlying interpersonal trust and certain expectations). The next chapter will focus on reviewing the empirical data that test the role of both cognitive and personality variables underlying suggestibility.
Chapter 2

Non-cognitive factors associated with suggestibility

Although not central to the current thesis, the non-cognitive factors associated with suggestibility are reviewed because Gudjonsson (1992a) has argued for both cognitive and non-cognitive factors in his theoretical model of suggestibility. To gain a thorough understanding of the concept of suggestibility, it is necessary to briefly review this literature to provide a balanced view for the reader. Following this section, the literature examining the relationship between cognitive variables (i.e., IQ and memory) and suggestibility is reviewed.

Anxiety and suggestibility

Definition of anxiety

Emotions play an important role in the way that individuals handle various situations and it is generally accepted that differences in personality and experiences might predispose people to react to the same situation in different ways (Spielberger, Sydeman and Owen, 1999). The State-Trait Anxiety Inventory (STAI: Spielberger, Gorsuch. and Lushene, 1970) is a validated measure of anxiety. State anxiety refers to situational feelings such as apprehension, tension, nervousness and worry whereas trait anxiety refers to general anxiety-proneness. The STAI is designed to differentiate between state/trait anxiety and has been used extensively in the suggestibility literature to elucidate the role of anxiety in interrogative suggestibility.
Empirical evidence on the effects of anxiety on suggestibility

There is evidence in the literature that suggestibility is more strongly associated with situational stress and hence, state anxiety. Gudjonsson (1988) showed that when administering the STAI both before and after negative feedback on the GSS, the correlations between the STAI and suggestibility were higher on second administration and the Shift and Yield 2 scores correlated more highly with state anxiety (than trait anxiety) during both administrations of the STAI (0.42 before negative feedback and 0.69 after). The results were interpreted as supporting the hypothesis that state anxiety would correlate more than trait anxiety since the situation provokes much apprehension rather than a simple reflection of a person's generalized anxiety proneness. The fact that the scores correlated with the Yield 2 and Shift scores lends support to the Gudjonsson and Clarke (1986) model that performance on these scales depends highly on anxiety and coping processes than Yield 1 which is typically related to memory ability. This finding appeared as a trend in a later study by Smith and Gudjonsson (1995b) in a study of 32 psychiatric inpatients in regional secure units. However, no significant correlations were found for anxiety and the yield and shift scores following interrogation. The authors concluded that the STAI might not be the best measure to use with this sample because of its complexity.

Other studies have examined the effects of anxiety using different methods. Hansdottir, Thorsteinsson, Kristinsdottir, and Ragnarsson (1990) found that instructional manipulation increases anxiety on the GSS 1 in college students. When students received a high expectation instruction (that they should know all the answers to the questions) versus a low expectation instruction (that they do not have to know all
answers), the high expectation group showed elevated levels of suggestibility. Furthermore, Gudjonsson and Singh (1984b) in an earlier study showed how objective ratings by teachers; of the levels of suggestibility and self-esteem in delinquent and adolescent boys, correlated highly with the GSS1 shift score. Wolfradt and Meyer (1998) found in a study of patients diagnosed with DSM IV criteria for anxiety that compared to normal controls, the patients showed significantly higher suggestibility, yield 2 and shift scores, even though the groups did not differ in their immediate and delayed recall scores. These results were explained in terms of increased susceptibility to uncertainty in the anxious patients, which they argue is further increased by negative feedback, hence the higher correlation with the shift score. On the other hand, in a recent study, Gudjonsson, Rutter and Clare (1995) found that suspects detained at a police station, showed higher correlations on the GSS 2 and trait anxiety. The authors argue that the circumstances in which the study was conducted may have artificially influenced this relationship (being detained by the police). Finally, Tata and Gudjonsson (1990) showed that stress manipulation (relaxation vs. stress by white noise) had no effect on suggestibility, but negative feedback increased suggestibility more than positive feedback.

Summary of anxiety and suggestibility
The evidence reviewed generally indicates that anxiety has an effect on suggestibility and this is largely due to the demand characteristics of the situation. This conclusion arises because the relationship has mainly been found between state rather than trait anxiety. These studies lend support to the Gudjonsson and Clarke (1986) model, since
the relationship invariably appears in the scores that are derived following manipulation of the interpersonal pressure, namely Yield 2 and Shift.

**Compliance, Acquiescence and Suggestibility**

*Definition of compliance and acquiescence*

Compliance refers to the tendency of an individual to go along with propositions and requests even when they are fully aware that their responses are a) being influenced and b) that they may disagree with the proposition and so, personal acceptance of the proposition is not required to react in a compliant way. This is in contrast to suggestibility, where it is argued there is personal acceptance of the proposition and suggestibility is related to IQ and memory to a greater degree than compliance. Gudjonsson (1989a) argues that compliance has two components, a) eagerness to please and b) avoidance of conflict and confrontation. These factors overlap considerably with Milgram’s (1974) construct of ‘obedience to authority’ and this theoretical work underlies the development of Gudjonsson’s Compliance Scale (GCS: 1989), a self report 20 item true or false type questionnaire. The scale measures the extent to which people comply with requests and obey instructions for some immediate instrumental gain. Acquiescence on the other hand, is a tendency to respond to questions affirmatively without much regard for the content (Cronbach, 1946). The main difference between acquiescence and suggestibility is that in suggestible questioning, the questions are structured in such a way as to elicit a specific answer, whereas with regard to acquiescence, specific responses are not expected.
Empirical evidence on the relationship between compliance, acquiescence and suggestibility

Gudjonsson (1990c) found that Yield 1(0.40), shift (0.53) and total suggestibility (0.54) correlated with compliance and a low, but significant correlation was found between suggestibility and acquiescence (Gudjonsson, 1986). Compliance and acquiescence were found not to correlate significantly with each other (Gudjonsson, 1990c). Several researchers have found a negative relationship between IQ and acquiescence (Siegelman, Budd, Spanhel and Schoenrock, 1981; Gudjonsson 1986; Gudjonsson and Clare 1995), but no relationship with compliance (Gudjonsson, 1990c). Gudjonsson (1991) showed in a comparison of false confessors, resisters and forensic patients, alleged false confessors had the lowest IQ scores and highest compliance and suggestibility scores followed by the forensic patients and resisters. These effects remained when IQ and memory were controlled for, and the author argues, this indicates that suggestibility and compliance differentiate between these groups in their own right.

Summary of the relationships between compliance, acquiescence and suggestibility

The literature suggests that both compliance and acquiescence bear some relationship to suggestibility, but this is strongest for compliance. Acquiescence on the other hand, seems to be affected mainly by intellectual level, and supports Gudjonsson’s (1992a, p.142) claim that “acquiescence is best construed as predominately comprising intellectual and educational components rather than temperament or personality variables.”
Cognitive factors associated with suggestibility

This section focuses on reviewing the literature examining the relationship between cognitive factors and suggestibility. The two major areas of cognition that have been reported in the literature are the effects of IQ and of memory; this research is detailed below. This section ends with the introduction and speculation of a third and unexplored area of cognition in relation to suggestibility, namely executive functioning.

Intellectual functioning and suggestibility

Definition of intellectual functioning

There is controversy in the literature about the reliability and measurement of intelligence and about what the concept itself means however, it is not the scope of this current review to visit these controversies, but to provide a general definition of what intelligence is reported to encompass. Wechsler viewed intelligence as the “capacity of the individual to act purposefully, to think rationally and deal effectively with his or her environment” (Wechsler, 1944, p.3). Within this framework, intelligence tests have been designed to tap a variety of cognitive functions ranging from verbal and memory ability to spatial and reasoning ability. Intelligence tests generally differentiate between verbal and performance IQ and this distinction relates to the concepts of crystallized and fluid intelligence (Horn and Cattell, 1967). Fluid intelligence is considered to encompass abilities such as problem solving and flexibility when faced with an unfamiliar task whereas crystallized intelligence refers to tasks that involve previous training and education.
Empirical evidence on the relationship between IQ and suggestibility

Gudjonsson (1983) in the first study using the GSS 1 found that IQ as measured by the WAIS correlated negatively with both Yield 1 and Shift. The correlations for Full Scale, Verbal and Performance IQ were -0.55, -0.47 and -0.50, respectively. Thus, the higher the intellectual functioning of the individual, the less likely they are to give in to leading questions and subsequently change their response following negative feedback. Again, Gudjonsson (1988) found that by comparing IQ and suggestibility both in controls (N=23) and in forensic patients (N=73), full-scale IQ and total suggestibility (GSS1) were negatively correlated (r= -0.52 and r= -0.58, respectively). He also observed that when the two populations were split for IQ above and below 100 (average) that this data revealed range effects. In those with IQ<100, the correlation for the controls was r= -0.46 and for patients r= -0.29. The correlation between IQ and suggestibility was non-significant in both groups when IQ was above the mean. Gudjonsson (1988) argues that this is why Tata (1983) failed to find a significant negative relationship in his sample where the National Adult Reading Test (NART: Nelson, 1991) IQ’s scores were generally above average (average IQ 117, range 106-125).

The relationship between IQ and suggestibility has been documented elsewhere in intellectually disabled individuals (Tully and Cahill, 1984; Clare and Gudjonsson, 1993; Gudjonsson and Clare, 1995). Clare and Gudjonsson, (1993) compared the performance of individuals with mild learning difficulties (mean IQ=65, sd =5.3, N=20) with controls (mean IQ=99, sd =7.2, N=20). The authors found that persons with mild learning difficulties showed significantly worse performance on immediate and delayed
recall, Yield 1 and 2, total suggestibility and confabulation. However, there was no
difference between the groups on the ‘Shift’ measure. The authors argue that the non-
significant difference in the ‘Shift’ measure may represent ceiling effects in the learning
disabled group, since there was not much scope for changing response after giving in to
many of the leading questions. In addition to these studies, Gudjonsson (1991) found
that in a comparison of alleged ‘false-confessors’ and ‘resisters’ (during police
interrogation), the resisters showed higher levels of intellectual functioning and lower
levels of suggestibility whereas the false-confessors showed the converse profile.

Gudjonsson (1990c) hypothesizes that the key components in intellectual
functioning that are relevant to suggestibility are capacity for logical reasoning,
sequential thought, social awareness and sophistication. He argues these factors are
important since examining the correlations between all the subtests of the WAIS-R
(Wechsler, 1981) showed high correlations with suggestibility for the following subtests;
Picture Arrangement (r=-0.48), Similarities (r=-0.43) and Comprehension (r=-0.40). In
this respect it is interesting to note that Sharrock and Gudjonsson (1993) have shown
that previous convictions tend to reduce the correlation between intelligence and
suggestibility. Gudjonsson and Singh (1984b) also report a significant negative
correlation between shift and number of previous convictions. They argue that the
person gains coping mechanisms because of experience of police interview and so are
less susceptible to interpersonal pressure.
Summary of intellectual functioning and suggestibility

The literature indicates that higher intelligence seems to reduce susceptibility to suggestion. In relation to the Gudjonsson and Clarke model (1986), the argument follows that suggestibility is related to uncertainty and that this latter concept depends on memory capacity. The authors argue that given intelligence and memory correlate significantly and both have the same effect on suggestibility, persons of low intellectual capacity have limited resources to cope with the unfamiliar task of suggestion. Given this reasoning, it is not surprising that the number of convictions reduces the correlation between IQ and suggestibility, since the authors would argue that this brings about familiarity with the situation and so influences the person’s ability to cope with the uncertainty, expectations and pressure during interrogation. In this respect, it is interesting how the authors have interwoven cognitive and personality factors together in their model.

Memory and suggestibility

Definition of memory

The term ‘memory’ encompasses a variety of processes and structures and in describing the reliability of interviewee’s testimony, it is important to examine the memory processes that may affect this reliability. In this respect, Loftus (1979a) provides an early account of the factors that are considered to affect testimony. She describes memory in terms of a three stage sequential model encompassing acquisition, retention and retrieval (sometimes referred to as encoding, storage and retrieval). The first stage involves the perception and encoding of an event in short-term memory for a few seconds so that it can be interpreted in the context of previous knowledge and
experience and then eventually transferred to long-term memory. Within this description, it is plausible that past expectations and experiences may influence the information whilst being encoded in memory. In the retention phase, between acquisition and retrieval, these memories can start to become less accurate. Accuracy may be affected by the retention interval since memory deteriorates with time, but is reported to deteriorate most rapidly after the acquisition of information (Yarmey, 1990). Furthermore, the interference of post event information can also alter the information retained in memory. As Loftus (1979a, p. 55) postulates, post event information "...can not only enhance memories but also change a witness's memory and even cause non-existent details to become incorporated into a previously acquired memory." Experimental evidence suggests that misleading information readily distorts memory after a long retention interval (Loftus, Miller and Burns, 1978). In the final stage of retrieval, information can be retrieved through tests of recall or recognition. It is reported that free recall of events often results in reliable information; however, the accounts are often incomplete and require follow-up with further questioning (Dent, 1986).

Empirical findings on the relationship between memory and suggestibility

As described above, the GSS1 and the GSS2 provide memory scores for both immediate and delayed recall; and Gudjonsson (1992a) argues that the recall scores give an "indication of a subject's attention, concentration and memory capacity" (p. 134). A wealth of studies have examined the relationship between memory and suggestibility and most have reported a negative correlation i.e., the poorer the subject's memory the
more suggestible they are likely to be. This has been found both in normal control
subjects and forensic patients however, in the latter group, the correlation is lower
(Gudjonsson, 1983, 1984b, 1987c, 1988b; Smith and Gudjonsson, 1995b; Santtila,
Alkiora, Ekholm and Niemi, 1999). Furthermore, the relationship between poor
memory and suggestibility has been replicated in people with intellectual disabilities
(Tully and Cahill, 1984; Clare and Gudjonsson, 1993; Gudjonsson and Clare, 1995;
Cardone and Dent, 1996; Everington and Fulero, 1999; Milne, Clare and Bull, 2002).

Nevertheless, a key study by Cardone and Dent (1996) has shown that, in a
group of intellectually disabled individuals, multimodal presentation (both visual and
verbal) of the GSS2 led to more complete and accurate recall than the verbal
presentation only. Furthermore, this multimodal presentation reduced the yield score
compared to those individuals that received verbal presentation only. This lends support
to the notion that the visual and verbal condition produces optimal memory strength for
the narrative and so, leads to reduced suggestibility. This study is particularly important
as suggestibility is reduced in a population considered to be highly suggestible (Tully
and Cahill, 1984).

Additionally, Gudjonsson (1983) has reported that the rate at which memory
deteriorated in the 50-minute gap between immediate and delayed recall, significantly
correlated with 'Shift' on the GSS1. This finding implies again that the poorer the
memory trace for the narrative, the more likely the person is to give-in to leading
questions. Gudjonsson and Lister (1984) also note that administering the leading
questions immediately after the first free recall of the narrative produces similar
suggestibility scores to those obtained when incorporating a 50-minute delay, implying that memory decay in itself does not underlie suggestibility.

