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The Relationship Between Interrogative Suggestibility And Decision-Making

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THE RELATIONSHIP BETWEEN INTERROGATIVE SUGGESTIBILITY AND
DECISION-MAKING

by

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ABSTRACT

Interrogative suggestibility is the individual's tendency to yield to misleading questions and negative feedback. Individuals who exhibit this tendency have been found to be more likely to falsely confess to a crime, a decision with often severe negative consequences. Many individual differences in cognition, emotion, and personality have been linked with interrogative suggestibility. These individual differences have also been found to be related to an individual's decision-making ability. However, the relationship between interrogative suggestibility and decision-making has not been investigated. The current project sought to determine how decision-making abilities, cognitive ability, memory, and anxiety predict variability in interrogative suggestibility. Results indicate that cognitive ability is a strong predictor of interrogative suggestibility. Furthermore, cognitive ability significantly interacted with the decision-making ability of consistent risk perception in predicting suggestibility. Future research should focus on the underlying processes important for both suggestibility and decision-making as these both have important forensic applications.

CHAPTER I

INTRODUCTION

What is Interrogative Suggestibility?

Suggestibility is "the tendency of the individual to respond in a particular way to suggestions" (Gudjonsson, 2003, p. 336). Interrogative suggestibility is "the extent to which, within a closed social interaction, people come to accept messages communicated during formal questioning, as the result of which their subsequent behavioral response is affected" (Gudjonsson & Clark, 1986, p. 84).

There are two specific theoretical approaches to suggestibility. The first is the experimental approach, which focuses on explaining the conditions in which leading questions can affect the witnesses' accounts of an event. This approach is illustrated by the misinformation effect and false memory research of Elizabeth Loftus and colleagues. The second approach is the individual differences approach, which emphasizes the individual's ability to generate and use coping strategies when faced with uncertainty and expectations in an interrogative situation. This approach is exemplified by the Gudjonsson and Clark model (1986). The two research paradigms have shown differential relationships with other variables. For example, the former approach was found to be related to imagery ability and the latter was related to conformity (Eisen, Gomes, Lorber, Perez, & Uchishiba, 2013). The focus of the current project is on the latter approach and definition of suggestibility.

The Gudjonsson-Clark (1986) theoretical model of interrogative suggestibility suggests four main features of this concept. First, interrogative suggestibility involves questioning within a closed social interaction (i.e. a police interrogation). Second, the questioning is focused on past experiences and events. Third, there is a high degree of uncertainty in the situation and the degree of uncertainty is related to the cognitive ability of the individual. Fourth, interrogative suggestibility often involves high stress situations with important consequences for the individual and others (Gudjonsson, 2003).

The model also emphasizes two components of suggestibility: leading questions and negative feedback. The first component, leading questions, relates to the reliability of the individual's answers to questions designed to bias the respondent in a certain direction. The second component, negative feedback, relates to the tendency for the individual to shift, or change, his or her answers in response to negative feedback from interrogators following the individual's initial, and likely accurate, responses (Gudjonsson, 2003).

According to the Gudjonsson-Clark model, interrogative suggestibility depends on the individual's ability to generate and implement coping strategies in the face of the uncertainty and expectations inherent in an interrogative situation. Uncertainty, interpersonal trust, and expectations are essential prerequisites to interrogative suggestibility. Uncertainty means that the individual is not certain about the right answer to the question. This can lead to the individual being compliant—accepting a suggestion from a leading question despite knowledge of its inaccuracy in order to please the interrogator—or suggestible—accepting the suggestion as accurate or at least plausible. Interpersonal trust is an important element of this model. Individuals who believe the

interrogator is trustworthy are more likely to accept suggested information than those who are suspicious of the interrogator's motives. Furthermore, the more accurate the individual's memory is for the event, the more likely he or she will detect an interrogator's attempt to influence the responses. Expectations within this situation keep individuals from responding with "I don't know" type responses. There is a general reluctance to respond with uncertainty because people believe they must provide a definite answer, they should know the answer to the question, and they are expected to know and give the answer (Gudjonsson, 2003).

Given the right combination of uncertainty, interpersonal trust, and expectations, anyone would be susceptible to suggestions. However, the theory also emphasizes the individual's use of coping strategies to deal with the uncertainty, trust, and expectations of the situation. For example, an individual who is able to view the situation objectively and critically may not be as likely to answer a question unless he or she is absolutely certain about the facts of the situation. On the other hand, an individual who has an unrealistic appraisal of the situation and reluctance to admit that one's memory is imperfect is more likely to be suggestible (Gudjonsson, 2003).

Feedback received by the individual is also important to interrogative suggestibility. Feedback is defined as "a signal communicated by an interrogator to a witness, after he/she has responded to a question or a series of questions, intended to strengthen or modify subsequent responses of the witness" (Gudjonsson & Clark, 1986, pp. 93-94). This feedback may be either positive or negative and implicit or explicit. For example, positive implicit feedback may include providing the individual with refreshments, and positive explicit feedback may include the interrogator responding to

desired or acceptable answers with encouragement or praise. Negative explicit feedback may include the interrogator stating that the individual has made mistakes in his/her responses. Gudjonsson and Clark (1986) suggest that negative feedback is particularly influential on individual's behavior by making them shift, or change, their answers and increases their subsequent responding to misleading questions (Gudjonsson, 1984a). Negative feedback following a series of questions is particularly difficult for individuals to cope with because they are not sure which answers should be changed (Gudjonsson & Clark, 1986).

Individuals may respond with suggestible or resistant behavior to feedback, and this response is partly dependent on the individual's previous responses to misleading questions and the coping strategies used to handle the uncertainty and expectations of the situation. For example, suggestible responding may be reinforced with positive feedback leading to a cognitive set that is more susceptible to further suggestions in questioning. Similarly, resistant responding can be reinforced by positive feedback leading to more resistant responding. However, resistant responding is most likely to be followed by negative feedback from the interrogator. Individuals who have used a critical or suspicious coping strategy may reject the negative feedback and continue to exhibit a resistant cognitive set that is unlikely to yield to suggestion. If the individual accepts the negative feedback, uncertainty is likely to increase which also increases anxiety and decreases self-esteem. These changes make it more likely that the individual will use external information as a coping strategy. This can ultimately lead to a more suggestible cognitive set. Finally, suggestible responding may be followed by negative feedback. Although this is likely rare because it only confuses the individual, negative feedback

may follow suggestible responses when the individual has not answered with the desired alternative in false forced choice rather than yes-no questions (Gudjonsson, 2003).

The Gudjonsson Suggestibility Scales

Based on the previously described theoretical work, Gudjonsson constructed and validated the *Gudjonsson Suggestibility Scales* (GSS; Gudjonsson, 1997), which assess an individual's responses to leading questions and negative feedback while recalling a fictitious event previously described in a narrative. The participant is read a narrative about a fictitious robbery. He or she is then asked to recall the narrative. Free immediate recall is followed by a 50-minute delay. After the delay, the participant is asked to free recall the narrative again (delayed recall). After the delayed recall, the participant is asked 20 specific questions, 15 of which are misleading (i.e. false or inaccurate information, false forced-choice). After answering the 20 questions, the participant is told that he or she has made several errors and must answer the questions again. The participant is then asked the same 20 questions a second time.