In this context, Schooler and Loftus (1986) proposed that the significant correlation between memory and suggestibility might be an artifact confounded by item similarities within the scale. They argued that given that memory recall is based on the same items to which misleading suggestions are later made, it was difficult to ascertain whether it is poor memory per se that contributed to elevated suggestibility. Gudjonsson (1987c) clarified this criticism by correlating between and within scale scores on both the GSS 1 and 2 showing that the correlation between memory and suggestibility were not markedly affected by item similarities on the two measures.

Critique of the association between memory and suggestibility

A major critique of Gudjonsson and Clarke’s (1986) model is presented by Schooler and Loftus (1986). The authors have reinterpreted Gudjonsson and Clarke’s (1986) ‘individual differences’ approach to interrogative suggestibility through experimental research on college students and propose that a central cognitive mechanism “discrepancy detection” underlies suggestibility. The authors propose that “Recollections are most likely to change if a person does not immediately detect discrepancies between post-event suggestions and memory for the original event” (Schooler and Loftus, 1986, p.107-108). Discrepancy detection is affected by two factors: the strength of the original information in memory and the manner by which the post event information is influenced. Hertel, Cosden and Johnson, (1980) and Loftus
Miller and Burns (1978) provide evidence for the influence of memory on discrepancy detection by manipulating the interval between viewing an event and subsequent suggestion. The results indicate that the longer the interval, the more memory deteriorates over time so participants are more likely to incorporate misleading suggestions into their recollections and increase suggestibility. Schooler and Loftus (1986) argue that the decay in memory impairs discrepancy detection. Furthermore, Loftus (1981) has shown that by explicitly directing attention to misleading information, subjects scrutinize their memories further and are better at detecting discrepancies and so are less susceptible to misleading information and if the questions asked are too blatantly misleading, subjects become less receptive to suggestions (Loftus, 1979b). Schooler and Loftus (1986) have reported a failure to find a significant relationship between cognitive variables associated with memory and intelligence and have argued that major components of the Gudjonsson and Clarke (1986) model can be explained by the principle of discrepancy detection. The authors propose that “It appears that the individual differences approach in cognitive abilities may not always be as directly related to suggestibility as Gudjonsson and Clarke would have us believe” (p.110). The rationale for this argument is highlighted in Table 3.
Table 3 Showing principles from Gudjonsson and Clarke (1986) theoretical model that have been reinterpreted by Schooler and Loftus (1986)

<table>
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<tr>
<td>Uncertainty</td>
<td>Poor memory ability reduces discrepancy detection and so increases suggestion</td>
</tr>
<tr>
<td>Interpersonal trust</td>
<td>Suspicious cognitive set makes witnesses scrutinize questions to identify discrepancies</td>
</tr>
<tr>
<td>Negative feedback</td>
<td>Reduces confidence in persons own memory and increases anxiety to reduce scrutinising questions prior to answering</td>
</tr>
<tr>
<td>Expectations</td>
<td>Authors do not argue for a role in this principle</td>
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Gudjonsson (1992a) argues that their theoretical model (Gudjonsson and Clarke, 1986) would predict that discrepancy detection is a necessary but not sufficient condition for individuals to yield to suggestive questioning. He argues that indeed, people may fail to detect discrepancies between what is observed and what is suggested, but this does not automatically lead them to accept misleading information, since they could simply state that they did not know the answer. It is this part of the original model, concerning certain expectations, that has not been explained in terms of a central cognitive mechanism by Schooler and Loftus (1986), but can be understood in terms of personality factors. Furthermore, Gudjonsson (1987c, 1992a) argues that the failure to find a significant relationship between cognitive variables underlying memory, IQ and suggestibility in their studies (Schooler and Loftus, 1986) represents the importance of range effects, since their samples have exclusively used college students with homogenous cognitive abilities (Gudjonsson, 1987c). Gudjonsson (1992a) argues that deriving a theory of a central cognitive mechanism from homogeneous samples such as college students, where the range of intellectual abilities is restricted, would not be
readily generalisable and applicable to heterogeneous samples such as those included in this review; highlighting that there is a relationship between memory, IQ and suggestibility. He also goes on to say that the majority of people with average intellectual function can adequately appraise and cope with the interrogative situation and it is those individuals with lower levels of intelligence that find the situation challenging. He states, “It is possible with this minimum level of intellectual ability, other factors besides intelligence, such as anxiety, assertiveness and self esteem, become more prominent” (Gudjonsson, 1992a, p.146). Moreover, the individual differences approach serves its function in teasing out the effects of various other non-cognitive variables on suggestibility that a central mechanism cannot adequately describe. It seems that the role of a central cognitive mechanism certainly has its place in current thinking about the factors that are involved in suggestibility, albeit, that it cannot adequately describe *every* aspect of the model.

**Confabulation and Suggestibility**

*Definition of confabulation*

The additional measure that is derived from the GSS measures is a score on confabulation, which clearly relates to memory. Gudjonsson (1992a) states that confabulation can be defined as “problems in memory processing where people replace gaps in their memory with imaginary experiences which they believe to be true.” In the scoring of confabulation on the GSS, this includes any pieces of information that have been added to the story that were previously unmentioned (fabrications) and slight
changes to the story which are close to the original narrative but with some variation in content (distortions).

Confabulation has traditionally been studied in relation to organic syndromes (Alzheimer’s disease and Kosakoff’s syndrome: Kopelman, 1987), where two types of confabulation have been identified; spontaneous and provoked confabulation. The former has been related to frontal lobe pathology and is characterized by ‘spontaneous outpourings’ of irrelevant associations. The latter is considered to reflect poor memory processes. Smith and Gudjonsson (1986) report that on the GSS1, the average number of confabulations for immediate and delayed recall is 0.5 – this average score was also obtained by Register and Khilstrom (1988).

Empirical findings on the relationship between confabulation and suggestibility

Given the link between confabulation and memory in organic syndromes, the relationship of confabulation to memory with regard to the GSS is interesting since one might assume a strong link; however, the literature provides mixed findings in this area. Clare and Gudjonsson (1993) found that people with mild intellectual disability tend to confabulate more and this is related to their poorer memory abilities. In a sample of 145 subjects with wide ranging IQ scores (mean = 81, sd = 17.7) including 66 participants with intellectual disabilities, Gudjonsson and Clare (1995) assessed the relationship between IQ, memory and suggestibility. The authors found that distortions and fabrications did not correlate significantly with intellectual ability, memory or suggestibility. Significant relationships emerged between the immediate and delayed
distortion and fabrication scores respectively, but distortion and fabrication (the scores that combine to make up confabulation) did not correlate with each other, suggesting independent mechanisms may underlie the two. Nevertheless, the authors do refer to the poor reliability for scoring these responses (a point which will be returned to later).

Similarly, Tata (1983) found that recall scores and confabulation do not correlate. Conversely, Sigurdsson, Gudjonsson, Kolbeinsson, and Petrusson (1994) reported that confabulation correlated positively with overall recall, but this was in a group of depressed patients recovering from ECT. In an alternative analysis, Smith and Gudjonsson (1995a) examined the relationship of mental disorder to confabulation and suggestibility in forensic patients. They found no significant differences between those patients with a history of hallucinations and those who were non-hallucinators in their levels of suggestibility or confabulation. When the sample (32 forensic inpatients) was split diagnostically to produce the two largest diagnostic groups: patients with schizophrenia (N=16) and personality disorder (N=7), the latter showed more fabrications in recall than patients with schizophrenia. As noted above, the discrepant findings in the literature regarding confabulation may reflect the unreliability of scoring the concept (Clare, Gudjonsson, Rutter and Cross, 1994). This might be borne out by the finding that the correlation between the immediate and delayed recall memory scores is 0.92, whereas the immediate and delayed scores for distortions and fabrications are much lower at 0.42 and 0.52 respectively (Smith and Gudjonsson 1995b). However, in this latter study, the authors also report a significant correlation between distortions, fabrications and anxiety as measured by The State-Trait Anxiety Inventory (STAI: 37
Speilberger, Gorsuch, and Lushene, 1970) and conclude that anxiety interferes with the consolidation of memory and so may result in increased confabulation.

**Summary of memory, confabulation and suggestibility**

The research highlights that poor memory increases a person’s susceptibility to suggestion. This finding has been replicated in control subjects, forensic patients, depressed patients and individuals with intellectual disabilities. In relation to the Gudjonsson and Clarke model (1986), the authors propose that poor memory increases uncertainty and this affects susceptibility to leading questions. Mixed evidence has emerged on the relationship between memory and confabulation; some suggesting that confabulation increases when memory is poor, whereas others have found no relationship. There is some suggestion that confabulation may be mediated by some effects of anxiety, but these findings require replication since it appears that the reliability of the confabulation measure is questionable and this may be reflected in the fact that the measures do not correlate so highly with each other (Gudjonsson and Clare, 1995).

The next section will focus on detailing a previously unexplored area of cognition in relation to suggestibility. Executive functioning is perhaps the third most important area of research in cognition following intellectual functioning and memory. It appears that this area has never been examined in relation to suggestibility before and that there is good reason to speculate why specific executive functions may also be implicated in mediating some aspects of performance on the suggestibility measure.
What are executive functions and which aspects might relate to suggestibility?

What is Executive Functioning?

The term executive function(s) refers to high-level cognitive processes that are associated with the function of the frontal lobes in humans. The frontal lobes comprise between 35-40% of the total cerebral cortex (Semendeferi, Lu, Schenker, and Damasio, 2002). Given the size of the frontal lobes, it is unsurprising to find that they are divided into various sub regions, some of which are associated with specific cognitive and executive functions. Indeed, some suggest that perhaps the major theoretical question about executive function is whether discrete regions are dedicated to particular operations (Carpenter, Just and Reichle, 2000).

Stuss and Levine (2002) propose anatomical distinctions between those functions subsumed by the ventrolateral prefrontal cortex (VPFC) and the dorsolateral prefrontal cortex (DPFC). These neuroanatomical regions seem to be split in terms of cognition and emotion with the latter being served by the VPFC. By contrast, the DPFC is associated with the organizing of spatial and conceptual reasoning processes; superior medial lesions lead to lack of initiation, the frontal poles may underpin self-awareness; while the frontal polar regions are linked to higher human abilities such as Theory of Mind (Stuss, Gallop and Alexander 2001).

At the cognitive level, the parallel controversy concerns the unity and diversity of human executive functions (Miyake, Friedman, Emerson, Witzki and Howerter,
2000); with evidence accumulating for the greater fractionation of executive functioning into sub-processes—each of which may be associated with different frontal anatomical locations. Hence, it is not easy to establish a simple definition that adequately and succinctly encompasses the meaning of the term 'executive function(s)'. A compromise, that often seems to be reached by researchers, is to suggest that 'executive functions are what executive function tasks measure'. This line of argument has developed both from research with varied populations and from the finding that tasks tapping executive function frequently fail to correlate highly or not at all in some cases (Miyake et al, 2000). The one common feature of executive tests is that they are believed to be particularly difficult for patients with frontal lobe lesions. Superficially, executive tests come in a variety of forms and tap what might be more correctly regarded as a loose collection of task demands relating to: focused attention, goal selection, higher-order inferences, planning, organisation, execution and monitoring of complex behavioural sequences, strategy application, cognitive flexibility, response initiation and suppression (see Milner 1982; Shallice 1982; Shallice and Burgess, 1996; Nathaniel-James, Fletcher and Frith, 1997).

**What might be the relationship between executive functions and suggestibility?**

Working memory is considered one of the sub-processes of executive functioning (Baddeley 1986). Baddeley’s model conceptualizes working memory as a system for the temporary maintenance and manipulation of information. When a task is novel, working memory is utilized to ‘juggle’ cognitive resources. It consists of an attentional control system or Central Executive (CE) that coordinates performance by controlling
two slave systems: the phonological loop (which is specialized for the maintenance of speech-based information) and the visuo-spatial sketchpad (which preserves visual information). It is proposed that the CE uses information to suppress habitual responses and guide goal directed behaviour. The CE is limited for both the amount of information that may be processed and the speed of that processing. Hence, with increasing amounts of information, the rate at which tasks are performed decreases.

Baddeley (1986) has proposed that Norman and Shallice’s (1980) Supervisory Attentional System (SAS) can be incorporated into the role of the central executive to further explain working memory function. The latter authors have argued that many situations activate well-learned responses (via schemata). The selection of specific schemata will depend on the level of activation relative to the level of competing signals and influence of higher level controlling schemata (referred to as the system of contention scheduling). The proposed system results in the ability to perform complex, but routine tasks in a successful and automatic way. Nevertheless, if a situation is novel or when the schemata are inappropriate, the system is ineffective and the SAS must intervene to bias the competition between response schemata ‘through excitatory or inhibitory modulation’ (Shallice 1988). The two models meet by proposing some unifying element for executive functions in both attending to and responding to stimuli.

The next section will focus on ideas describing how executive functions and suggestibility may relate. The focus here is on Loftus’ (1979) descriptions of memory in relation to testimony and the ‘discrepancy detection’ model of Schooler and Loftus (1986). Given that the GSS is dependent on the retrieval of appropriate responses to
questioning, a number of executive task demands may be involved in distinguishing between a suggestible and a non-suggestible response. First, [Loftus 1979a, Schooler and Loftus, 1986], information is encoded in memory along with biases reflecting cultural expectations and past experience. Therefore, it is plausible that when the narrative on the GSS is encoded, some additional information will be activated and encoded that was not originally mentioned (akin to Norman and Shallice’s idea that many situations activate well-learned responses or scripts). The resulting network of information is then potentially much greater than the basic narrative to be retrieved. Hence, the retrieval of specific information will require intact working memory and specific inhibitory mechanisms. In the GSS task, not only do the questions require processing for meaning, but they need to be 'held in mind' while an appropriate memory search is conducted. During this search of possible 'hits' and 'misses', inappropriate responses must be inhibited and appropriate information must be extracted so as not to simply 'guess' the answer. In this respect, speed of information processing is paramount so as not to become overburdened with routine schemata and so decision-making at this stage needs to be efficient. It has been documented that patients with frontal lobe lesions tend to misapply strategies resulting in simple 'guessing' (Burgess and Shallice, 1996). In this respect, Schooler and Loftus’ (1986) central mechanism of 'discrepancy detection' may depend highly upon the attainment of rules (i.e., learning that the context of the specific items from the narrative has been changed in some of the questions) so that the respondent applies a strategy when answering the misleading questions rather than just guessing the answer.
Detection of a discrepancy between what was encoded and what is subsequently being (misleadingly) asked, requires 'on-line' processing of information in working memory to help discern whether a match or mismatch has occurred. It is plausible then that a greater load on the information processing capacity of the central executive occurs when the discrepancy -- between the original narrative and the subsequent leading questions -- is small. This would make the retrieval of specific information much harder since the level of activation relative to the level of competing signals is high, (Norman and Shallice, 1980). For example, in the narrative on the GSS1 the story mentions that a woman is robbed of her handbag. In subsequent questioning, the respondent is asked, “Did the woman hit the assailants with her fist or handbag?” Given Schooler and Loftus’ (1986) claim that information is encoded with biases and expectations, it is understandable that the respondent may well think that the woman did hit the assailants with something and their decision involves whether she used her fist or handbag. The confusion arises because the respondent has heard the word ‘handbag’ twice, once during the encoding of the narrative and second during the questioning. This results in a small discrepancy between what is heard and what is then being asked (since what has been changed in the question i.e. where the small discrepancy lies, is the context of the handbag). Because of the spreading of information within semantically linked networks (i.e., the original narrative plus the additional information that has been encoded due to personal biases and past expectation), this small discrepancy may produce a much greater pool of information within memory from which to retrieve. Relating these ideas to speed of information-processing, when processing load is high (i.e. the discrepancy is small), then inhibitory processes become more dominant to suppress the inappropriate responses during retrieval. To give an example of the converse profile, if the
discrepancy between the original narrative and subsequent question items is large (i.e., that the questions contain premises that were not previously heard or are less plausible), the speed of information-processing demands are reduced since there will be fewer networks of items to search through to retrieve the specific items from memory.

In a parallel of the idea outlined above, it is possible that this inhibitory mechanism relates to the concept of 'uncertainty' as described by Gudjonsson and Clarke (1986). 'Uncertainty' here represents a conflict between what a respondent can remember and what is implied during questioning since the questions are constructed to create doubt. The 'doubt' element is considered to reflect the role of inhibitory processes in working memory since 'doubting' may well represent the increased information-processing load of the central executive when the discrepancy is small. Furthermore, 'doubting' one's recollections in response to misleading questions suggests that the participant has not reached a point of understanding that there is a rule within the questioning, i.e., that they are being misled and so, not all questions have a true answer. This lack of rule-attainment also heightens susceptibility to suggestion. Drawing these ideas together, leads to the inference that there may be a relationship between specific executive functions, such as suppression of inappropriate responses and rule-attainment in reducing suggestibility. It seems by implication that in order to attain knowledge of a rule that is not being made explicit to you, a rule that can have an effect on how much doubt is created and 'giving in' to leading questions, the participant is required to have skill in 'mentalising ability'.
Another sub-process of executive functioning is Theory of Mind (ToM). ToM has been defined as the ability to recognize and comprehend other people’s mental states. Theory of mind has largely been associated with understanding the interpersonal and social deficits observed in infantile autism (e.g., Baron-Cohen, 1985). In referring to theory-of-mind abilities, researchers often describe two levels of Theory of Mind. These include so-called ‘first-order’ belief attributions which refer to the ability to imagine another person’s thoughts about some objective event; and ‘second-order’ or higher-order belief attributions which refer to the ability to imagine another person’s thoughts about a third person’s thought on some objective event. Neuroimaging data from normal subjects indicate that mentalising ability is mediated by a circumscribed part of the frontal (the anterior paracingulate cortex) region (for a review see Gallagher and Frith 2003). This largely accords with data from lesion studies showing an association of medial frontal lesions with Theory of Mind ability (Stuss, Gallop and Alexander, 2001).

In relation to suggestibility, Gudjonsson and Clark (1986) suggest that the degree of interpersonal trust between the interviewer and respondent underpins whether a suggestible response is elicited. They propose that for a respondent to ‘yield’ to questions, it is important that they feel that there is no trickery involved in the questioning and that interpersonal trust between themselves and the interviewer is present. The authors state that suspiciousness reduces yielding to leading questions, even under increasing conditions of uncertainty. Hence, it appears that if the respondent is more aware of the interviewer’s true intentions they are less suggestible and this could be construed as having good Theory of Mind. Given that the authors relate interpersonal
trust to uncertainty such that suspiciousness can reduce yielding to leading questions, the aforementioned account of suggestibility uncertainty suggests that superior Theory of Mind abilities may reduce suggestibility.

**Executive functioning and suggestibility – a theoretical link?**

What is described above is the possible relationship between executive functions and suggestibility. From linking the literature on executive functioning and suggestibility, it seems that there is a plausible relationship between some executive functions and performance on the suggestibility task. The key elements that are hypothesised to relate to suggestibility are working memory capacity, inappropriate response inhibition, speed of information processing, and rule-attainment/strategy application to reduce simple guessing in response to the questions. Furthermore, the role of Theory of Mind requires exploration, since it is speculated to have some effect on these latter cognitive processes.
Chapter 3

This chapter will focus on issues relating to the sampling of ‘forensic’ patients in the literature. It is noticeable from the literature review that samples are invariably described as ‘forensic’ or ‘psychiatric’; except where specific factors such as anxiety or mental handicap have been considered. In these instances, patients were described using DSM-IV criteria for anxiety or learning disability. Although the psychological vulnerability of suspects during police detention and interview (crying, sleeping badly, feeling low -- see Pearse, Gudjonsson, Clare and Rutter, 1998) has been recognized and indeed, has led to changes in police interviewing procedures (e.g. Gudjonsson, 1992a), consideration of specific cognitive vulnerabilities associated with diagnostic groups however, have, been largely neglected. In this sense, it is a major misgiving of the literature to ignore diagnosis since ‘forensic’ groups may be heterogeneous and hence, some may have well-documented associated cognitive deficits (e.g. schizophrenia) whilst others may not (e.g. personality disorder). Nevertheless, including all participants under the general rubric of a ‘forensic’ category may cloud our ability to permit accurate inferences about the relationship of cognitive deficits to suggestibility.

Previous studies have examined heterogeneous samples of forensic patients and court referrals as one group (e.g. Gudjonsson, 1987a); or samples that are referred to as forensic (psychiatric) patients (e.g. Gudjonsson, 1984a, 1988; Smith and Gudjonsson, 1995b) without any description of the characteristics that make up the psychiatric group. A major drawback of such heterogeneous sampling is the underlying assumption that having a ‘forensic’ history implies that all participants are comparable. This is true
insofar as they will have been committed some criminal activity and have been exposed to forensic procedures, such as being detained and interviewed by the police and may have been to prison. Nevertheless, becoming a 'forensic psychiatric' patient means that criminality represents only one aspect of their 'story'. Clinically it is relevant to consider the mental health status of this population with regard to research, since some participants in some of the research have some form of mental impairment and have therefore been hospitalized and detained under the Mental Health Act typically in regional secure units or psychiatric wards. Why these individuals differ from the average forensic case will be the focus of the remainder of this chapter.

It is noticeable that the incidence of psychotic disorder is high within regional secure units. An example of this is Smith and Gudjonsson's (1995a) study assessing the relationship of hallucinations to suggestibility. They found that by splitting their sample into the main diagnostic clusters, the sample consisted of 50% patients with schizophrenia, 22% had personality disorder and the remaining 28% were a mix of other DSM-IV diagnosed categories. Given the high proportion of patients with schizophrenia, this highlights the potential importance of considering the issue of diagnosis. Although little attention has been given to patient diagnosis in studies of suggestibility, a link between diagnosis and suggestibility is implicated since forensic samples have a high proportion of patients with schizophrenia and they are known to have specific cognitive deficits. For example, there are known IQ, memory and executive function impairments in schizophrenia (for recent reviews, see Sharma and Harvey, 2000). By contrast, other diagnostic groups (e.g. personality disorders) do not have comparable IQ and memory deficits. Hence, the use of mixed diagnostic groups
could serve to distort any group profile since the participants are heterogeneous. Indeed, mixed client groups may disproportionately reflect the performance of the patients with schizophrenia rather than those with personality disorder or than other diagnoses. The following section will focus on the cognitive deficits associated with schizophrenia to examine how these deficits may relate to suggestibility.

Given the long history of studying cognition in schizophrenia dating back to Bleuler (1911) and Kraepelin (1913) from the beginning of the last century, this review will select those cognitive processes that potentially seem most salient to understanding suggestibility. Some research has highlighted the relationship of negative symptoms (e.g., flat affect, social withdrawal, lack of motivation and initiation, impaired judgment and difficulty in planning) to cognitive deficits in this population (i.e. reduced verbal fluency correlates with poverty of speech); however, linking cognitive performance with positive symptoms (e.g., delusions (irrational beliefs), hallucinations (sensory perceptions with no outside stimulus), thought disorder (e.g., loosened associations) and bizarre behavior, has proven difficult (see Philips and David, 2000). The focus of the current study is not, however, to test the relationship of suggestibility to transient symptoms in schizophrenia, since the literature indicates that cognitive deficits in schizophrenia are a stable component of the disorder, remaining even after symptoms have remitted (Laws and McKenna 1997; Addington, 2000). This finding is critical since it suggests that patients with a lifetime diagnosis of schizophrenia may not currently display any symptoms, but may potentially still have cognitive deficits.
Research in schizophrenia has highlighted core cognitive deficits in both IQ and memory. Additionally, another major area of research in patients with schizophrenia focuses on deficits of executive functioning. This is particularly important in relation to the suggestibility literature detailed in this thesis, since no previous studies have examined the relationship between executive functioning and suggestibility. The remainder of this chapter will therefore describe the literature on memory and IQ in schizophrenia as well as propose a possible link between executive functioning and suggestibility.

Cognitive deficits in schizophrenia

Definitions of memory and intelligence have already been provided in the previous chapter detailing cognitive deficits associated with suggestibility, so these shall not be revisited here. This section will provide an overview of the literature characterising the IQ, memory and executive deficits in patients with schizophrenia.

Deficits in Intellectual Functioning

Evidence for a generalised cognitive deficit in schizophrenia comes from studies using measures of mental state, IQ and batteries of neuropsychological tests. In the largest study using simple clinical tests of mental state, Owens and Johnstone (1980) reported that up to 15% of 510 chronically hospitalised patients were not oriented in time, place or person and unable to answer elementary general knowledge questions. Perhaps the strongest corroboration for a generalised intellectual decline in schizophrenia comes
from studies showing that patients perform below average on standard measures of current IQ (e.g. on versions of the Wechsler Adult Intelligence Scale: WAIS, WAIS-Revised). Studies of general intellectual function clearly accord with the presence of substantial impairment in some patients with schizophrenia (Nelson, Pantelis, Carruthers, Speller, Baxendale, Barnes, 1990). The degree of this impairment appears to be related to the severity and chronicity of the illness and so, patients show marked variability in the extent of such impairment. In the most severe chronically hospitalised patients, this might be considered almost a form of dementia; however, even in very young patients with schizophrenia aspects of dementia are sometimes evident (see deVries, Honer, Kemp and McKenna, 2001). Finally, a recent meta-analytic study has shown that the WAIS-R IQ of patients with schizophrenia (from 35 studies) was 110 indicating that they perform over one-standard deviation below healthy control comparison groups (Heinrichs and Zakzanis 1998).

With respect to this last point, there seems to be some controversy surrounding the nature of the IQ impairment in this population. Some researchers believe the IQ impairment is present before onset of illness and that this may be a developmental precursor (Russell, Munro, Jones, Hemsley and Murray, 1997; Kondel, Mortimer, Leeson, Laws and Hirsch, in press) whilst others have reported a decline in intellectual functioning following illness onset. Indeed some researchers have reported a sub-group of patients with schizophrenia that do not have intellectual deficits (Weickert, Goldberg, Gold, Bigelow, Egan, and Weinberger, 2002).
Given the heterogeneity of intellectual functioning in schizophrenia and the documented relationship between IQ and suggestibility, it seems feasible that some patients with schizophrenia might show increased suggestibility. Furthermore, it is plausible that when Gudjonsson (1992a) refers to range effects on the GSS (i.e. that suggestibility is greater in patients with lower IQ), it may represent a sub-group of patients with schizophrenia within the ‘forensic’ sample that could be contributing this factor. Unless this patient group is selected-out to test this hypothesis, the relationship between IQ and suggestibility might be confounded.

Deficits in Memory Functioning

The memory deficit in schizophrenia has been characterised in a variety of (sometimes contradictory) ways. Some show impairment of delayed and immediate recall, while others report only impaired delayed recall (e.g. Goldberg, Greenberg, Griffin, Gold, Kleinman and Pickar et al, 1993; Heaton, Paulson, McAdams, Kuck, Zisook, Braff, et al, 1994; Van Oostrom, Dollfus, Brazo, Abadie, Halbecq, Thery and Marie, 2003). This variability may reflect a variety of differences across the patients tested (including, the severity or chronicity of their illness, level of general intellectual impairment). In a recent meta-analytic review on 70 studies reporting memory impairment in schizophrenia, Aleman, Hijman, de Haan and Kahn (1999) found significant and stable memory impairment in schizophrenic patients. The effect size for verbal recall memory performance was large (ES=1.21), and comparable with that for delayed verbal recall (1.20). The authors also found that the effect size for cued (immediate and delayed) verbal recall was better than that for uncued recall. These findings were not moderated by age, medication, illness-duration, patient status (in- or out-patient), or the severity of
psychopathology. With regard to suggestibility, this pattern of memory performance is central, because these deficits would be expected to affect GSS performance and hence suggestibility (especially when one considers that the GSS contains immediate and delayed verbal recall components and participants are also given cues of a particular misleading nature).

Again, in relation to suggestibility research, knowing that there may be deficits in immediate and delayed recall in patients with schizophrenia implicates a vulnerability to suggestion in this patient group. Therefore, knowing that patients with schizophrenia have problems in a core component of the suggestibility measure indicates that again, inclusion of this subgroup may skew any relationship observed between memory and suggestibility. Thus, poor memory in patients with schizophrenia may heighten suggestibility. The cause is, however, different from, for example, a forensic case -- with personality disorder -- who may show poor memory on the scale, but does not have this known cognitive deficit. In this latter case, perhaps anxiety, poor concentration, or attention may affect their memory reliability.

Summary of IQ and memory deficits in patients with schizophrenia
This review of cognitive deficits in schizophrenia so far has established that this patient group may be at a considerable disadvantage in their performance on the suggestibility scale owing to their IQ and memory impairments. The next section will focus on the considerable evidence showing that patients with schizophrenia have problems on tasks assessing executive functions.
Evidence for deficits in executive functioning in schizophrenia

A disturbance of high-level cognitive operations, affecting the integration and strategic control of behaviour has been an enduring theme in theorising in schizophrenia research. Notions of cognitive fragmentation, lack of co-ordination and integration of higher mental functions figured prominently as far back as the work of Bleuler (1911) and Kraepelin (1913). The importance of this line of research in schizophrenia is testified by the number of studies comparing patients with schizophrenia and controls on a wide range of these tests and the large number of functional brain imaging studies reporting a 'hypofrontal' i.e. reduced metabolic activity in patients with schizophrenia when they are performing executive tasks (e.g. Weinberger et al 1986; Berman et al 1992, 1995; for a review, see Chua and McKenna, 1995).