The GSS provides several scores important for measuring suggestibility such as immediate and delayed recall, the number of misleading questions the individual responds to in a suggestible manner both before and after negative feedback (Yield 1 and Yield 2, respectively), the number of times the individual changes his or her answers to misleading questions (Shift), a total suggestibility score based on the two previous measures (Total Suggestibility), and major memory distortions (Gudjonsson, 2003). These scores are discussed more specifically in the methods section.

The GSS comes in two forms, GSS 1 and GSS 2. The two forms were developed for research purposes with forensic and clinical samples. The GSS 1, the original scale,

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reflects the forensic nature of the instrument and uses a narrative that describes a fictitious robbery, while the GSS 2 has a narrative of non-criminal content that is generally simpler and better for use with children and adults with learning disabilities (Gudjonsson, 2003; Henry & Gudjonsson, 1999; Gudjonsson, Murphy, & Clare, 2000). Gudjonsson (2003) suggests that the two scales may be used interchangeably. Total Suggestibility scores on the two scales have been found to correlate highly at about .90 with both normal and forensic samples (Gudjonsson, 1987a).

The scales have also shown adequate test-retest reliability with correlations around .80 in both normal and forensic samples in time periods ranging from one day to 18 months (Gudjonsson, 1997). This indicates support for the stability of interrogative suggestibility over time. The inter-rater reliability has also been found to be about .90 for both Shift (i.e. changes in answers to misleading questions) and Total Suggestibility scores (Richardson & Smith, 1993; Clare, Gudjonsson, Rutter, & Cross, 1994; Gudjonsson, 1997).

Factor analysis has found that Yield 1 (i.e. yielding to misleading questions) and Shift measures of the GSS load on two factors. This indicates the presence of two independent components of interrogative suggestibility. The first is described as the extent to which people give in to misleading questions, and the second is described as the individual's response to interrogative pressure (Gudjonsson, 2003; Scullin & Ceci, 2001).

Although the normative data provided in the manual includes samples from only Iceland and Great Britain, a forensic sample of 334 juveniles and adults in the United States showed results consistent with those found in the British and Icelandic samples (Frumkin, Lally, & Sexton, 2012). Comparing the UK samples from the GSS manual

with a small, non-forensic U.S. sample, no age, gender, or occupational differences on the GSS 2 were found, and IQ was significantly negatively correlated with all suggestibility measures. Differences between the UK and U.S. samples were noted, with the UK sample scoring significantly higher on the tendency to yield to misleading questions and the US sample scoring significantly higher on the tendency to change answers in response to interrogative pressure (Pollard, Trowbridge, Slade, Streissguth, Laktonen, & Townes, 2004). All samples have shown that Yield 1 scores are consistently negatively correlated with intellectual ability, while Yield 2 and Shift scores are more consistently negatively associated with emotional and personality disturbance (Frumkin et al., 2012).

False Confessions

Gudjonsson's primary reason for developing his theory was to develop a measure that could be used in forensic assessment to measure an individual's susceptibility to suggestion in false confession cases (Gudjonsson, 2003). The few studies that have investigated suggestibility and false confession suggest a relationship. Sigurdsson and Gudjonsson (1996) used a sample of prison inmates who claimed to have falsely confessed to a crime. No differences in suggestibility were found between these inmates and a control group of inmates. However, when the researchers only included those inmates who described a coerced-internalized false confession, in which they came to believe they committed the crime at some point during interrogation and later realized they did not commit the crime, these inmates showed higher suggestibility scores than other false confessors on several GSS measures including the tendency to yield to

misleading questions, change their answers to questions when asked a second time, and exhibit memory distortions.

Redlich and Goodman (2003) attempted to induce a false confession in a group of 12 to 26 year olds. Subjects were told not to hit a specific button or the computer would crash, but the computer crashed for all subjects in the experiment without any of the subjects hitting the button. The dependent measures were the subject's willingness to sign a false confession statement that he or she hit the button and the computer crashed, the subject's sharing of the experience with another experimenter in which he/she indicated that he/she hit the button, and the subject's memory of whether or not he/she hit the button. Over half of the participants signed the false confession, nearly half of those who signed internalized the false confession (i.e. told another experimenter they had hit the button when recalling the event), and about one third of those who signed the false confession exhibited distorted memory for hitting the button. The dependent measures were significantly related to scores from the GSS including a tendency to yield to leading questions and change one's answer when asked the question a second time.

By reviewing the legal, psychological, and psychiatric components of alleged false confession cases, Gudjonsson and MacKeith (1988) determined that interrogative suggestibility and compliance were the two most important characteristics involved in these cases. Comparing defendants who persistently denied involvement in a crime with those who had initially confessed and then retracted the confession, Gudjonsson (1984b) found that the latter group was more suggestible than the former as measured by the GSS. They were more likely to change their answers to misleading questions following feedback that they had not answered the questions adequately the first time. In a follow-

up study, Gudjonsson (1989) matched the two groups on age, intelligence, memory, and sex. The results were similar to that of the first study, with the alleged false confessors being more suggestible than those who consistently denied involvement in the crime. Suggestibility has also been shown to differentiate better than intelligence among alleged false confessors, forensic patients who had not retracted their confessions and defendants who denied involvement but were convicted by other evidence (Gudjonsson, 1991).

These studies indicate that individuals who are more suggestible are more likely to falsely confess to crimes. This tendency places suggestible individuals at risk for several consequences including wrongful conviction. Although the commonsense belief is that innocent individuals do not confess to crimes, almost 25% of wrongful convictions exonerated by DNA evidence included a false confession (Kassin, 2008). Bedau and Radelet (1987) considered 350 homicide and rape cases of wrongful conviction in the United States and found that 14% of these convictions included a false confession. More recently, Garrett (2011) examined the cases of 250 individuals exonerated due to the work of the Innocence Project, a national litigation and public policy organization that relies on DNA evidence to exonerate wrongfully convicted individuals and works to reform the criminal justice system. Sixteen percent of these cases included a false confession, and in about 40% of these cases the individual was either mentally ill or developmentally disabled. Almost two thirds of those who falsely confessed to the crime went to trial, and none of the confessions were successfully challenged.

Confessions have a disruptive effect on evidence and witnesses. When a confession is present, research indicates that previously inconclusive evidence such as fingerprints and polygraphs were interpreted in line with the confession (Elaad, Ginton,

& Ben-Shakhar, 1994; Dror & Charlton, 2006). In experimental conditions, 60% of participants changed their identification of a suspect after being told another suspect had confessed. The participants did so with high degrees of confidence in their decision (Hasel & Kassin, 2009). Data from cases of false confession from the Innocence Project showed similar errors in 78% of the cases (Kassin, Bogart, & Kerner, 2012). These results indicate that false confessions can lead to devastating and long-lasting consequences for the individual.

Individual Differences in Interrogative Suggestibility

Interrogative suggestibility, as measured by the Gudjonsson Suggestibility Scales, has been found to be related to a variety of individual difference variables including compliance, acquiescence, coping strategies, self-esteem, anxiety, cognition, and memory.

Personality and emotion-focused individual differences.