Rule-attainment, response inhibition and decision-making deficits in schizophrenia

Studies using a variety of tasks have shown impaired executive functions in patients with schizophrenia (see Table 4 for a list of executive tasks on which patients with schizophrenia have been shown to be impaired). These include showing that patients with schizophrenia perform poorly on tasks judgment and decision-making (cognitive estimates and speed of comprehension: e.g. Shallice, Burgess and Frith 1991; Tamlyn, McKenna, Mortimer, Lund, Hammond and Baddeley 1992); verbal initiation and suppression (verbal and category fluency, e.g. Joyce, Collinson and Crichton, 1996), trail making and the Stroop test, (McGrath, 1997); (response inhibition e.g. the Hayling test: Nathaniel-James, Brown and Ron, 1996; Marczewski, Van der Linden, Larøi,
prospective memory (Kondel 2002); and planning (Tower of London task e.g. Morice and Delahunty, 1996; Marczewski, Van der Linden, Larøi, 2001). The Wisconsin Card Sort Test (WCST) which is widely assumed to be the definitive 'frontal-executive' test has been the most commonly used in studies of executive function in schizophrenia (Laws 1999). The WCST -- like all executive tasks -- is complex insofar as performance requires intact: memory, auditory and visual attention to the task, the cards and their characteristics; abstraction to allow rule learning; categorisation of the cards in working memory; and executive control of all or any of those functions (see Keefe, 1995).

Nonetheless, the tendency to fail executive tests might be greatest in those patients with the most severe and extensive intellectual impairment (see Shallice, Burgess and Frith 1991; Laws 1999). Corroboration for this speculation comes from studies showing that failure on the WCST can result from a generalised cognitive deficit (e.g. Robinson, Heaton, Lehman, and Stilson, 1980). Moreover, a relationship between executive function and IQ has been demonstrated for patients with schizophrenia: for example, WCST measures correlate with WAIS-R scores (Heinrichs, 1990) and performance on the WCST and verbal fluency, load on the same factor as IQ (Addington and Addington, 1991).

A recent meta-analysis of 30+ WCST studies in patients with schizophrenia accords with this view in confirming the large ES for WCST categories (ES=.91), but was larger for WAIS IQ (1.23) in the same patients and moreover, IQ was a significant mediator of executive function in those patients. This accords with the notion that
intellectual function and executive deficits are related in schizophrenia (moreover, this relation does not appear to hold for other groups: Stuss and Benson, 1986). While it is clear that patients with schizophrenia perform poorly on tests of executive function and the WCST in particular, it remains open whether executive dysfunction is disproportionate to the intellectual performance found in this patient group. Given the research shows that IQ and suggestibility are correlated and the schizophrenia research highlights deficits in executive function that are related to their IQ functioning, we might also expect a relationship to exist between executive functioning and suggestibility.
## Table 4 Standard executive tests with localization details and studies reporting impairment in patients with schizophrenia

<table>
<thead>
<tr>
<th>Test</th>
<th>Function</th>
<th>Lesion Studies</th>
<th>Study documenting patients with schizophrenia show impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive Estimates Test</strong> (Shallice and Evans, 1976): subjects are asked to make inferential judgments, e.g. ‘How fast do race horses gallop?’ or ‘What is the average length of a man’s spine?’</td>
<td>Decision-making and judgments</td>
<td>anterior lesions (Shallice and Evans, 1976)</td>
<td>Shallice, Burgess and Frith (1990); Laws et al (1996)</td>
</tr>
<tr>
<td><strong>Speed of Comprehension</strong> (Baddeley, Emslie &amp; Nimmo-Smith, 1992): subjects are asked to judge the truth/falsity of sentences within a limited time</td>
<td>Inhibition</td>
<td>anterior lesions (Burgess and Shallice, 1994)</td>
<td>Nathaniel-James and Frith (1996); Nathaniel-James, Brown and Ron (1996); Marczewski, Van der Linden, Larøi (2001).</td>
</tr>
<tr>
<td><strong>Hayling Test</strong> (Burgess and Shallice, 1994): subjects presented with sentence in which final (largely redundant) word is missing and they must complete; later they must provide a word that does not fit sentence (responses are timed and errors counted)</td>
<td>Inhibition</td>
<td>left frontal (Perret, 1974)</td>
<td>McGraith et al (1997); Saykin et al (1991); Hoff et al (1992) Goldberg et al (1993); Saykin et al (1994); Joyce, Collinson and Crichton (1996)</td>
</tr>
<tr>
<td><strong>Stroop</strong>: naming colour of ink and not the word written</td>
<td>Inhibition</td>
<td>left frontal (Perret, 1974)</td>
<td>Morice and Delahunty (1996); Elliott et al 1998; Hutton et al 1998; Pantelis et al 1997, Marczewski, Van der Linden, Larøi (2001).</td>
</tr>
<tr>
<td><strong>Tower of London</strong> (See Shallice, 1982): subjects have to move a series of discs across three pegs according to pre-defined rules (e.g. no larger disk on top of a smaller disk) to match a given example</td>
<td>Planning</td>
<td>left frontal (Shallice, 1982)</td>
<td>no difference between frontal patients and normal controls matched for IQ (Shallice, 1988)</td>
</tr>
<tr>
<td><strong>Verbal fluency</strong>: Spren and Strauss, 1991), using initial letters (FAS) <strong>Category/Design Fluency</strong>: subjects required to produce as many exemplars as possible over 1 minute</td>
<td>Planning, strategy formation</td>
<td>verbal fluency related to non-specific cerebral pathology design (right frontal, Jones-Gotman and Milner, 1984) verbal fluency (left frontal: Milner, 1964, 1971; Perret, 1974)</td>
<td></td>
</tr>
<tr>
<td><strong>Brixton Task</strong> (Burgess and Shallice, 1994): This task has been likened to the Wisconsin Card Sort Test (Burgess &amp; Shallice, 1997)</td>
<td></td>
<td>On the Brixton test, patients with frontal lobe lesions make three types of error: perseveration; misapply a strategy; or bizarre guessing responses.</td>
<td>Marczewski, Van der Linden, Larøi (2001).</td>
</tr>
</tbody>
</table>
Evidence for working memory deficits in schizophrenia

There is a wealth of research suggesting that working memory is impaired in schizophrenia. Although it is not the space here to review all these studies, some overview will be provided to gain an impression of the tasks used. For a recent review of the working memory deficits in schizophrenia, see Keefe (2000). The studies have attempted to segregate the different components within the working memory tripartite model; namely the phonological loop, the visuo-spatial sketchpad and the central executive. It appears that patients have deficits in all three components of the model, but that it is difficult to ascertain whether the relative impairments of each to the others. Some examples of how these three faculties have been examined are provided below.

Gold et al (1997) found that patients with schizophrenia performed significantly less well than normal controls on the letter-number sequencing task from the WAIS III. The task involves hearing a string of mixed letters and numbers that must then be repeated back with the numbers first (in the right numerical order) and then the letters (in the right alphabetical order). It is argued that this task may be performed utilising the visuo-spatial sketchpad as well – and so may be less specific to functioning of the phonological loop. Nevertheless, this task does appear to be impaired in the patient sample and is assessing working memory function. Furthermore, on a similar task assessing language comprehension in patients with schizophrenia (based on the Reading Span Test, Daneman and Carpenter, 1980), Condray, Steinhauer, van Kammen and Kasparek (1996) found that patients performed worse than controls at remembering the last word from auditory presented series of sentences. The task involves sets of sentences increasing in size (2 sets of 2 sentences, 3 sets of 3) where the participant has

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to recall the last word of each sentence after hearing all the items in the set. Sentence span is measured as the largest set for which all items are recalled correctly. Similar impairments have been found on tasks assessing the performance of the visuo-spatial sketchpad (Salame, Danion, Peretti, and Cuervoe 1998 and Spindler, Sullivan, Menon, Lim, and Pfefferbaum, 1997). These studies have used delayed recall paper and pen tasks where the participant has to recall from memory the pattern of a previously seen array of shapes. Similarly using computerised tasks, participants are required to locate the spatial position of an object after the item has disappeared from the computer screen or locate the position of that item from a pool of subsequent items presented. These studies have highlighted that patients perform worse than normal controls on these tasks. Finally, the role of the central executive has been examined in studies using dual task paradigms such as tracking a square on a computer screen whilst carrying out foot-press reaction time to tones. Again, patients with schizophrenia perform less well than controls as the degree of interference is increased (see Bressi, Miele, Bressi, Astori, Gimosti, and Linciano, 1996).

The general conclusion from this brief review of the literature suggests that rule-attainment, response inhibition and working memory is impaired in patients with schizophrenia and although in the latter case, it can be difficult to tease apart the relative contribution of the phonological loop, visual-spatial sketchpad and the central executive. Nevertheless, the literature does provide some direction in discerning tasks that have been shown to reveal working memory, response inhibition and rule-attainment deficits in this population.
Evidence for Theory of Mind (ToM) deficit in schizophrenia

It is perhaps quite understandable why schizophrenia researchers would turn their interest to ToM in this disorder. Problems with interpreting the mental states of others could clearly be linked to aspects of schizophrenia such as paranoia. Corcoran, Mercer and Frith (1995) found that schizophrenic patients with predominantly negative symptoms and incoherence performed significantly worse on Theory of Mind tasks when compared to controls. Furthermore, patients with paranoid features performed more poorly than patients with passivity symptoms and those in remission. The same finding emerged in another study even when IQ effects were controlled (Corcoran, Cahill and Frith 1997). More recently, Pickup and Frith (2001) have shown that individuals with paranoid schizophrenia are most impaired on ToM tasks, but this was associated with lower IQ. Similarly, a very recent study (Brune, 2003) has found that their poor IQ explained the performance of patients with schizophrenia on several ToM tasks. The issue about the specificity of a Theory of Mind deficit in schizophrenia remains therefore debatable.
Overview of existing research examining the relationship between cognitive variables and suggestibility: a rationale for the current study

The research literature examining the role of cognitive variables in suggestibility has revealed inverse relationships between IQ and suggestibility and memory and suggestibility. By contrast, a paucity of research has considered the relationship between other areas of cognition and suggestibility – namely executive functions. The executive functions considered to be of primary relevance to suggestibility are: working memory, response inhibition, rule-attainment, speed of decision-making and Theory of Mind.

Furthermore, a limitation of previous work has been the lack of diagnostic information about forensic samples. Hence, examination of cognitive deficits associated with mental impairment also needs to be considered when examining suggestibility. We can conclude from the review of cognitive deficits in schizophrenia that there is variability in patient’s performance on a number of tasks – reflecting the heterogeneity of cognitive deficits in this population. Therefore, to look at the roles of IQ, memory and executive functions in suggestibility, it was considered necessary to pre-select a sample of patients that reflected the major diagnostic group (i.e., psychotic disorder) within the forensic population because they are generally known to exhibit some of the deficits in some of the cognitive domains under question. In this respect, the participants would form a diagnostically homogeneous group. However, we know from this review that there is heterogeneity in their performance on cognitive tasks assessing these four domains. By comparing patients high on the suggestibility scale with patients low on
the suggestibility scale, it is possible to examine how these other cognitive factors may cluster in this population according to their level of suggestibility.

**Hypotheses**

A tentative theoretical link between executive functioning and suggestibility has been described above. It is hypothesised that patients with high suggestibility may have poor working memory function and so cannot process the dual-task requirements i.e. processing information in memory whilst attending to the leading questions to provide an answer. Furthermore, it is hypothesised that the retrieval of information in memory requires selection of correct items from incorrect items and so, inhibiting inappropriate responses is important in reducing suggestibility. Linked to this is the notion that guessing will lead to increased suggestibility, so attaining the rule that some questions are misleading is essential. Lastly and linked in with this latter point is that Theory of Mind is also tentatively linked to suggestibility insofar as accurate inferring of the intentions of the interviewer may also reduce suggestibility.
In an attempt to assess the role of these various executive functions on suggestibility, patients with a diagnosis of psychotic disorder were split into two groups of high and low suggestibility (as measured by the GSS 1) and examined on the following tasks tapping various executive functions:

- Working memory (Daneman & Carpenter listening span test, 1980)
- Response suppression (Hayling response suppression task: Burgess and Shallice, 1997)
- Rule-attainment (Brixton spatial anticipation task: Burgess and Shallice, 1997)
- Theory of mind (Channon and Crawford, 2000)
- Speed of information processing (The Speed and Capacity of Language Processing Test SCOLP: Baddeley, Emslie and Nimmo-Smith, 1992)

All participants completed a measure of current intellectual functioning, the Wechsler Abbreviated Scale of Intelligence (WASI).

The study specifically examined the following hypotheses:

1. The high suggestible group will perform significantly more poorly than the low suggestible group on the memory and IQ measures.

2. The high suggestible group will perform significantly more poorly than the low suggestible group on the tests of working memory capacity.
3. The high suggestible group will perform significantly more poorly than the low suggestible group on the test of response suppression.

4. The high suggestible group will perform significantly more poorly than the low suggestible group on the test of strategy application.

5. The high suggestible group will perform significantly more poorly than the low suggestible group on the Theory of Mind task.

6. The high suggestible group will perform significantly more poorly than the low suggestible group on the Speed of Comprehension test.
Chapter 4

Method

Design

A between subjects design was used to compare fifteen adult forensic patients rated as having “high suggestibility” and seventeen adult forensic patients rate as having “low suggestibility” as measured by the Gudjonsson Suggestibility Scale (GSS1: Gudjonsson 1984a).

Participants

Fifty-six forensic patients sectioned under the Mental Health Act (1983) were approached to take part in this study. English was the first language in all cases. The patients were approached when their notes indicated a history of psychotic disorder. An independent clinician then confirmed a diagnosis of psychotic disorder using the SCID I and II: Structured Clinical Interview for the diagnosis of DSM-IV Axis I Disorders, Clinician Version (SCID-I-CV) and Structured Clinical interview for the Diagnosis of DSM-IV Axis II (SCID-II: First et al 1996). This was used to ensure that all participants were currently not displaying overt signs of any psychotic phenomena and that none were currently using any illicit substances or abusing alcohol. All participants were currently stabilized on neuroleptic medication.

The inclusion criteria for the study was that participants had: a diagnosis of psychotic disorder; sufficiently good comprehension abilities to understand test
requirements (using the TROG: Test for the Reception of Grammar; Bishop, 1982); and an IQ of 70+ to ensure they were above the cut-off for intellectual disability (using the WASI: Wechsler, 1999). Twenty-four (43%) refused to participate and this left 32 two adult male forensic patients who decided to participate in the study and who met the inclusion criteria (see Table 5).
Table 5: Age, Mental Health Act (1983) section, Diagnosis and Index Offence

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Ethnicity*</th>
<th>CLoH**</th>
<th>Section</th>
<th>Psychotic disorder</th>
<th>Index offence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>42</td>
<td>1</td>
<td>19</td>
<td>37/41</td>
<td>Paranoid Schizophrenia (PSz)</td>
<td>Actual Bodily Harm (ABH)</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>2</td>
<td>7</td>
<td>37/41</td>
<td>PSz</td>
<td>Murder</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>1</td>
<td>24</td>
<td>37/41</td>
<td>PSz</td>
<td>Grievous Bodily Harm (GBH) with intent</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
<td>1</td>
<td>18</td>
<td>47/49</td>
<td>PSz</td>
<td>Arson</td>
</tr>
<tr>
<td>5</td>
<td>41</td>
<td>2</td>
<td>15</td>
<td>37/41</td>
<td>PSz</td>
<td>(GBH)</td>
</tr>
<tr>
<td>6</td>
<td>44</td>
<td>2</td>
<td>18</td>
<td>37/41</td>
<td>PSz</td>
<td>Threats to kill</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>1</td>
<td>24</td>
<td>37</td>
<td>PSz</td>
<td>Abduction and sexual assault</td>
</tr>
<tr>
<td>8</td>
<td>36</td>
<td>2</td>
<td>10</td>
<td>37/41</td>
<td>PSz</td>
<td>Manslaughter</td>
</tr>
<tr>
<td>9</td>
<td>24</td>
<td>1</td>
<td>15</td>
<td>37/41</td>
<td>PSz</td>
<td>Arson</td>
</tr>
<tr>
<td>10</td>
<td>42</td>
<td>1</td>
<td>8</td>
<td>47/49</td>
<td>PSz</td>
<td>Rape</td>
</tr>
<tr>
<td>11</td>
<td>37</td>
<td>1</td>
<td>28</td>
<td>37/41</td>
<td>PSz</td>
<td>ABH</td>
</tr>
<tr>
<td>12</td>
<td>32</td>
<td>1</td>
<td>7</td>
<td>37/41</td>
<td>PSz</td>
<td>GBH</td>
</tr>
<tr>
<td>13</td>
<td>24</td>
<td>1</td>
<td>16</td>
<td>37</td>
<td>PSz</td>
<td>ABH</td>
</tr>
<tr>
<td>14</td>
<td>42</td>
<td>1</td>
<td>7</td>
<td>37/41</td>
<td>PSz</td>
<td>Murder</td>
</tr>
<tr>
<td>15</td>
<td>36</td>
<td>2</td>
<td>10</td>
<td>37/41</td>
<td>PSz</td>
<td>ABH</td>
</tr>
<tr>
<td>16</td>
<td>48</td>
<td>1</td>
<td>8</td>
<td>37</td>
<td>PSz</td>
<td>GBH</td>
</tr>
<tr>
<td>17</td>
<td>33</td>
<td>1</td>
<td>16</td>
<td>37/41</td>
<td>PSz</td>
<td>Manslaughter</td>
</tr>
<tr>
<td>18</td>
<td>31</td>
<td>1</td>
<td>7</td>
<td>37/41</td>
<td>PSz</td>
<td>Possession of weapon</td>
</tr>
<tr>
<td>19</td>
<td>48</td>
<td>2</td>
<td>9</td>
<td>37/41</td>
<td>Delusional disorder</td>
<td>Harassment</td>
</tr>
<tr>
<td>20</td>
<td>44</td>
<td>2</td>
<td>12</td>
<td>37/41</td>
<td>PSz</td>
<td>Threats to kill</td>
</tr>
<tr>
<td>21</td>
<td>49</td>
<td>2</td>
<td>7</td>
<td>37</td>
<td>PSz</td>
<td>Harassment, criminal damage</td>
</tr>
<tr>
<td>22</td>
<td>27</td>
<td>1</td>
<td>12</td>
<td>37/41</td>
<td>PSz</td>
<td>GBH with intent</td>
</tr>
<tr>
<td>23</td>
<td>33</td>
<td>1</td>
<td>7</td>
<td>37</td>
<td>PSz</td>
<td>Burglary</td>
</tr>
<tr>
<td>24</td>
<td>21</td>
<td>1</td>
<td>8</td>
<td>47/49</td>
<td>PSz</td>
<td>Unlawful wounding, false imprisonment</td>
</tr>
<tr>
<td>25</td>
<td>41</td>
<td>1</td>
<td>6</td>
<td>37/41</td>
<td>PSz</td>
<td>Manslaughter</td>
</tr>
<tr>
<td>26</td>
<td>20</td>
<td>2</td>
<td>6</td>
<td>47/49</td>
<td>PSz</td>
<td>Robbery</td>
</tr>
<tr>
<td>27</td>
<td>34</td>
<td>3</td>
<td>7</td>
<td>41</td>
<td>PSz</td>
<td>Arson</td>
</tr>
<tr>
<td>28</td>
<td>33</td>
<td>1</td>
<td>15</td>
<td>37/41</td>
<td>PSz</td>
<td>ABH and burglary</td>
</tr>
<tr>
<td>29</td>
<td>30</td>
<td>3</td>
<td>8</td>
<td>37/41</td>
<td>PSz</td>
<td>GBH</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
<td>1</td>
<td>12</td>
<td>37/41</td>
<td>PSz</td>
<td>Wounding with intent</td>
</tr>
<tr>
<td>31</td>
<td>49</td>
<td>2</td>
<td>27</td>
<td>37/41</td>
<td>PSz</td>
<td>Attempted murder, robbery, GBH</td>
</tr>
<tr>
<td>32</td>
<td>45</td>
<td>1</td>
<td>13</td>
<td>37/41</td>
<td>Delusional disorder</td>
<td>Criminal damage, putting people in fear of violence</td>
</tr>
</tbody>
</table>

** Ethnicity: 1 = Afro-Caribbean, 2 = Caucasian, 3 = Asian

** CLoH: Current Length of Hospitalisation in months

37/41 - Hospital order - person has committed offence and initially in hospital for 6 months
37 - Hospital order - with restriction order for protection of public
41 - Restriction order applied for more serious persistent offender
47 - Transfer of a sentenced prisoner with mental illness by home office
47/49 - Offence of extreme severity
Procedure

The Enfield and Haringey Health Authority, Local Research Ethics Committee provided approval for the study (see Appendix D). In accordance with the Committee guidelines for recruiting participants, an information sheet was given to all patients (see Appendix A) and written consent to participate was obtained (see Appendix B). Furthermore, the participants gave written consent to provide information to their consultant concerning the assessment results from this study (see Appendix C).

Patients were tested on hospital premises or at community premises where the patients were currently resident. Each session lasted two hours with a half hour break between sessions. A fixed order of test administration was used to ensure that any fatigue or practice effects were similar across all participants. Participants were provided with breaks as necessary between testing to help minimise the effects of fatigue. The tests were conducted in the following order: session 1 (WASI, TROG, GSS 1); and session 2 (Hayling and Brixton Task, Daneman Listening Span, Channon and Crawford ToM task, Speed of comprehension task).
Screening measures to determine inclusion

The following measures were used to determine inclusion in the study. Clients were selected according to DSM-IV criteria, ability to comprehend language, and excluded if they obtained an IQ in the learning difficulties range.

Structured Clinical Interview for the Diagnosis of DSM-IV Axis I and II Disorders, Clinical Version (SCID-I and -II, First et al 1996)

The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) is a semi-structured interview for identifying the major DSM-IV Axis I diagnoses. It is designed for use in clinical settings as a way of ensuring standardized assessments. It includes a reusable administration booklet and a one-time-use score sheet. The SCID-I CV covers those DSM-IV diagnoses commonly seen in clinical practice. The SCID-II is a semi-structured interview for making DSM-IV Axis II (Personality Disorder) diagnoses. The SCID-II is comprised of a self-report personality questionnaire that is used as a screening tool to shorten the time it takes the clinician to administer the SCID-II. After the subject completes the Personality Questionnaire (which usually takes 20 minutes), the clinician simply circles the numbers to the left of the SCID-II items that correspond to items answered "yes" on the questionnaire. When the SCID-II is administered, the clinician needs only to inquire about the items screened positive on the questionnaire. The assumption is that a subject who responds with a "no" on the questionnaire item would also have answered "no" to the same question had it been read aloud by the interviewer. The SCID-I- CV takes about an hour to one and a half hours to administer,
depending on the complexity of the individual’s presentation and history. The SCID II takes half an hour to administer.

**Test for the Reception of Grammar (TROG: Bishop, 1982)**

The Test for the Reception of Grammar (TROG) was used to screen for poor language comprehension. The test requires participants to look at four pictures and choose the one that corresponds to a sentence spoken by the test administrator. The complete test takes between ten and twenty minutes to complete and consists of eighty four-choice items. The items are divided into twenty blocks with four items in each block. The blocks are arranged in order of increasing difficulty. The test is scored in terms of the number of blocks passed and in order to pass a block, participants need to get all four items correct. Testing begins after a baseline of five consecutive blocks are correctly answered, but is discontinued if five consecutive blocks have been failed. The test manual suggests that failure on more than four blocks is clinically significant. Therefore, this was used as a cut-off for inclusion in the study.

**Wechsler Abbreviated Scale of Intelligence (WASI: Wechsler, 1999)**

Based on subtests from the full Wechsler tests for adult intelligence (Wechsler Adult Intelligence Scale III, 1997), the Wechsler Abbreviated Scale of Intelligence (WASI: Wechsler 1999) has been designed to provide a quick and accurate estimate of an individual’s current level of intellectual functioning. The WASI consists of four subtests: Vocabulary, Block Design, Similarities and Matrix Reasoning. These four
subtests are used to derive an estimate of full-scale IQ. The Vocabulary and Similarities subtests generate an estimated verbal IQ score and the Block Design and Matrix Reasoning subtests generate an estimated performance IQ score. Administration takes approximately forty minutes.

**Gudjonsson Suggestibility Scale 1 (GSS 1: Gudjonsson, 1984a)**

The GSS 1 was used in this study to measure participants’ level of suggestibility. The scales consist of a short fictitious story. The GSS1 comprises a story that is salient to the forensic context and describes a ‘mugging’ of a woman on holiday in Spain. The scale consists of 20 questions, 15 of which are suggestive; the suggestive questions are of two general types, examples of which are provided below from the narrative in the GSS1:

**Leading questions:** These items are constructed in such a way that they do not embody a strong expectation from the participant, but there are salient premises in the question to create some expectation in the answers (e.g., “Did the woman’s glasses break in the struggle?” where struggle makes a confirmatory answer plausible).

**Leading False alternative questions:** Five of the questions suggest the presence of objects, persons or actions that are not mentioned in the story (e.g., “Did the woman hit the assailants with her fist or handbag?” where neither answer is correct).

The final five questions are ‘true’ questions and the correct answer is an affirmative one. These items are interspersed among the 15 leading questions to conceal
the real purpose of the task. These items are not included in the scoring of the test and so are unrelated to suggestibility on this measure.

Before the story is read to the participant, the following instruction is given: “I want you to listen to a short story. Listen carefully because when I am finished I want you to tell me everything you can remember.” The participant is then required to recall all that they can remember and the administrator records their response verbatim. This account is then scored for the number of ideas accurately recalled (where the maximum is 40). After a delay of 45 minutes, the participant again recalls the story and immediately following this, is asked to answer the 20 questions relating to the story. Once they have answered the 20 questions, the participants are provided with negative feedback and are told firmly “You have made a number of errors. It is therefore necessary to go through the questions once more and this time try to be more accurate.” The 20 questions are then repeated and any distinct change to the 15 suggestive questions is noted for scoring. Therefore, the scale provides a measure of memory-recall and three suggestibility measures: Yield, Shift and Total. The Yield1 score relates to the leading or leading false alternatives given to each suggestive question. The Shift score represents a distinct change in reply to any of the 15 suggestive questions. The Total Suggestibility Score is the sum of Yield on trial 1 and Shift (range is 0-35). Yield 2 (i.e., the Yield score on the second trial) relates to affirmative answers given to the suggestive questions after negative feedback.
Measures of executive functions

Inhibition: The Hayling Test (Burgess and Shallice 1997)

This test is composed of two sections. Each section consists of 15 short sentences, each with their last word missing. The sentences are read aloud by the examiner and participants are expected to provide a verbal response. In the first condition, participants are asked to provide a logical final word to complete each sentence as quickly as possible under timed conditions (e.g., “Johnny hit his sister on the ...head”). By contrast, the second condition requires the participant to provide a word that does not fit the end of the sentence and which is unconnected to the meaning of the sentence (e.g., “London is a very busy.....Banana”).

The test provides three measures relating to executive function. In the first condition, the response latencies are summed to give a measure of response initiation. In the second condition, the aim is to suppress the expected answer and replace it with a nonsensical one. From this condition, two scores are calculated, the sum of the response latencies and an error score. The error score is based qualitatively on both the type of answer and the frequency of such answers. The manual suggests that those scoring poorly on the second condition are those that responded slowly or are impulsive, completing the sentences with semantically related words. A participant is considered to perform well when they have developed a strategy to cope with the demands of the testing situation. For example, the participant might seek out items in the testing room to aid response suppression.
**Rule detection: The Brixton Spatial Anticipation test (Burgess and Shallice 1997)**

Participants are shown a 56-page stimulus booklet with a series of 10 circles numbered one to ten (two rows of five) aligned in a rectangle on each page. On each page, one circle is filled with the colour blue. This task involves detection of a spatial rule whereby the blue circle moves around the 10 positions sequentially as the administrator turns each page of the booklet. The participant is required to detect the simple spatial rules by guessing where the next filled position will be by trying to see a pattern based on what they have seen on previous pages. This task has been likened to the Wisconsin Card Sort Test (Burgess and Shallice, 1997) that has been shown to be impaired in patients with schizophrenia. On the Brixton test, patients with frontal lobe damage have been shown to make three types of error: they may repeat a response consecutively (perseveration); misapply a strategy; or produce bizarre guessing responses. The measure used to calculate scaled scores is the total number of errors on the test.

**Working memory: Daneman and Carpenter Listening Span Test (1980)**

This reading span task aims to measure working memory capacity for verbal material. The important element of this task is that it tests both active processing (i.e., to decide whether the sentence makes sense) and storage (i.e., to retain the information to recall the last word) functions of working memory. In the task, participants are presented with trials of sentences that they have to listen to and recall the final word, (e.g. "when at last his eyes opened, there was no gleam of triumph, no shade of anger"). There are six trials and the number of sentences in each trial is progressively increased from sets of two sentences to six. Sentence span is the maximum number of final words the participant
can remember after all the sentences in the trial have been read aloud. The participant is told that a series of unrelated sentences will be read aloud to them; some of the sentences make sense, and some of the sentences do not make sense. After each sentence, the participant is required to say “Yes” if the sentence makes sense and “No” if the sentence does not make sense. Participants are informed not to spend too much mental energy over analysing the sentences. After answering, “Yes” or “No” the next sentence is read aloud. Once all the items in the trial have been administered, the participant is required to repeat the last words of each sentence in the order that they were presented. If they cannot remember them in order, they are allowed to say them in any order, but they should not start with the last word first, unless it is the only word they can remember. The test is scored in terms of the total number of last words recalled at the end of each set of sentences (Daneman, *personal communication*).