Suggestibility is often confused with compliance. The important distinction between the two constructs is that suggestibility includes acceptance of the information as truth while compliance is the tendency of the individual to agree with the information for some secondary gain but not accept it as truth (Gudjonsson, 2003). Compliance may be thought to include two aspects: protection of self-esteem and avoidance of conflict (Gudjonsson, 1989, 1997). Gudjonsson (1989) created a self-report measure, the *Gudjonsson Compliance Scale* (GCS), in which the individual answers true/false statements about how he or she typically interacts with others. Suggestibility and compliance are also different from acquiescence, which may be defined as the tendency of the individual to answer questions affirmatively regardless of content. Acquiescence

can be thought of as a personality trait including aspects of submissiveness and eagerness to please (Finlay & Lyons, 2001)

Suggestibility as measured by the GSS is weakly associated with acquiescence (Gudjonsson, 1986, 1990; Gudjonsson & Clare, 1995). Gudjonsson (2003) suggests that individuals experience the uncertainty and low self-esteem that arises in the interrogative situation as unpleasant, which may cause them to reduce their uncertainty and increase self-esteem by answering affirmatively. Using other instruments to measure suggestibility, researchers have shown acquiescence to be related to the tendency to accept misleading information (Eisen, Morgan, & Mickles, 2002).

Theoretically, compliance should not be highly correlated with suggestibility because it does not include acceptance of the misleading information and is generally independent of intelligence (Gudjonsson, 1990). However, Gudjonsson (1990) found suggestibility measured by the GSS to be significantly positively correlated with compliance measured by the GCS. Similarly, in a factor analysis of the GSS, GCS, and Wechsler Adult Intelligence Scale-Revised (WAIS-R), Gudjonsson (1990) found compliance and suggestibility to load on the same factor, while acquiescence loaded highly on the verbal and non-verbal intelligence factors. In an adolescent forensic sample, Richardson and Kelly (2004) also found that compliance scores from the GCS were highly correlated with the tendency to yield to misleading questions, indicating that those who are more compliant also tend to be vulnerable to the influence of misleading questions.

Research has supported the role of coping strategies in suggestibility. Using subjects' descriptions of their behavioral and cognitive coping strategies in an

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experimental interrogative situation, Gudjonsson (1988a) found three specific types of coping strategies: active-cognitive, active-behavioral, and avoidance coping. Active-cognitive coping strategies include active management of thoughts and appraisal of the situation. Subjects who used this coping strategy had self-statements such as "I cannot be expected to know all the answers." Active-behavioral strategies include behavioral attempts to deal directly and critically with the situation. The self-statements of subjects in this group often included, "I stuck with what I knew." Avoidance coping includes avoiding critical appraisal of the situation. Subjects in this group often had self-statements such as "I did not want to look stupid" or "I changed answers I was not certain about." Those who used the avoidance coping strategy were found to be more suggestible than those who used the active cognitive or behavioral strategies, as measured by the Gudjonsson Suggestibility Scales. Others have also found suggestibility to be positively related to emotion-focused coping strategies (Howard & Hong, 2002).

Self-monitoring is an important component of coping with adverse situations. Bain, Baxter, and Ballantyne (2007) found those that were high in self-monitoring, as measured by a self-report self-monitoring scale, exhibited significantly higher scores than those low in self-monitoring on the Yield 1, Yield 2, Shift, and Total Suggestibility measures from the GSS 1. This indicates that those who show increased attention to social cues, are highly concerned about managing their internal states, tend to be more attentive to demand characteristics, and are more easily influenced by others show higher levels of suggestibility. High self-monitors tend to adapt their behavior to fit the expectations of the situation and thus are more likely to be suggestible.

Self-esteem is also an important component of the Gudjonsson-Clark model. In general, research indicates that self-esteem is negatively correlated with suggestibility. Individuals with self-reported low self-esteem scored significantly higher than those with high self-esteem on the Shift measure of the GSS indicating that those with low self-esteem are vulnerable to interrogative pressure. Those with low self-esteem also showed lower recall scores than those with high self-esteem (Bain, Baxter, & Fellowes, 2004).

Using a sample of delinquent boys, Gudjonsson and Singh (1984) measured self-esteem using the Coopersmith Behavior Rating Form and the GSS 1. Those with low self-esteem as rated by the staff members of the assessment center were more likely to change their answers following negative feedback. Self-esteem, as measured by the Semantic Differential Scales, was found to be negatively correlated with suggestibility when subjects were administered the GSS for the first time, but the correlation was reduced when they were administered the GSS a second time. This may suggest that manipulation of self-esteem via negative feedback may have a greater impact on suggestibility for inexperienced or naive individuals (Singh & Gudjonsson, 1984). Similarly, research has shown that the greater the individual's perceived discrepancy between self and interrogator in regard to potency and competence, the more likely the individual was to be suggestible (Gudjonsson & Lister, 1984). Some have found no relationship between self-rated self-esteem and suggestibility, but this may be due to the reliability of the self-esteem measure used in the study (Smith & Gudjonsson, 1995).

Baxter, Jackson, & Bain (2003) found a significant main effect for self-esteem, with those with higher self-esteem scoring lower on the GSS 1. However, they also found self-esteem to significantly interact with interview demeanor in such a way that

individuals with high self-esteem showed less suggestibility when facing a friendly versus an abrupt interviewer while those with low self-esteem showed higher suggestibility scores when facing a friendly versus abrupt interviewer. These results suggest that individuals with low self-esteem are particularly susceptible to suggestibility when faced by an interviewer whom they find friendly and perhaps want to please. However, these results have not been unanimously supported. Bain, Baxter, and Fellowes (2004) did not find self-esteem to interact with interviewer behavior in effecting suggestibility. Also, Drake, Bull, and Boon (2008) did not find a significant relationship between self-esteem and GSS measures.

Self-esteem is closely associated with locus of control. Individuals who believe they are powerful and competent may tend to have an internal locus of control—they perceive outcomes in their environment to be contingent on their own behavior. This is opposed to an external locus of control in which the individual believes outcomes are largely due to environmental factors. Research has shown that those with an external locus of control are more likely to be suggestible (Gudjonsson & Lister, 1984). Those with an internal locus of control and confidence in their own abilities are less likely to yield to leading questions (Liebman et al., 2002).

Trait anxiety, as measured by self-report questionnaires, has been found to be poorly correlated with suggestibility (Gudjonsson, 1983; Haraldsson, 1985). However, evidence suggests that state anxiety is an important predictor of interrogative suggestibility. State anxiety, as measured by the Spielberger State Anxiety Inventory both before and after administration of the GSS, was found to be correlated with the individuals tendency to change their answers to misleading questions and be more

suggestible following negative feedback (Gudjonsson, 1988a). These correlations were particularly strong when using the post-GSS administration measure of state anxiety (Gudjonsson, 1988a). Wolfradt and Meyer (1998) found that psychiatric patients with anxiety disorders were significantly more suggestible as measured by the GSS 2. The patients were more likely to yield to leading questions and change their answers when asked the questions a second time. The patients also exhibited higher state anxiety scores than the normal controls.

There have been some conflicting results when using state-trait anxiety inventories. For example, Smith and Gudjonsson (1995) found that state anxiety measured immediately after GSS administration was not related to suggestibility scores, but confabulation as measured by free recall of the GSS narrative at one-week follow-up was significantly correlated with state anxiety at the initial administration. They also found anxiety to be more highly correlated with Yield 2 and Shift scores than Yield 1 scores, which supports the role of negative feedback in the Gudjonsson-Clark model of interrogative suggestibility. Results such as these indicate that the timing of anxiety measurement is important as it is the negative feedback component of the GSS that is anxiety-provoking (Gudjonsson, 2003).

Gudjonsson (1988a) investigated the relationship between suggestibility and social-evaluative anxiety using the Fear of Negative Evaluation and Social Avoidance and Distress Scales (Watson & Friend, 1969). All GSS scores correlated positively with fear of negative evaluation scores indicating that those who fear social evaluation also tend to be more suggestible, but there were no significant correlations between suggestibility and social avoidance and distress scales.

Researchers have found a small correlation between suggestibility and social desirability as measured by the Eysenck Personality Questionnaire (EPQ; Richardson & Kelly, 2004) and the Marlowe-Crowne social desirability scale. An early study by Gudjonsson (1983) found a small, positive correlation between suggestibility as measured by the GSS and the lie scale of the EPQ. Haraldsson (1985) found similar results using other social desirability measures. However, interrogative suggestibility as measured by the GSS 2 was not found to be related to impression management or self-deception enhancement (Gudjonsson & Young, 2008). These results indicate that the relationship between interrogative suggestibility and socially desirable responding is tentative and dependent on the measurement of social desirability.

Impulsivity and assertiveness have also been investigated in relation to suggestibility. The individual's tendency to change his or her answers to misleading questions when asked the question again was found to be positively correlated with impulsivity as measured by the Arrow-Dot Test (Gudjonsson, 1984c). Assertiveness, as measured by the Rathus Assertiveness Scale, has been found to be negatively correlated with suggestibility as measured by the GSS 1 (Gudjonsson, 1988a).

Intellectual and cognitive individual differences.

Strong empirical evidence exists indicating a negative relationship between intellectual functioning and interrogative suggestibility. Using the WAIS-R, Gudjonsson (1983) found full scale IQ, verbal intelligence, and performance intelligence to be negatively related to the tendency for individuals to yield to misleading questions and change their answers when asked the question a second time. One study investigating the WAIS-R subscale correlations with suggestibility (GSS) indicated that Picture

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Arrangement, Similarities, and Comprehension showed the highest negative correlations with suggestibility, which the authors interpreted as suggestibility being associated with logical reasoning, sequential thought, and social awareness (Gudjonsson, 1990).

While the relationship between intelligence and suggestibility is strong, several studies also indicate that this relationship is impacted by range effects. Studies using subjects of above average intelligence have failed to find significant results, but those using subjects of average or below average intelligence and studies acquiring a large range of intelligence scores found a significant relationship between suggestibility and intellectual functioning. Gudjonsson (1988b) found similar results in a forensic and non-forensic sample, but the relationship was only significant when considering the full range of scores or intelligence scores below 100; the relationship was not significant for scores above 100. Gudjonsson (2003) suggests that these results indicate the need to use appropriate samples when attempting to test hypotheses regarding suggestibility and intellectual functioning. However, others have not found range effects to be important in the relationship between IQ and suggestibility, supporting a negative correlation between IQ and GSS scores throughout the full range of IQ scores (Søndenaa, Rasmussen, Palmstierna, & Nøttestad, 2010).

Memory is an important component of intellectual functioning, and it has been shown to correlate negatively with suggestibility. Individuals with poor memory tend to be more suggestible. Several studies found significant negative correlations between the immediate and delayed recall portions of the GSS and the suggestibility scores from the same measures (Gudjonsson, 1988; Gudjonsson & Clare, 1995; Sharrock & Gudjonsson, 1993), and between the two versions of the GSS (Gudjonsson, 1987b). The relationship

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between memory and interrogative suggestibility has also been shown in adolescents, with those with poor visual memory being more likely to yield to leading questions and change answers in response to interrogative pressure (Callicchia & Santostefano, 2004).

The relationship between memory and suggestibility may be more nuanced than simple absolute memory. For example, individuals who showed more rapid memory deterioration between immediate and delayed recall, as measured by the percentage of immediate versus delayed recall on the GSS 1, were more likely to be suggestible than those who showed less deterioration but equally poor recall (Gudjonsson, 1983). Physiological data suggest that interrogative suggestibility reflects individual differences in post-retrieval memory processes. Using event-related potential (ERP) measurement and visual representations of the GSS 1 and GSS 2, researchers found that interrogative suggestibility was not indicated by differences in ERP measures of attention (Howard & Chaiwutikornwanich, 2006).

Cognitive load has also been used to explain the relationship between interrogative suggestibility and memory. When instructed to remember a series of five numbers during the administration of the GSS, subjects who performed this concurrent task exhibited a tendency to yield to misleading questions and change answers to interrogative pressure compared to subjects who did not complete this task. However, these differences did not reach statistical significance (Drake, Lipka, Smith, & Egan, 2013).

Intelligence and memory, although correlated, appear to contribute individually to suggestibility. Gudjonsson (1983) found that immediate and delayed recall added to the variance explained in suggestibility after controlling for intelligence. Sharrock and

Gudjonsson (1993), via path analysis, found that delayed memory and intelligence scores individually and together explained variability in suggestibility. Similarly, after accounting for age, gender, IQ, and memory, Gudjonsson and Young (2010) found confabulation to significantly predict Total Suggestibility on the GSS 2. This suggests that confabulation, the tendency to replace gaps in memory with false information believed to be true, is important for understanding the relationships among IQ, memory, and suggestibility.

Field dependence, a cognitive dimension defined by the reliance on information from the frame or field rather than the object, has been found to be positively correlated with suggestibility as measured by the GSS. Individuals who tend to be field dependent also tend to be more suggestible (Blagrove, Cole-Morgan, & Lambe, 1994; Singh & Gudjonsson, 1992). A potential explanation for this relationship notes that field dependent individuals may have difficulty with the critical analysis necessary in an interrogative situation (Singh & Gudjonsson, 1992). Contrary to these findings, others have suggested that field dependence may be a coping mechanism for some individuals in the interrogative situation, but have failed to find a relationship between field dependence and performance on the GSS (Drake & Bull, 2011).

Demographic and situational variables.

There appears to be a small, insignificant gender difference in suggestibility as measured by the GSS. In general, women tend to be slightly more suggestible than men, but this difference is dependent on the type of information presented. Men and women tend to remember different details about a situation and this influences their responses to different leading questions. In some studies, young men and adolescent boys have been

shown to be more suggestible than women, but this may also be due to the tendency for women to have higher immediate recall scores. Among an adult sample, age related differences in suggestibility have been found. Older adults showed a greater tendency to yield to misleading questions. However, older and younger adults did not differ in the susceptibility to change their answers following interrogative pressure. After controlling for age, memory and self-assessment of one's memory were significant predictors of the tendency to yield to misleading questions for the group of older adults (Polczyk, Wesołowska, Gabarczyk, Minakowska, Spuska, & Bomba, 2004). Studies comparing juveniles with adults have shown that age is negatively correlated with all suggestibility measures, with juveniles exhibiting greater yield 1, yield 2, shift, and total suggestibility scores (Frumkin et al., 2012).

Instructional manipulations have been found to impact suggestibility. For example, those told that they should be able to answer all the questions on GSS 1 responded in a more suggestible manner than those who were told they were not expected to be able to give definite answers to all the questions and those who were given no specific instructions regarding performance expectation (Gudjonsson & Hilton, 1989). Similar results were found when only two groups, high and low expectations, were included (Hansdottier et al., 1990). Warning subjects that the questions are misleading has also been shown to reduce suggestibility (Boon & Baxter, 2000; Warren, Hulse-Trotter, & Tubbs, 1991).