**Examples of trial items:**

**Sets of Two**
The house quickly got dressed and went to work.
I took a knapsack from my shovel and began removing the earth.
The target words to be recalled in this set are: *work and earth*

**Sets of Three**
The murky swamp slipped into the waters of the crocodile.
The castle sat nestled in the refrigerator above the tiny village.
It wasn't all her fault that her marriage was in trouble.
The target words to be recalled in this set are: *crocodile, village and trouble.*
Theory of Mind: Story Comprehension Task (Channon and Crawford, 2000)

The Story Comprehension Task was used to assess ‘high’ level Theory of Mind in adults. The task requires participants to infer the thoughts of another person. The test consists of twelve short stories (vignettes) presented one at a time. Each story is printed on a single page and participants are asked to read each one in turn. There is no time limit and in order to reduce memory constraints, the story remains in full-view of the participant. The text itself does not explicitly provide a reason for the speech and actions of the characters. Furthermore, the last sentence of each vignette provides information to ensure that the story cannot be understood adequately using a literal interpretation. Participants are allowed a single neutral prompt (e.g., ‘Can you give me a little more information’) if their response is unclear.

The vignettes include examples of sarcasm, threat, lie, white lie, pretence, misunderstanding and dare. An example of one vignette is: “Harriet’s daughter Lara likes playing with her friends after school, but she has been told to be home by 5 o’clock. Sometimes Lara is late and then Harriet worries that something has happened to her. This evening, Harriet tells Lara “if you are not back by 5 you won’t get any dinner.” The participant is then asked why they thought Harriet said what she did.

Channon and Crawford developed a scoring system with written guidelines. The system classifies answers according to accurate interpretation of the characters’ words and/or actions. Corrects answers would indicate clearly that the words of the main character were not supposed to be taken literally. For example, the correct answer for the vignette above could include “It’s a threat to get her back on time.” Participants score a
point for each correct interpretation of a vignette, and these are summed to provide a total score. Channon and Crawford (2000) found inter-rater reliability between two blind raters to be 93 % for the classification of responses as correct versus incorrect.

**Speed of decision-making: The Speed of Comprehension Test (Baddeley, Emslie and Nimmo-Smith, 1992)**

This task is a subtest of the Speed and Capacity of Language-Processing battery (SCOLP) and measures the rate of information processing during a decision-making task. More recently, it has also been considered a useful tool in detecting mild head injury and is sensitive to difficulties in planning and attention switching (Papagno and Baddeley, 1997). It requires participants to verify a series of statements about the world as rapidly as possible. The statements consist of knowledge about the world, half of which are true and half of which are false. The false statements were produced by mismatching the predicate and subject from two true statements. There are 100 sentences in a set and the participant is given 2 minutes to verify as many sentences as possible within this time. The manual suggests that performance on this task is measured in terms of speed since normals and patients make very few errors and provides scaled scores for the number of items completed within the two minutes. The test provides two measures (the percentile and scaled scores) that are age-scaled. There is no suggestion that either is preferable to use, so for consistency with other tests, scaled scores were used in all analyses.
Chapter 5

Results

Descriptive data

The computerized statistical package SPSS version 8 was used to analyse the data. Initially, the data were inspected for skewness of distribution and outliers, as these can violate the assumptions of normality and linearity underlying parametric tests.

The degree of skewness was calculated for each variable (within each group) and compared against the standard error of skewness obtained using Tabachnick and Fiddell's (1983) formula to see whether it differentiated significantly from zero:

The standard error for skewness is:

\[ S_s = \sqrt{\frac{6}{N}} \]

Where \( N \) is the number of cases. The probability of obtaining a skewness value of this size is:

\[ Z = \frac{S - 0}{S_s} \]

Where \( S \) is the value for skewness. At the 1% level, a \( Z \) value in excess of \( \pm 2.58 \) would lead to a rejection of the assumption of normality.

So, with \( n=17 \) (in the larger of the two groups; the other \( n=15 \)):

\[ S = \pm 2.58 \times S_s = \pm 2.58 \times 0.59 = \pm 1.52 \]
The data was also checked for outliers using a standard score (±3 standard deviations from the mean) as the cut-off point for continuous variables (Tabachnick and Fidell, 1983). Standardised scores were calculated for each variable (within each group) in order to identify those that might contain values outside these limits. None of the variables were significantly skewed, showed significant kurtosis or contained outliers.

The data was split into two groups according to Yield 1 scores on the GSS1. This is construed as the purer measure of suggestibility as it reflects ‘giving in’ to leading questions when there is no negative feedback or interpersonal pressure. Yield 1 is influenced by cognitive factors rather than situational factors like the Yield 2 score (which is scored after negative feedback has been given). Hence, splitting on the Yield 1 score rather than total GSS 1 total score (which includes data following the application of negative feedback) allows exploration of the underlying factors associated with giving in to leading questions and being suggestible when there is no external pressure to do so.

According to Gudjonsson (1984a), the mean Yield 1 score in normal controls is 4.6 \( \text{sd} =3 \). Therefore, the “low suggestibility” group \( N=15, \text{Mean}= 3.07, \text{sd} 1.03, \text{range 1-4} \) were characterized by score \( \leq 4 \) and the “high suggestibility” group \( N=17, \text{Mean}= 7.60, \text{sd} 2.50, \text{range 5-12} \) were categorized as having a score \( \geq 5 \) (see Table 6). All comparisons on cognitive measures involve these groupings.
Table 6 Mean differences between high and low suggestibility groups on all measures of suggestibility

<table>
<thead>
<tr>
<th></th>
<th>Low suggestibility (N=15)</th>
<th>High Suggestibility (N=17)</th>
<th>t value (sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield 1</td>
<td>3.07 [sd 1.03]</td>
<td>7.59 [sd 2.50]</td>
<td>6.52 (p=.000)</td>
</tr>
<tr>
<td>Yield 2</td>
<td>5.60 [sd 3.20]</td>
<td>8.73 [sd 3.80]</td>
<td>2.53 (p=.017)</td>
</tr>
<tr>
<td>Shift</td>
<td>4.47 [sd 3.36]</td>
<td>5.71 [sd 2.93]</td>
<td>1.15 (p=.27)</td>
</tr>
<tr>
<td>GSS 1 Total</td>
<td>7.53 [sd 3.83]</td>
<td>13.29 [sd 3.85]</td>
<td>4.23 (p=.000)</td>
</tr>
</tbody>
</table>

Demographic variables

Table 7 displays that demographically the groups did not differ in their mean age, or current length of hospitalisation.

Table 7 Mean age, and months of current hospitalization

<table>
<thead>
<tr>
<th></th>
<th>Low suggestibility (N=15)</th>
<th>High Suggestibility (N=17)</th>
<th>t value (sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>35.27 [sd 8.62]</td>
<td>36.71 [sd 8.46]</td>
<td>0.48 (p=.64)</td>
</tr>
<tr>
<td>Current length of hospitalisation (months)</td>
<td>11.20 [sd 4.63]</td>
<td>14.00 [sd 7.5]</td>
<td>1.25 (p=.27)</td>
</tr>
</tbody>
</table>
Table 8 shows that there were no differences in the ethnicity of the high and low suggestible groups ($\chi^2 = 1.22, p = .87$).

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Low</th>
<th>High</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afro-Caribbean</td>
<td>9</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>Caucasian</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>17</td>
<td>32</td>
</tr>
</tbody>
</table>

The SCID II showed that seven participants showed co-morbid personality disorder; 3 were avoidant, 2 were paranoid and 2 showed obsessive compulsive personality disorder. Additionally, 15 participants had abused substances in the past and these were: alcohol dependency, cocaine dependency, cannabis dependency and hallucinogen abuse. Of the current sample, 4 participants showed polysubstance abuse. The incidence of past drug use across the high and low suggestible groups did not significantly differ ($\chi^2 = 3.13, p = .08$). Regular random drug checks were in operation and none of participants were currently using recreational drugs.
A significant intellectual difference between the high and low suggestible groups?

To explore the mean group differences in IQ variables, independent samples t-tests were performed. There were no significant differences between the groups on Full scale, Verbal or Performance IQ (see Table 9).

Table 9 Mean group scores for the low and high suggestible groups on IQ measures

<table>
<thead>
<tr>
<th></th>
<th>Low suggestibility (N=15)</th>
<th>High Suggestibility (N=17)</th>
<th>t value (sig)</th>
<th>Range*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale IQ</td>
<td>98.33 [sd 12.10]</td>
<td>91.71 [sd 9.93]</td>
<td>1.71 (p=.10)</td>
<td>77-115</td>
</tr>
<tr>
<td>Verbal IQ</td>
<td>95.67 [sd 12.96]</td>
<td>90.24 [sd 9.21]</td>
<td>1.37 (p=.18)</td>
<td>72-110</td>
</tr>
<tr>
<td>Performance IQ</td>
<td>100.53 [sd 13.11]</td>
<td>93.88 [sd 11.81]</td>
<td>1.51 (p=.15)</td>
<td>75-123</td>
</tr>
</tbody>
</table>

* Range for whole sample

Table 9 shows that there is a trend in the data for group differences on full scale IQ. Nevertheless, the overlap of the standard deviations between the groups clearly shows that the groups are not distinct in IQ performance.

A significant memory difference between the high and low suggestible groups?

To explore the mean group differences in memory (immediate and delayed recall memory), independent samples t-tests were performed. Table 10 shows that there were no significant differences between the groups in terms of their memory performance (all \( p >.05 \)).
Table 10 Means for the low and high suggestible groups on immediate and delayed memory

<table>
<thead>
<tr>
<th></th>
<th>Low suggestibility (N=15)</th>
<th>High Suggestibility (N=17)</th>
<th>t value (sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed memory</td>
<td>10.13 [sd 4.51]</td>
<td>9.47 [sd 3.52]</td>
<td>0.47 (p=.64)</td>
</tr>
</tbody>
</table>

A significant difference between the high and low suggestible groups on executive measures?

Mean group differences on the Hayling and Brixton tasks (Burgess and Shallice, 1997), the Daneman listening span task, the Channon and Crawford (2000) Theory of Mind measure, and the speed of comprehension test were examined using independent samples t-tests. The results show non-significant differences between the groups on the Hayling response suppression task ($t=.632$, $df=30$, $p=.53$) and the Daneman Listening Span Task ($t=.067$, $df=30$, $p=.95$). However, significantly better performance was observed in the low suggestible group on the Brixton Spatial Anticipation Task (Burgess and Shallice, 1997), the Channon and Crawford (2000) Theory of Mind task, and the speed of comprehension task (see Table 11).
Table 11  Mean group scores for the low and high suggestible groups on executive function measures

<table>
<thead>
<tr>
<th>Task</th>
<th>Low suggestibility (N=15)</th>
<th>High Suggestibility (N=17)</th>
<th>t value (sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response inhibition (Hayling Test)</td>
<td>4.93 [sd 1.10]</td>
<td>5.18 [sd 1.07]</td>
<td>.632 (p = .53)</td>
</tr>
<tr>
<td>Rule-attainment (Brixton Test)</td>
<td>6.33 [sd 1.71]</td>
<td>4.47 [sd 2.27]</td>
<td>2.6 (p = .015)</td>
</tr>
<tr>
<td>Working memory (Daneman)</td>
<td>32.93 [sd 17.3]</td>
<td>33.29 [sd 13.3]</td>
<td>0.07 (p = .95)</td>
</tr>
<tr>
<td>ToM task (Channon)</td>
<td>7.53 [sd 2.64]</td>
<td>5.53 [sd 2.67]</td>
<td>2.13 (p = .04)</td>
</tr>
<tr>
<td>Decision-making (SoC)</td>
<td>6.33 [sd 1.72]</td>
<td>5.00 [sd 1.62]</td>
<td>2.26 (p = .03)</td>
</tr>
</tbody>
</table>

Given that the groups showed differences on three of the tests of executive function, it seemed important to ascertain whether these tasks were indeed tapping separable executive processes in relation to suggestibility. To determine this, the relationships between the measures were assessed in relation to each other, to suggestibility and to other tests of cognitive function, namely IQ.
Table 12 Correlation matrix for GSS 1 measures and cognitive tests

<table>
<thead>
<tr>
<th></th>
<th>PIQ</th>
<th>FSIQ</th>
<th>Imm</th>
<th>Del</th>
<th>Yield 1</th>
<th>GSS Total</th>
<th>Response inhibition</th>
<th>Rule-attainment</th>
<th>ToM</th>
<th>SoC</th>
<th>Working Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIQ</td>
<td>.55**</td>
<td>.865**</td>
<td>.143</td>
<td>.272</td>
<td>-.309</td>
<td>-.225</td>
<td>.217</td>
<td>-.085</td>
<td>.487**</td>
<td>.446*</td>
<td>.270</td>
</tr>
<tr>
<td></td>
<td>.00</td>
<td>.000</td>
<td>.436</td>
<td>.132</td>
<td>.085</td>
<td>.216</td>
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** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Table 12 reveals an interesting pattern of correlations. First, as expected, all IQ measures inter-correlate, and immediate and delayed recall correlate significantly. Similarly, Yield 1 scores correlate very highly with GSS total scores. By contrast memory and IQ measures did not correlate.

If we turn to the other cognitive measures including the tests of executive functioning, it is apparent that the Brixton fails to correlate with any other task; however the SoC correlates with both working memory and ToM tasks and all three correlate with FSIQ. This clearly indicates some distinctive function of the Brixton task from other measures. By contrast, the remaining executive tasks seem to be related to each other and to a general IQ factor.

Finally, it is notable that the Yield 1 correlations with executive measures are all approaching significance (see dotted outline in Table 12); however, the correlations with GSS total were lower in each case (being non-significant for SoC and Brixton and approaching significance for ToM). This appears to validate the notion that Yield 1 relates more to cognitive factors than GSS total score (e.g. Gudjonsson 1992).

**ANCOVA**

A multivariate ANCOVA using FSIQ as a covariate with Brixton, ToM and SoC as dependent variables revealed that only the Brixton remained significantly different across the high and low suggestibility groups after IQ was partialled-out (F=5.466, df=1,29, p=.027); ToM (F=2.014, df=1,29, p=.17); SoC (F=2.66, df=1,29, p=.12)
Overview of the current findings

I shall now provide an overview of the results corresponding to the hypotheses of the study. The groups differed in their performance on some tests and not on others these are listed below:

- **The high suggestible group will perform significantly more poorly than the low suggestible group on the memory and IQ measures.**

The results indicate that the groups did not differ in terms of either their immediate or delayed recall on the GSS. Furthermore, they did not differ in their full scale, verbal or performance IQ. This result is surprising given that the review of the literature led to hypothesizing that these would be worse in the high suggestible group.

- **The high suggestible group will perform significantly more poorly than the low suggestible group on the tests of working memory capacity.**

The groups were found to show no differences in their performance on the Daneman Listening Span task. The result indicates that working memory capacity did not differ.