Suggestibility and Decision-Making

The processes underlying interrogative suggestibility are very similar to those involved in decision-making processes. Within the Gudjonsson-Clark model of

interrogative suggestibility, uncertainty and expectations play an important prerequisite role in eliciting suggestibility. These features are also important in decision-making. Decision-making is a response to a certain situation in which the decision-maker faces many possible actions, considers the probabilities of outcomes for each action, and evaluates the potential consequences of the outcomes (Hastie & Dawes, 2001).

Individuals employ a number of strategies for coping with a decision situation. One strategy is to use heuristics—strategies that allow for efficient decision-making but do not always produce an optimal decision. While these strategies are robust in decision-making situations in that they usually produce good decisions without much cost or effort, they also produce errors and biases (Hastie & Dawes, 2001). In using heuristics, important information regarding the situation is often ignored, making the decision prone to error (Hastie & Dawes, 2001; Sanna, Small, & Cook, 2004). The use of heuristics in the decision-making context appears to be similar to an avoidant (Gudjonsson, 1988a) or emotion-focused coping strategy (Howard & Hong, 2002) within an interrogative situation.

The Gudjonsson-Clark model proposes that uncertainty related to the individual's cognitive ability is an important feature of interrogative suggestibility. Decision-making situations also include a high degree of uncertainty, and decision-making competence—the ability of the individual to use normative decision-making skills accurately and consistently in the decision-making process—has been found to be an important individual difference factor that impacts decision outcomes. It includes the ability to properly use heuristics and other decision-making short-cuts, but it also includes the awareness that such strategies are not always sufficient for making a competent decision

(Bruine de Bruin, Parker, & Fischhoff, 2007). Decision-making competence directly addresses decision-making skills in regard to accuracy and consistency (Parker & Fischhoff, 2005).

Just as interrogative suggestibility is believed to be related to an individual's cognitive skill and ability to develop and engage in cognitive coping strategies, decision-making competence incorporates four basic skills: assessing beliefs, assessing values, combining beliefs and values to identify choices, and meta-cognitive understanding of one's abilities (Parker & Fischhoff, 2005). The skill of assessing beliefs entails accurately judging the probability of the occurrence of an event. For example, an adequate ability to assess beliefs would result in an accurate estimate of the probability of getting the flu in the next two months. The assessing values skill requires being receptive to relevant task changes while ignoring irrelevant changes. For example, an individual who makes the same decision regarding ground beef whether it is presented as 80% lean or 20% fat is effectively utilizing this skill. This skill also includes the ability to ignore past costs and simply focus on future outcomes. For example, a good financial decision-maker would not consider the money already spent on a project but would focus on the probability of future success or failure of the project. The integration skill (i.e. combining beliefs and values) requires accuracy and consistency in applying decision rules. For example, when choosing a new laptop computer, an individual may have certain requirements, or rules (i.e. low cost, large screen, average processing speed), which should lead to a specific outcome. Consistent and accurate application of such rules should lead to the correct option. Finally, meta-cognitive understanding is conceptualized as having accurate confidence in one's decisions. For example, an individual who is simply guessing at the

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answer to a true/false question would be accurate in indicating that she is 50% confident in her decision. However, if she was simply guessing and stated that she was 75% confident, she would be overconfident and exhibiting poor meta-cognitive skills in the decision-making domain (Parker & Fischhoff, 2005).

Considering these decision-making skills within an interrogative situation indicates that each is likely related to an individual's tendency to be suggestible. If one is unable to accurately judge the probability of an event, he or she may be exceptionally impacted by negative feedback. Accuracy in probability judgment is negatively impacted by anxiety and memory, both of which have been positively and negatively related to suggestibility, respectively (Smith and Gudjonsson, 1995; Gudjonsson, 1988; Gudjonsson & Clare, 1995; Sharrock & Gudjonsson, 1993). This is probably also true in regard to the skill of assessing values. Being easily swayed by contextual information is often detrimental to decision-making, and this would appear to be particularly true in interrogative situations. As noted previously, individuals who tend to be field dependent, or rely on the context rather than the object for information, are often more suggestible (Blagrove, et al., 1994; Singh & Gudjonsson, 1992) perhaps due to poor critical analysis (Singh & Gudjonsson, 1992). Accuracy and consistency are crucial in interrogative situations. The ability to integrate information into an accurate picture of an event, without being influenced by leading questions or negative feedback would require adequate decision-making skills. Finally, the meta-cognitive understanding of one's confidence in a decision or piece of information is essential in interrogative situations. Recognizing and monitoring one's confidence is important for avoiding influence of misleading questions and negative feedback. As indicated previously, those who use

active-cognitive coping strategies, which include management of expectations and one's confidence, were less likely to be suggestible (Gudjonsson, 1988a).

The four basic skills important to decision-making competence also reflect the ability to avoid common decision-making obstacles. The skills manifest themselves in decision-making tasks such as resistance to framing, consistency in risk perception, applying decision rules, under/overconfidence, resistance to sunk costs, and recognizing social norms. These skills make up the *Adult Decision-Making Competence* battery (ADMC; Bruine de Bruin et al., 2007).

The *framing effect* occurs when the decision-maker formulates different decisions in regard to the same information presented in opposing frames. This effect would include an individual responding with a different answer to a misleading question, or a question framed in a different way. For example, one may decide that 80% lean ground beef is better than 20% fat ground beef even though they are the same. In most experimental manipulations of this effect, the problem statement is presented in two different frames in which the wording is slightly different but the information is the same (Hastie & Dawes, 2001). The general decision trend is to make riskier decisions in regard to negative frames and less risky decisions in regard to positive frames (Fagley, Miller, & Jones, 1999). People are more likely to take risks to avoid a loss and less likely to take risks to achieve a gain (Levin, Gaeth, Schreiber, & Lauriola, 2002). The framing effect offers support for the idea that decision-making is not always logical and systematic and is biased by surface features of the situation.

Risk perception is believed to be related to the availability heuristic—judging probability by the frequency of occurrences in memory. While this heuristic may result in

accurate risk perception due to the availability of commonly occurring events in memory, it is also subject to individual differences in memory content and contextual factors (i.e. exposure to uncommon risks) that can distort risk perceptions (Herwig, Pachur, & Kurzenhauser, 2005). For example, one may decide that getting attacked by a shark is very likely because of the number of news stories about shark attacks even though the risk of this occurring is actually low. Using the availability heuristic to judge risk can lead to incorrect estimates of risk because individuals base the estimates on instances in memory which often do not match the instances in reality (Herwig et al., 2005). Affect is also important in probability judgments of risk because it relies on memory and the affective associations of memory. For instance, individuals are often more concerned with the perceived possibility than the actual probability of an event, which helps explain why perception of risk is often inconsistent (Slovic, Peters, Finucane, & MacGregor, 2005). Within an interrogative situation, the individual may be uncertain of his or her memory content and use an avoidance or emotion-focused coping strategies leading to poor probability judgment and increased suggestibility.

Applying decision rules assesses the accuracy of decisions and the individual's ability to integrate information in order to make a decision. An individual's ability to apply decision rules accurately has been found to be highly correlated with general cognitive ability, suggesting that this component of decision-making requires adequate or superior cognitive ability to be performed successfully (Bruine de Bruin et al., 2007). This is perhaps similar to an individual's ability to implement adequate coping strategies within an interrogative situation.

Under/overconfidence measures the accuracy of an individual's recognition of the extent of his or her own knowledge (Bruine de Bruin et al., 2007). An individual's level of certainty is an important aspect of the Gudjonsson-Clark model of interrogative suggestibility, with those who are less certain about their answers being more likely to be suggestible (Gudjonsson & Clark, 1986). It may be that those who tend to be under or over confident in their decisions may be particularly likely to show a tendency toward suggestibility.

Resistance to sunk costs assesses the ability to ignore past costs in a decision. Unrecoverable costs related to a past decision should be ignored because they cannot be changed. Decision-making is best when focused on future consequences (Bruine de Bruin et al., 2007). Within an interrogative situation, being able to monitor the impact of past answers on future answers would seem important for maintaining consistent answers following negative feedback and the second presentation of the misleading questions.

Recognizing social norms assesses the individual's ability to accurately assess peer social norms. A comparison is made between what the individual believes to be acceptable behavior and the rate at which the individual believes his or her peers are engaging in these behaviors (Bruine de Bruin et al., 2007). One's ability to remain consistent and accurate within a decision-making or interrogative situation may depend on one's understanding and expectations of normative behavior in these situations. Within the Gudjonsson-Clark model (1986), the individual's expectations of the interrogative situation are important for determining the individual's level of suggestibility.

While decision-making competence focuses on the processes and skills of decision-making rather than the outcomes, it is related to outcomes of good decision-

making, thus supporting the idea that better decision-making skills will often result in better decisions (Bruine de Bruin et al., 2007; Parker & Fischhoff, 2005). In addition, decision-making competence is associated with real-world outcomes of decision-making, thus increasing its ecological validity beyond simple laboratory tasks. Among a sample of adolescents, decision-making competence has shown negative relationships with "maladaptive" risk behavior (i.e. antisocial disorders, externalizing behavior, delinquency, substance use, sexual activity) and positive relationships with positive family and peer environments (Parker & Fischhoff, 2005). Perhaps decision-making competence is also related to suggestibility in that those with greater decision-making competence are less likely to be suggestible or to find themselves in interrogative situations.

The interrogative situation is often a very risky situation with important consequences for the individual. Many decision-making tasks used in research incorporate an element of risk in assessing the adequacy of decision-making skill. The *Iowa Gambling Task* (IGT) has been widely used to assess decision-making ability. It was developed to identify decision-making deficits in individuals with damage to the prefrontal cortex (Bechara, Damasio, Damasio, & Anderson, 1994; Barry & Petry, 2008). Participants are required to selects cards from four decks that vary in probability and magnitude of rewards and punishments. Decks which provide immediate large gains also provide net losses over time (Franken & Muris, 2005). Less risky decision-making on the IGT is considered to be better performance (i.e. better decision-making). Research has indicated gender differences in IGT performance, with men performing better than women (Bolla, Eldreth, Matochik, & Cadet, 2004). Research also indicates that

performance on the IGT improves over multiple trials, but the gains in performance

continue to occur for less well educated participants who perhaps rely more on emotion-

based decisions (Evans, Kemish, & Turnbull, 2004). Those who engage in avoidant or

emotion-focused coping strategies in an interrogative situation may perform better on this

task of decision-making. Understanding the relationship between a risky, emotion-based

task and suggestibility is important for understanding the decisional, emotional, and

cognitive processes underlying suggestibility.

Just as the Gudjonsson-Clark model relies on individual differences as

explanations for suggestibility, decision-making has also been explained from an

individual differences approach. Individual performance on decision-making tasks tends

to be consistent across tasks (Bruine de Bruin et al., 2007). Stanovich and West (1998)

found significant correlations among a variety of reasoning and decision-making tasks

including tasks similar to those in the Adult Decision-Making Competence battery and

tasks measuring the use of heuristics. Decision-making tasks have also been found to be

related to other individual difference variables such as cognition and anxiety.

Bruine de Bruin et al. (2007) found that individuals performed consistently across

the tasks within their Adult Decision-Making Competence battery. These tasks included

resistance to the framing effect, the recognition of social norms, under or overconfidence

in one's decision, the ability to adequately apply decision rules, consistency in perceiving

risk across different situations, and resistance to the consideration of sunk costs (i.e.

disregarding the amount of money already spent in an endeavor when considering

whether or not to continue in the endeavor). These findings indicate that errors in

decision-making are not random, but that individual's portray consistent differences in how they reason and make decisions (Stanovich & West, 1998).

Performance on decision-making tasks is also related to individual differences in basic cognitive ability, indicating an underlying, consistent difference in reasoning abilities (Stanovich & West, 1998). Reasoning abilities, which strongly reflect the basic skills of accuracy and consistency in assessing beliefs and values, integrating information, and monitoring cognition necessary for decision-making, have been found to be related to individual differences in cognitive ability as measured by SAT score, performance on Raven's Matrices, and reading comprehension tests (Stanovich & West, 1998). Parker and Fischhoff (2005) found measures of resistance to framing and applying decision rules to be significantly correlated with measures of both verbal ability and non-verbal ability as measured by subtests of the Wechsler Intelligence Scale for Children-Revised (WISC-R; i.e. vocabulary, block design, picture arrangement, and object assembly). The ADMC, as an overall measure of decision-making competence, has been found to be significantly correlated with the verbal and non-verbal measures of cognitive ability. Similarly, in the validation process of the ADMC, better performance on each task was related to higher levels of cognitive ability (Bruine de Bruin et al., 2007).

Anxiety is also related to decision-making. Social anxiety and trait anxiety have been found to be related to risk-avoidant decision-making. Furthermore, the relationship between trait anxiety and risk-avoidant decision-making was found to be relatively unchanged when controlling for negative mood (Maner et al., 2007). High trait anxiety is also correlated with impaired decision-making as measured by the Iowa Gambling Task (Miu, Heilman, & Houser, 2008). When comparing a clinical sample of anxiety

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disordered patients to those with other psychological disorders (i.e. mood and learning), the anxiety patients exhibited more risk avoidance than both clinical groups as well as a non-clinical control group (Maner et al., 2007). Individuals with high trait anxiety also tend to use evidence that confirms their hypotheses and disregard evidence that disconfirms their hypotheses when making adjustments to their previous hypothesis (Bensi, Giusberti, Nori, & Gambetti, 2010).

Research has noted that state anxiety may better account for the association between trait anxiety and decision-making. For example, Bensi et al. (2010) found that trait anxiety was negatively correlated with the amount of evidence requested to make a decision. However, state anxiety was also negatively correlated with the amount of evidence requested. When it was entered into the model, the relationship between trait anxiety and evidence needed for a decision was no longer significant. The variance of trait anxiety was better accounted for by state anxiety. This is similar to the relationship between state anxiety and suggestibility, with high state anxiety, and not trait anxiety, being related to increased suggestibility (Gudjonsson, 1988a; Smith & Gudjonsson, 1995).

The Current Project

The present project sought to understand the relationship between interrogative suggestibility and decision-making as measured by the Gudjonsson Suggestibility Scales, the Adult Decision-Making Competence battery, and the Iowa Gambling Task. Understanding the relationship between these individual differences is important for understanding the general decision-making abilities of individuals who tend to be suggestible. Suggestibility has been found to be related to increased likelihood of making

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a false confession, an important real-world decision with significant consequences. However, minimal empirical research has focused on the general decision-making abilities of individuals who are and are not suggestible. It is important to understand the relationship between these processes as a means of appropriate assessment and intervention in forensic and clinical applications.