- **The high suggestible group will perform significantly more poorly than the low suggestible group on the test of response suppression**

The groups showed no differences in their performance on the Hayling response inhibition task. The finding indicates that both groups performed within the moderately
average range on this task and that indeed, the high suggestible group did not show poorer response inhibition.

. The high suggestible group will perform significantly more poorly than the low suggestible group on the test of rule-attainment.

Indeed, the high suggestible group performed significantly worse on the Brixton Spatial Anticipation Task. This result suggests that the low suggestible group were better at learning rules to complete the task accurately whereas the high suggestible group seemed to use guessing rather than a clear strategy to perform the task.

. The high suggestible group will perform significantly more poorly than the low suggestible group on the Theory of Mind task.

The high suggestible group did perform more poorly than the low suggestible group on the ToM task. The result suggests that the low suggestible group were better in terms of their ‘mentalizing’ skills.

. The high suggestible group will perform significantly more poorly than the low suggestible group on the tests of the Speed of Comprehension test

Indeed, the high suggestible group did show worse performance on the speed of comprehension task. The result indicates that the low suggestible group had better speed and attention during a task tapping decision-making.
Finally, given the relationship between IQ and executive function measures, covarying the effects of IQ revealed that the only executive measure to significantly differentiate between the two groups was rule-attainment. Both speed of decision-making and Theory of Mind became non-significant.
Chapter 6

Discussion

This between-group comparison of forensic patients with psychotic disorder has revealed that the measure of pure suggestibility (i.e. Yield 1) is associated with a particular cognitive profile. This profile suggests that patients with psychotic disorder have cognitive vulnerabilities that lead to increased suggestibility even before experiencing any interpersonal pressure. Indeed, this study also shows that some cognitive factors, not previously examined, appear to be associated with this measure of suggestibility; while others that have previously been associated with suggestibility did not significantly differ between the high and low suggestibility groups. Contrary to previous research the results revealed no significant differences between the high and low suggestibility groups in their IQ, or immediate and delayed memory. By contrast, patient performance on tests of different executive functions has highlighted how some executive functions were related to suggestibility while others are not. In particular, the high and low suggestibility groups did not differ in their working memory and response inhibition performance, but the high suggestibility group did perform worse on tasks tapping rule-attainment, Theory of Mind and, speed and attention during a decision-making task. Moreover, two of the executive tasks that did produce differences between the groups (speed of decision-making and theory of mind) correlated with IQ and so partialling out the effects of these measures on suggestibility revealed that only the task assessing rule-attainment maintained significant differences between the groups. The pattern of these results is discussed further below, turning first to the failure to replicate previous findings regarding IQ, memory and suggestibility.
IQ and suggestibility

Let me first address the possibility that differences reflect the use of different suggestibility measures, i.e. the current study used Yield 1 as measures of pure suggestibility while previous studies have concentrated on GSS 1 total scores. As noted, Gudjonsson (1984a) suggests that Yield 1 relates more to cognitive factors (while Shift is more situationally determined); and since total suggestibility reflects a combination of the two, it is multi-determined. In this respect, Yield 1 score is construed as the purer measure of suggestibility since it reflects ‘giving in’ to leading questions when there is no pressure. Nevertheless, GSS 1 total and Yield 1 scores were highly related (sharing 58.5% of the variance); and furthermore, the relationships between IQ, memory and suggestibility that have been described in the literature document these relationships with Yield 1 as well as total suggestibility (see Sharrock and Gudjonsson, 1993; Gudjonsson and Clare, 1995); and finally, the high and low Yield groups described here still also differed significantly in total GSS 1 scores (Table 6). Despite this, only Yield 1 correlated with cognitive measures and in particular, for measures of executive function. This also appears to validate the use Yield 1 as a measure of pure suggestibility and its link with cognitive processes rather than situational factors (as with Shift). It also therefore seems unlikely that any differences with past studies reflect the use of Yield 1 rather than total GSS 1 score.

Another possibility concerns differences in the samples used across studies. One constraint of previous research has been to examine suggestibility in ‘forensic’ samples without considering the amorphous and heterogeneous nature of such samples. Given that a number of cognitive deficits are associated with the diagnosis of schizophrenia...
and that there are a high number of patients with psychotic disorder in the forensic population, the ‘forensic’ samples described in the literature typically reflect an unknown quantity. Finding a relationship between suggestibility and IQ (or with any other cognitive variable) therefore becomes unreliable and may fail to be replicated in a second sample. It was interesting to find that by deliberately selecting out a sample of patients with a known psychotic illness, the predicted relationship (based on past research) between IQ and suggestibility was not replicated. There are several possible reasons for this. First, Gudjonsson (1988) has suggested the importance of range effects in finding these associations in forensic patients. By this, he has argued that when IQ scores are above 100 the relationship with suggestibility is non-significant. However, in the current study the number of patients with IQ scores above 100 was only 9 out of a possible 32. So there seems to be some other factor associated with the range effect argument. Indeed, further inspection of earlier articles that argue for the association between IQ and suggestibility suggest that the range is even more specific than the above suggestion. In a study of 49 men and women with intellectual disabilities (mean WAIS-R IQ = 58; range 45-82), Gudjonsson et al (2000) found no correlation between suggestibility and IQ. They argue that the previously documented relationships also fail to hold at the lower end of the spectrum. Indeed, they suggest that for people “...who are intellectually disadvantaged, it is unwise to estimate suggestibility from memory and IQ scores.” Hence, the relationship of IQ with suggestibility appears to exist within a particular range that is somewhat under specified – somewhere possibly between 82-99 (but neither above nor below this range). In the current study, the low and high suggestibility subjects had IQ means of 98 (sd=12) and 91 (sd=9.9); and across both groups only 9 had IQ’s that were over 100 and 8 had IQ’s of less than 85. This means
that 17 subjects (53%) fell within the range where they might be expected not to show the relationship and this may, of course, have influenced the outcome.

Recall memory and suggestibility

As noted above for IQ, the previously documented link between recall memory and suggestibility also was not replicated in the present study. The high and low suggestibility groups showed no difference in their immediate or delayed recall of the GSS 1 narrative.

Could these findings reflect some difference in the level of memory performance reported here and in previous studies? Both the high and low suggestibility groups had poor memory but their immediate and delayed recall scores (see Table 10) were somewhat better than previously reported both for 16 patients with schizophrenia (7.9 and 6.3: Smith and Gudjonsson 1995a) and for 32 forensic psychiatric inpatients (10.59 and 9.24: Smith and Gudjonsson 1995b) on the GSS2. One possibility is that, as with IQ, range effects may exist for memory. Indeed, Gudjonsson (1988) has alluded to this possibility by showing that for forensic patients, the correlation between GSS total and memory was significant only when the memory performance was above (and not below) the mean. Unfortunately, however, he did not provide data concerning what the critical memory ranges might be.

Further inspection of the literature also points to some inconsistencies in the relationship between memory and suggestibility. Indeed, Gudjonsson (1984) found there was a significant negative relationship between memory and suggestibility in normal
controls (males N=58, -0.55; females N=56, -0.56), however, in his sample of forensic patients (n=40) there was no relationship with any of the GSS measures (Yield 1, -0.01; Yield 2, 0.14; shift, 0.02 and total suggestibility, 0.015). The relationship between these factors seems to be much higher in normal controls than in forensic samples generally (see Gudjonsson, 1987c; 1988b) and may represent the wider range of memory recall scores in the normal population. Indeed, Gudjonsson, Murphy and Clare (2000) found the correlation between memory and suggestibility to be poor in a sample of participants with intellectual disability. However their average immediate and delayed memory scores were poor (2.8 and 2.2 respectively) and again Gudjonsson et al (2000) propose that this may be due to range effects since their ‘... [IQ] and memory abilities are distinct from suggestibility at the two extremes of the distribution’. The conclusion might therefore be, that like IQ, the range of scores in the current sample were not wide enough (by comparison with normal recall performance) and so the current study did not support the previously documented relationship between memory and suggestibility. However, it is worth reiterating that the memory performance of the current sample does not seem idiosyncratic in that their recall scores are indeed comparable with the normative data supplied by Gudjonsson (1992) for court referrals.

Finally, we should note that since both the high and low suggestibility groups had poor memory, poor memory may be a necessary, but not a sufficient condition for suggestibility. In other words, this finding does not undermine a possible link with suggestibility, but shows that the role of memory alone is not enough to create higher levels of suggestibility.
Executive functions and suggestibility

A main purpose of the current study was to hypothesise a role for different executive functions in suggestibility. The proposed functions that were thought to relate to suggestibility were working memory, response inhibition, rule-attainment, Theory of Mind, and speed/attention whilst carrying out a decision-making task. The speculated roles for these various functions were somewhat interlinked insofar as intact working memory capacity is required for the dual-task of retrieving the original narrative whilst holding the question in mind. Speed of information processing was linked to being able to deal with this burden of information so that inhibitory mechanisms could accept and reject items from the pool of information that is reactivated in response to questioning (i.e. the original narrative, but also information that had become activated due to past biases in experience and expectations). This line of speculation presupposed that these two processes need to be intact for other executive processes to function properly. So for example, if working memory function is intact (the person can carry out the dual task of holding the narrative in mind as well as the questions) and their speed of processing is high to accommodate the pool of retrieved information, then intact inhibitory mechanisms can work efficiently to select plausible from implausible responses. Only then is it possible for rules to be attained (i.e., that the person realizes that there seems to be a pattern in the questioning, that not all questions have a true response) and thus ‘mentalising’ becomes a key factor in determining this rule. The results from the current investigation are interpreted given the speculated role for the various executive processes.
On general inspection of the correlations between the executive measures, some of these speculated roles seem to interlink. So for example, it seems that working memory and speed of decision-making are linked together as emphasized by their significant correlation. In addition to this, however, response inhibition and rule-attainment showed no relationship with these two variables, or indeed with each other. Lastly, ToM and speed of decision-making are also correlated. Nevertheless, the important roles of these various executive functions become particularly interesting when they are linked to suggestibility. In this respect, it appears that three executive measures (rule-attainment, ToM and speed of decision-making) show trends in the correlation with Yield 1 score for the entire sample. In order to determine the specific relationship of all three executive processes with suggestibility, the between-group differences approach seems to reveal those processes that differ significantly between the high and low suggestible groups and those processes that do not differ between the groups. I shall turn first to describing the tasks that did not differ between the groups: working memory and response inhibition.

**Working memory and suggestibility**

The Daneman listening span task assesses the ability to hold information in mind whilst making a judgment about verification of a sentence as well as remembering a salient feature of the sentence (i.e., the last word). The role of working memory in suggestibility was hypothesised to encompass the dual task demand of retrieving information from memory whilst holding the question in mind in order to answer. In this respect, the Daneman task *seems* to be tapping similar functions to the GSS 1 in assessing these abilities. The results showed that the high and low suggestibility groups did not differ in
their working memory performance as measured by the Daneman listening span task. Since the groups did not differ in working memory, we may conclude that working memory impairment is not a sufficient condition for suggestibility to occur, i.e. it is common to both groups. Despite this, the literature shows that patients with schizophrenia have poor working memory capacity, so we cannot eliminate the possibility that poor working memory forms a necessary condition for suggestibility. For example, it may be that poor working memory needs to co-occur with additional difficulties relating to memory encoding and retrieval, decision-making and inhibition. In conclusion then, the proposed role for working memory in suggestibility remains equivocal.

**Response inhibition and suggestibility**

The groups did not differ in their performance on the Hayling task tapping response-inhibition and so, the proposed role for inhibitory mechanisms in suggestibility also failed to be borne out in the data. The two groups did, however, perform in the moderately average range, suggesting that contrary to previous studies in schizophrenia (Nathaniel-James and Frith, 1996; Nathaniel-James, Brown and Ron, 1996; Marczewski and Van der Linden, Laroë, 2001), this sample of patients was unimpaired in their ability to inhibit inappropriate responses. Since the groups did not differ in response inhibition, and were relatively normal on this task we might conclude that response inhibition seems to be unrelated to suggestibility.

In the current study, it seems so far, that the groups did not display any differences on two of the executive functions measured: working memory (where the
performance was generally poor) and response inhibition (where the performance is generally good). The conclusions to be drawn from this are that it is possible that these two measures can either inform us about the performance of patients with psychotic disorder per se, or indeed, about the necessary and sufficient conditions for factors to be associated with suggestibility. Given that the data did not show any trends on these measures it cannot be argued that the sample size did not allow for the differences to be detected. There is always the possibility however, that perhaps the measures that were selected to tap the specific functions of working memory and inhibitory processes were not sensitive enough to link to those related to suggestibility. This can only be assessed by future studies using a variety of tasks. The next section will focus on describing the three executive functions that did reveal group differences namely: rule-attainment, speed of comprehension and Theory of Mind.

As described in the review earlier, a common problem in the literature on executive functioning relates to the unity and diversity of executive functions. In this study, these three functions were shown to differentiate between the high and low suggestible groups. Given the questions surrounding unity and diversity, it is always possible that as they are all tests of executive function, they may be tapping the same processes. Further analyses showed that some functions were linked, whilst the others had an independent effect. Interestingly, ToM and speed of decision-making were linked, whereas rule-attainment had a separable executive role to play in suggestibility. Moreover, the correlations between the former tasks and IQ were significant whereas the rule-attainment task did not bear any relationship to IQ. Covarying out the effects of IQ between the high and low suggestible groups revealed that only the Brixton rule-
attainment task had a specific function in relation to suggestibility, whereas the significant effect of the ToM and speed of decision-making tasks between the groups became non-significant. The possible reasons for this are speculated on in more detail in the next section.

**Rule-attainment and suggestibility**

The results from this investigation show that high suggestibility is linked with poor rule-attainment. In this preliminary analysis of executive functions in suggestibility it is possible only to speculate why the groups may differ on this task by examining what the task measures. Interestingly, the low suggestible group’s performance on the Brixton was in the average range and the high suggestible group performed in the low-average range. Given that failures on this task have been reportedly linked to *guessing* behaviour, the high suggestible group might simply be guessing during this task (rather than attaining the rule). Although we can only speculate about why they guess, we may eliminate the possibility that guessing in the high suggestible group simply reflects poorer memory since their memory did not differ from the low suggestible group. Likewise, the data from the response inhibition task rules-out the possibility that the high suggestible group were emitting random erroneous responses because they are less able to inhibit inappropriate responses.

Finally and critically, if we turn to the measurement of suggestibility, it seems quite conceivable that a similar guessing strategy might be practiced by the high suggestible group when faced with the misleading questions. Attainment of the rule on
the GSS 1 might reflect understanding that some questions are misleading and thus, in
the current study this would be inferring the purpose of the memory test.

**Speed of decision-making, ToM and suggestibility**

The two groups differed in their performance on the tests of speed of decision-making
and ToM. Nevertheless, in determining the specificity of these executive functions to
suggestibility, it was revealed that these tasks related to each other as well as to general
intellectual function. Hence partialling out the effects of IQ showed that the group
differences on these tasks did not remain.

The speed of comprehension task assesses the ability to comprehend a sentence
and make a decision (as quickly as possible) as to whether the sentence makes sense or
not. In this respect it has some comparability with the suggestibility narrative as they are
both verbal tasks and both involve decision-making to factual statements. The task
shows that a poor score represents slowness of information processing during decision-
making. Similarly, the ToM task is a verbal task involving reading of a script and then
inferring the mental state of the characters involved. It is seems both tasks are verbally
mediated, but both also require non-verbal skills, such as decision-making and
mentalising. General IQ seems to be the mediating variable in performance on these
tasks. This would suggest that both ToM and speed of decision-making *per se* are not
necessary conditions for suggestibility, but that IQ may be (since there was a trend for
the groups to differ in IQ) – as reported previously in this literature.
It seems then that the reported roles for the various executive processes were not entirely borne out in the current data. Rule detection seems to be the key executive function that relates to suggestibility independently of IQ and the other executive measures that have been examined in this study. Another issue, however, that must be excluded in this study concerns the past history of substance misuse within the current sample (50% of sample). It is possible that this may have affected both the level of suggestibility and executive functioning in the sample. The counter arguments to this are that first, it is important to remember that all patients were currently not using any illicit substances. Second, the drug users were equally distributed across the high and low suggestible groups. Third, if we assume that drug use is associated with unreliable confession (Murakami, Edelmann and Davis 1996), then the small trend was in the opposite direction to that which might be expected i.e. the low suggestible group showed a slightly greater incidence of past drug abuse. Additionally, all had been drug free for a minimum of at least 6 months (see Table 5) and so would not be more suggestible because of possible withdrawal effects since these tend to be short-term (see Gudjonsson, Hannesdottir, Petursson, Tyfingsson 2000). So it seems that drug use as a possible mediating factor in this study is untenable.
What can we learn about the role of executive functions in suggestibility?

This study has highlighted three key conceptual questions concerning the relationship between executive functioning and suggestibility: the necessary and sufficient executive conditions for suggestibility; the unity and diversity of executive functions in relation to suggestibility and lastly; the sensitivity and specificity of executive functions in relation to suggestibility.

Turning to the first point, some issues need to be noted regarding the status of different kinds of evidence. First, groups may or may not show differences on a cognitive variable; however, the status of the finding depends upon whether both groups are impaired or normal. When both are normal and they do not differ, then we can eliminate the role of this variable in suggestibility (e.g. the Hayling Test). When both groups are impaired, but do not differ significantly, then we cannot eliminate the cognitive deficit as a necessary condition (e.g. immediate and delayed recall). By contrast, the difference in rule-attainment across the two groups reflected the fact that the high suggestibility group was impaired and the low suggestibility group performed relatively normally – hence impaired rule-attainment is clearly a necessary condition for suggestibility. It is, of course, possible that several necessary conditions contribute to a multifactorial sufficient explanation for suggestibility e.g. impaired memory plus poor rule-attainment.
Second, the current study has highlighted that although performance on all these tasks have been linked to the frontal lobes, some of the tasks relate to each other (speed of comprehension and Theory of Mind), but rule-attainment does not. This highlights the unity and diversity of executive functions in that some are mediated by general intellectual functioning.

This brings us to the final point about the sensitivity and specificity of tasks assessing executive performance. The conclusion from the current study suggests that rule-attainment is a specific frontal function whereas SoC and ToM are sensitive to frontal lobe deficits as well as deficits in general intellectual function. Given that they related to both verbal and non-verbal IQ, this is unsurprising. It has been noted in meta-analyses that IQ and some aspects of executive function are strongly correlated in patients with schizophrenia (Laws, 1999). Finally, although not the principal focus of this thesis, Duncan and colleagues have argued that the frontal lobes (and executive functioning) are related to intellectual functioning, especially perhaps fluid intelligence (e.g. Duncan, Burgess and Emslie 1995; Duncan, Johnson, Swales and Freer 1997; Duncan, Seitz, Kolodny, Bor, Hertzog, Ahmed, Newell and Emslie 2000). Future studies might examine this feature in greater detail by taking measures of fluid as well as crystallised intelligence to determine if the former might relate more strongly to suggestibility.

Clinical implications of the current study
The clinical implications of this research highlight how patient diagnosis is an important factor when investigating the relationship of cognitive factors to suggestibility. In
particular, the study shows that certain cognitive impairments associated with schizophrenia are related to suggestibility. Moreover, unlike psychotic symptoms (which may remit), these cognitive deficits persist in people with schizophrenia even if symptoms remit. These deficits are likely to influence suggestibility even if a person presents with no signs of current mental illness; thus it becomes important to examine their mental health history.

Second, it has become clear that whilst clinical psychologists may evaluate the degree of suggestibility from a GSS score, they should also examine some other aspects of cognitive functioning that may affect suggestibility. This is especially true for tests of executive functioning. Ideally one could identify if the subject is cognitively more prone to suggestibility and whether this is likely to be exacerbated by circumstances (by, for example, after false feedback). In this respect, it would seem that important clinical questions can perhaps be answered concerning whether (a) a person presents with a cognitive vulnerability to be suggestible as well as (b) susceptibility to give in to interrogative pressure during police interview.

In a clinical context, the GSS is often used to examine suggestibility-proneness; however, the results from this investigation highlight that using the GSS alone may be misleading in forensic cases who have a mental disorder. For example, if a person (referred within a legal context with questions surrounding reliability of evidence) shows increased guessing (e.g. on the Brixton) during a comprehensive neuropsychological assessment, this study has shown that it possible to differentiate succumbing under interrogative pressure and succumbing due to a predisposed cognitive vulnerability. The
key take-home message is that some people may also have a primary heightened susceptibility to suggestion even without any interrogative pressure.

The latter finding compliments the previous focus on response to interrogative pressure, but adds to it by showing that some people clearly have a predisposition to suggestibility and that this seems to reflect a particular cognitive profile. Furthermore, it seems that the conventional views of the contribution of memory and IQ in relation to suggestibility need to be contested with every case where the scales are used. This seems a critical point raised in this study since the relationships between these variables is unclear on the basis of the samples in the existing research literature. Indeed the current study has shown that these concepts appear to have no bearing on GSS 1 performance in the ways previously described. However, the generalisability of these findings should be viewed with some caution – a point returned to below in the section on limitations.

Another point of interest is the consideration that given the history of forensic cases, it is possible that their life experiences may predispose them to circumstances within which mild, but undetected head injuries may occur. Although the current sample i.e. patients with schizophrenia, are known to experience difficulties on tasks of frontal lobe function, it is not implausible that the profile of results could also be obtained in other forensic samples (for example, given their chances of sustaining insult or injury to the brain through criminal involvement and activity). This indeed can only be ascertained through further research in this field.
Limitations of the current study

It is important to note that this study involved a small sample size; therefore generalisations of the findings to the wider forensic population may not be valid. Indeed, it should be noted that the current study underscores the importance of understanding and acknowledging the heterogeneity of samples. The small sample size was also combined with a relatively large number of measures and so, increases the likelihood of finding false positive and false negative results (type I and type II errors). Furthermore, although none of the current sample was currently engaging in illicit substance use or alcohol abuse, it is a limitation of this research to not have quantified the amount of previous drug use. Partly, this is quite difficult to quantify since gaining knowledge of the amount of substance used, the type and nature of substance can be quite difficult with a forensic population. Nevertheless, it is certainly relevant to consider in any future work the role of drug use -- especially since criminal behaviour and drug use tend to go together and drug use can be linked to long term changes in cognition – especially in the frontal lobes (e.g. Lundqvist, Jonsson, and Warkentin, 2001).

The use of the GSS 1 as a measure of suggestibility is quite different from the conditions and pressures under which interrogation of suspects usually occurs. Hence, the findings may not fully generalise to the real-life situation. The results may, of course, be compared to previous studies using the same techniques, but for understandable ethical and legal reasons, it is not possible or feasible to examine the same issues in true real-life cases. Nevertheless, the GSS 1 is actually used in real-life cases when solicitors ask clinical psychologists to assess the suggestibility of suspects. This leads to some points concerning the clinical implications.
Directions for future research

The sections on clinical implications and limitations of the current research have highlighted plausible directions for future research. Indeed, the obvious study that would add to this preliminary investigation would be to carry out a comparison of forensic patients with psychotic disorder, patients who have psychotic disorder and no forensic history, another homogeneous sample of say individuals with personality disorder and non mentally disordered forensic cases such as court referrals or prison inmates (all split in terms of high and low suggestibility). Examination of these various combinations and the separation of factors would help to clarify some of the issues surrounding the necessary and sufficient conditions for suggestibility.

It would also be advisable to consider the effect of number of previous convictions on suggestibility (i.e. without interpersonal pressure). This is necessary since past research (Gudjonsson and Singh, 1984b) has suggested that the number of convictions reduces suggestibility and given that the current study is indicating a role for a cognitive vulnerability in executive functions to suggestion that is outside the usual realms of IQ and memory, it would be interesting to see if the number of convictions alters this vulnerability. This question is interesting since within the executive function literature, there is acknowledgement that executive tasks have low test re-test reliability (Denckla, 1994; Lowe and Rabbit 1998) and so, once a task has been experienced and a strategy or rule has been obtained, re-examination of that task produces unreliable results since there are likely to be fewer failures due to the learning of that particular strategy. In relation to suggestibility, it is not unsurprising then that the number of convictions reduces suggestibility since the person has already had the experience of
misleading questions before. This also suggests that when a person is referred for assessment on a number of occasions, it would be necessary to have several related or parallel versions of neuropsychological tests of executive function that could be used to assess rule-attainment (e.g., the Wisconsin Card Sort Test).

Finally, it is worth considering how future research could be directed toward examining the relationship between suggestibility and various other measures of executive function. Tests of executive function, by their nature, are quite different and hence have given rise to the notion of unity and diversity of executive function. It is not, for example, unusual for executive tests to show small or no correlations (Miyake, et al., 2000). Although the current study used a wide range of quite different executive tests, a large number of remaining executive tests could be examined to possibly provide a greater specification about the executive processes involved in suggestibility. Similarly, almost all previous studies have relied upon the memory measures from the GSS, which failed to show any relationship with suggestibility in the current study and appears to suffer from range effects. Future studies might examine other memory measures that do not relate directly to the material in the GSS. This would illuminate whether any role of memory is specifically related to the material under investigation or holds more generally for memory problems per se. It would also be possible to examine recognition measures as well as recall (which is investigated in the GSS); and non-verbal as well as verbal memory. Recognition memory tests may provide a more sensitive measure – especially for those subjects who have poor memory (as identified by recall) because it is, of course, an easier task. Moreover, these different aspects of memory may be susceptible in different ways to the influence of executive functions. With regard to the
notion that non-verbal memory could be tested, it should be noted that some forensic patients may well have had reduced schooling and so, their verbal memory ability may be relatively poorer than for non-verbal information. In this context, it is also worth considering the fact that Theory of Mind tasks often rely upon verbal encoding. Nevertheless, it is possible to employ tasks tapping Theory of Mind that rely less upon verbal encoding and information processing (e.g. simple version of the 'Eyes task': Baron-Cohen, 1995).

**Conclusion**

This study was designed to identify the presence of a cognitive profile of executive dysfunction present in a group of high suggestible compared to low suggestible forensic patients. In order to control for the effects of heterogeneity of diagnosis, only male patients with a diagnosis of psychotic disorder were recruited. The results from this study has shown that some of the previously documented relationships between cognition and suggestibility were not supported (i.e. did not replicate the inverse relationships previously found between IQ, memory and suggestibility). However, by examining an unexplored area of cognition, executive functioning, the results indicate a relationship between lack of rule-attainment and heightened suggestibility.
References


Bishop, D. V. M. (1983). *The Test for Reception of Grammar*. Published by the author and available from Age and Cognitive Performance Research Centre, University of Manchester, M13 9PL.


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Appendix A

INFORMATION SHEET

Participant number:

Title of project: Memory and problem-solving study

Name of researcher: Tejinder Kondel/Dr Mike Watts

You are being invited to take part in a study concerned with the ways in which people learn, remember and solve problems. The study aims to look at the nature and extent of difficulties in memory and reasoning in people of different ages and in those who have experienced mental health difficulties. This has relevance for everyday living where memory and problem-solving play an important role.

The ethics committee reviews all proposals for research using human participants before they can proceed. This proposal was reviewed by the Enfield and Haringey Health Authority Local Research Ethics Committee.

You will be given a series of psychological tests which measure aspects of learning, memory and problem-solving. These will be arranged to suit your convenience, and you will be able to take breaks if you feel tired. Because of the nature of the study we cannot give precise details of the tests so that this does not influence the findings. You will be asked a series of questions concerned with the way you are feeling and any difficulties you have been having, and asked to fill out a set of questionnaires. The study does not involve any blood tests or other medical procedures.

You will be asked to sign a consent form, and any information you give will be treated in strict confidence. You do not have to take part in this study if you do not want to. If you decide to take part you may withdraw at any time without giving a reason. Your decision to take part or not will not affect your care or management in any way.
CONSENT FORM

Participant number:

Title of project: Memory and problem-solving study

Name of researcher: Tejinder Kondel/Dr Mike Watts

Please initial box

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<td>I understand that my participation is voluntary and that I am free to withdraw at any time</td>
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<td>without my medical care or legal rights being affected.</td>
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<td>3</td>
<td>I am willing to allow access to my medical records but understand that strict confidentiality will be maintained. The purpose of this is to document relevant medical history.</td>
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<td>4</td>
<td>I agree to take part in the above study.</td>
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Name of participant ________________________ Date __________ Signature __________

I have explained the nature, demands and foreseeable risks of the above research to the subject.

Name of person taking Consent if different from Researcher (status/relationship) ________________________ Date __________ Signature __________

Name of researcher ________________________ Date __________ Signature __________

1 for patient; 1 for researcher; 1 to be kept with hospital notes
Appendix C

North London Forensic Service
Camlet Lodge RSU
Chase Farm Hospital Site
The Ridgeway, Enfield EN2 8JL

Participant number:

Title of project: Memory and problem-solving study

Name of researcher: Tejinder Kondel
Dr Mike Watts

I would like my GP/other medical Consultant to receive a copy of my test results from this research study:

Signature of volunteer ..............................................
Name .................................................................
Date .................................................................
Address .........................................................

Name of GP/Consultant ............................................
Address ...........................................................
26 July 2001

Dr Mike Watts
Clinical Psychologist/Honorary Research Fellow
Camlet Lodge
Chase Farm Hospital
Barnet, Enfield & Haringey Mental Health NHS Trust

Dear Dr Watts

892 – The relationship between executive functioning, memory and interrogative suggestibility in adult forensic patients

Acting under delegated authority I write to inform you that the amendments to the above study contained in your letter dated 11 July 2001, have been approved.

Please quote the LREC number (892) on any future correspondence.

The committee looks forward to receiving a copy of your interim report in six months time or at the end of the study if this is sooner.

Yours sincerely

Christine Hamilton
LREC Administrator