The proposed project sought to determine the presence of a relationship between interrogative suggestibility and decision-making as measured by the Gudjonsson Suggestibility Scales and multiple decision-making measures. It was hypothesized that performance on decision-making tasks would predict suggestibility in such a way that those who performed poorly on decision-making tasks would be more likely to be suggestible. Given the relationship of decision-making and suggestibility with other factors such as intellectual ability and anxiety, it was also proposed that these variables may moderate the relationship between decision-making and suggestibility.

CHAPTER II

METHODS

Participants

One hundred and thirty-seven undergraduates from the University of North Dakota participated in the study. They were given course credit for their participation. Participants ranged in age from 18 to 60 with a mean age of 21.16. One hundred and fifteen women and 22 men completed the study. The sample included mostly freshmen (N=43) and sophomores (N=45) with fewer juniors (N=18), seniors (N=16), and students beyond the fourth year of undergraduate study (N=10). Five participants did not indicate their educational level. In regard to ethnicity, the sample was primarily White (N=124, 90.5%), followed by American Indian/Alaska Native (N=4, 2.9%), African-American (N=3, 2.2%), Hispanic (N=3, 2.2%), and Asian/Pacific Islander (N=3, 2.2%). In regard to ethnicity, the sample was generally representative of the undergraduate population at the university (Office of Institutional Research, 2014).

Measures

The *Gudjonsson Suggestibility Scales* (GSS; Gudjonsson, 1997) assess an individual's response to leading questions and negative feedback while recalling a fictitious event. The participant is read a narrative about a fictitious robbery. He or she is then asked to recall the narrative. Free immediate recall is followed by a 50-minute delay during which other tasks will be employed. After the delay, the participant is asked to

free recall the narrative again (delayed recall). After the delayed recall, the participant is asked 20 specific questions, 15 of which are misleading (i.e. have false or inaccurate information, presented in a forced choice between two incorrect options). After answering the 20 questions, the participant is told that "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" (Gudjonsson, 2003, p. 363). The participant is then asked the same 20 questions a second time. Although the GSS 1 and the GSS 2 show similar psychometric properties, the original GSS 1, with forensic-related content, will be used in the proposed study.

The GSS1 yields several scores including immediate recall, delayed recall, yield 1, shift, yield 2, total suggestibility, and confabulation.

Immediate Recall is a measure of the participant's immediate verbal recall of the narrative. Scores range from 0 to 40, with an average score of 21 (standard deviation of 7) for individuals of average intelligence.

Delayed Recall measures the participants delayed verbal recall for the narrative after a 50 minute delay. Scores range from 0 to 40 with a mean of 19 for individuals of average intelligence.

Yield 1 is a measure of the number of suggestions the subject yields to prior to negative feedback based on their answers to the 15 misleading questions. Scores range from 0 to 15, with a mean of 4.6 (standard deviation of 3) for normal subjects.

Shift is a measure of the number of times the subject makes a distinct change in his or her answer following negative feedback. Scores range from 0 to 20 because

participants can change their answers on both the misleading and non-misleading questions. The mean shift score for normal subjects is about 2.9 with a standard deviation of 2.5.

Yield 2 is a measure of the number of leading questions which the participant yields to after negative feedback. Yield 2 is usually one or two points higher than Yield 1.

Total Suggestibility is the sum of Yield 1 and Shift, and gives an estimate of the subject's overall level of suggestibility. The mean total suggestibility score for normal subjects is 7.5 with a standard deviation of 4.6.

Confabulation is a measure of memory processing problems in which people replace memory gaps with imaginary experiences that they believe to be true. This includes major distortions of the narrative during the free recall parts of the GSS. More specifically, confabulation includes distortions—a major change in the details of an existing idea—and fabrications—the addition of a new or novel element to the narrative (Gudjonsson, 2003).

The *Adult Decision-Making Competence* (ADMC) measure is used to assess decision-making competence (Bruine de Bruin et al., 2007). Following from the development of the Youth Decision-Making Competence measure, the ADMC includes tasks related to skills which are necessary for normatively competent decision-making. Across nearly 100 total items this measure includes six tasks: resistance to framing, recognizing social norms, under/overconfidence, applying decision rules, consistency in risk perception, and resistance to sunk costs. Internal consistency, test-retest reliability, and correlations between tasks support the validity of the ADMC as a measure of the

unified construct of decision-making competence. The ADMC also shows significant predictive validity in that is has been found to be associated with better decision outcomes (Bruine de Bruin et al., 2007).

The *resistance to framing* task includes 14 problems of two types. The first type requires the participant to indicate his or her relative choice between two options. For example, the problem states that a pesticide is threatening the lives of 1,200 endangered animals; the participant must then indicate his or her preference on a 1 (*definitely would choose A*) to 6 (*definitely would choose B*) scale with Option A resulting in 600 animals being saved for sure and Option B resulting in a 75% chance 800 will be saved and a 25% chance that no animals will be saved. Other item contexts include tax laws, disease outbreak, and investment in the stock market; the exact quantities and probabilities in each scenario also vary (Bruine de Bruin et al., 2007).

The second type of problem in this task requires the participant to indicate his or her judgment on a 1 (*definitely no*) to 6 (*definitely yes*) scale in regard to a product or situation. For example, presented with the information that 35% of graduating seniors say they have never cheated during their college career, the participant is asked, "how would you rate the incidence of cheating at your university?" Other contexts include condom effectiveness, test performance, and cancer treatment. The resistance to framing items are repeated later in the survey, but the frames are reversed to reflect a negative frame. For example, 35% of those who did not cheat becomes 65% who did cheat, and the options in regard to the first example become certain death for 600 animals if Option A is used and a 75% chance that 400 animals will be lost and a 25% chance that 1,200 animals will be

lost if Option B is used (Bruine de Bruin et al., 2007). Good decision-making would be indicated by consistent choices between the two presentations of the same information.

The 20-item *consistency in risk perception* task asks the participant to indicate his or her estimate as to the chance of a specific event happening to him or her at two points in the future. First, participants indicate the probability of each event occurring in the next year, and then they are asked to indicate the likelihood of each event occurring in the next five years. Examples of such events include getting in a car accident, dying from any cause, dying in a terrorist attack, and being a victim of robbery (Bruine de Bruin et al., 2007). Good decision-making would be indicated by equal or higher estimates for the events occurring in the next 5 years than for events occurring in the next year.

The 10 item *applying decision rules* task requires the participant to choose which of five DVD players the hypothetical individual consumer would buy. The DVD players are described in regard to the four unique qualities—picture quality, sound quality, programming options, reliability of brand—on a scale of 1 (very low) to 5 (very high). All of the DVD players are equally priced. For example, the participant would read the following statement, "LaToya only wants a DVD player that got a 'Very High' rating on Reliability of Brand," and then choose the DVD player (A, B, C, D, or E) which he or she believes best suits LaToya's desire. Better decision-making includes choosing the correct DVD player depending on the desired qualities presented in the scenario.

The *under/overconfidence* task includes 34 items and requires the participant to judge whether a statement is true or false and then indicate his or her level of confidence ranging from 50% (*just guessing*) to 100% (*absolutely sure*). Some statements include "many smokers use the nicotine in cigarettes to treat depression;" "there is no way to

improve memory;" and "meditation slows the heart rate" (Bruine de Bruin et al., 2007). Better performance on this task is indicated by the minimal difference between the individual's mean confidence rating and his or her actual performance, or percent correct.

The *resistance to sunk costs* task contains 10 items which present choices between two options. The participant is asked to indicate his or her relative preference on a 1 (*definitely would choose A*) to 6 (*definitely would choose B*) scale. For example, when presented with a choice between continuing to participate after painful injury in either a bowling club, which costs $50, or a tennis club, which costs $200, the participant is asked to indicate his or her preference between 1 (*most likely to play tennis*) and 6 (*most likely to play bowling*). Other contexts include buying a ring, giving a speech, and learning to play a musical instrument (Bruine de Bruin et al., 2007). Better performance on this task is indicated by a higher score, or more resistance to sunk costs, because the higher rating for each item is associated with discontinuing the behavior in which the person has made a greater investment and choosing a new behavior that is more desirable for other reasons.

The *recognizing social norms* task measures the ability of the individual to adequately assess peer social norms. It contains 16 items pertaining to the individual's beliefs regarding certain activities and his or her estimate of the proportion of peers, out of 100, who "would say it is sometimes OK" to do specific activities such as smoking, fighting, stealing, returning phone calls, and spending time with friends. Respondents first respond to the 16 questions regarding their beliefs about the acceptability of actions and then respond on a 1 to 100 scale in increments of 10 in regard to the proportion of their peers who would view the behavior as acceptable. The score is a rank correlation

between judged proportion and actual proportion, which is based on the responses of the sample.

The *Iowa Gambling Task* (IGT; Bechara, et al., 1994) is a computerized decision-making task which measures risky decision-making. For the IGT, higher quality decisions are associated with less risk-taking. During the task, participants select cards from four decks. Each deck of cards has a different distribution of monetary gains and losses: two decks have negative expected value (i.e. high gains of $100 per trial but also infrequent high losses) and two decks have positive expected value (i.e. low gains of $50 per trial and relatively low losses). Adaptive performance requires remembering the payoffs and losses to identify the decks with the positive expected value. Participants completed a total of 100 trials (Henninger, Madden, and Huettel, 2010). A total score is calculated by taking the total number of cards selected from the advantageous decks and subtracting the total number of cards selected from the disadvantageous decks (Bechara et al., 1994).

The *State-Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a brief, 20-item self-report inventory that measures the individual's current anxiety (state) and stable anxiety tendency (trait). The measure is the most frequently used measure of anxiety in the literature (Groth-Marnat, 2009). It has shown adequate test-retest reliability of about .73 to .86 for periods of 30 to 60 days. As expected, the test-retest reliability of state anxiety shows a lower range of about .36 to .51. Internal consistency has also been shown to be adequate with coefficients ranging from .88 to .93 for state anxiety and .92 to .94 for trait anxiety (Spielberger et al., 1983).

The *Vocabulary* subtest of the fourth edition of the Wechsler Adult Intelligence Scale (WAIS-IV) is a 30 item measure of verbal ability. Participants are asked to provide definitions for the presented vocabulary words which become increasingly more difficult (Lichtenberger & Kaufman, 2009). Of all the WAIS-IV subtests, Vocabulary provides the best estimate of overall cognitive ability. In factor analytic studies, it consistently yields the highest factor loading on *g*, general intelligence (Sattler & Ryan, 2009).

The *Visual Puzzles* subtest of the fourth edition of the Wechsler Adult Intelligence Scale (WAIS-IV) requires the participant to view a completed puzzle and select three responses that combine to form the puzzle within a specific amount of time (i.e. 20 to 30 seconds). It measures spatial visual-perceptual reasoning and assess nonverbal reasoning, mental transformation, processing speed, spatial ability, and attention. Visual Puzzles is considered a fair measure of *g*; 45% of the variance is this subtest is attributed to g. It has an average loading of .81 on the perceptual reasoning factor (Sattler & Ryan, 2009).

The *Verbal Paired Associates* subtests of the fourth edition of the Wechsler Memory Scales requires the participant to learn a list of orally presented word pairs and recall the second word of the pair immediately and after a delay of 20 to 30 minutes. It is a measure of simple short-term and long-term memory. The subtest has shown good internal consistency (.76) and substantial correlation with similar instruments (Wechsler, 2009).

Procedures

After giving informed consent, participants were read the GSS narrative and completed the immediate recall portion. After approximately a 50 minute delay, during which the participants completed the paper-and-pencil decision-making measure

(ADMC), they were administered the delayed recall and 20 questions portion of the GSS.
They were then administered the following tasks: STAI, WAIS-IV Vocabulary, WMS-IV
Verbal Paired Associates I, IGT, WAIS-IV Visual Puzzles, and WMS-IV Verbal Paired
Associates II. Upon completion of all tasks, participants were debriefed regarding the
purpose of the study and were given additional information regarding follow-up
questions about the research.

CHAPTER III

RESULTS

The primary analyses were conducted using a series of multiple regression analyses. The predictor variables included state anxiety from the State-Trait Anxiety Inventory (STAI-S), immediate recall of Verbal Paired Associates from the WMS-IV (VPA), and an estimate of full scale IQ using the scaled scores from Vocabulary and Visual Puzzles subtests from the WAIS-IV (FSIQ-E). Sattler and Ryan (2009) note this to be one of the ten best two-subscale estimates of full scale IQ. The following decision-making tasks were also included as predictors: the Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC), and Recognizing Social Norms (RSN). Criterion variables included three measures from the Gudjonsson Suggestibility Scales: Yield 1, Shift, and Total Suggestibility. Means and standard deviations for each of the 10 predictors and three criterions are presented in Table 1.

When using multiple regression analysis, the predictors must fulfill the assumption of independence. Regression coefficients can become unstable if the predictor variables are too highly correlated. Knight (1984) recommends a correlation of 0.80 as an unacceptably high correlation between predictor variables. The bivariate correlations between all predictors and criterions are presented in Table 2. Examination

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of these correlations among the predictor variables indicates an acceptable level of collinearity with no correlations over 0.30. Measures of multicollinearity (VIF and tolerance) did not reach levels to indicate collinearity among any of the predictors with no tolerance values below 0.70 and no VIF values above 1.40.

Table 1. Means, Standard Deviations, and Ranges of Predictor and Criterion Variables

	Mean	Standard Deviation	Range
Total Suggestibility	11.29	4.86	0.00 – 26.00
Yield 1	6.31	2.67	0.00 – 12.00
Shift	5.01	3.51	0.00 – 20.00
IGT	9.25	28.42	-44.00 – 88.00
RTF	0.96	0.44	0.00 – 2.64
UOC	0.92	0.06	0.75 – 1.00
ADR	0.74	0.14	0.33 – 1.00
RSC	3.52	0.47	2.20 – 4.60
CRP	0.72	0.10	0.35 – 0.95
RSN	0.23	0.07	0.11 – 0.51
VPA	10.73	3.04	4.00 – 19.00
FSIQ-E	102.47	13.46	70.00 – 139.00
STAI-S	94.74	11.67	76.00 – 134.00

Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC), Recognizing Social Norms (RSN), Verbal Paired Associates (VPA), Full Scale IQ Estimate (FSIQ-E), State Trait Anxiety Inventory-State (STAI-S)

The ten predictor variables were entered into a simultaneous multiple regression analysis and each was tested after all other variables were in the regression equation. The analyses were conducted separately for each criterion and the results are presented in Tables 3, 4, and 5. The reported slope coefficient estimates the amount of change in the suggestibility measure associated with one unity change in the predictor variable. The beta weight is a standardized slope coefficient that allows a comparison of the predictive strength of the predictor variables. The squared semi-partial, or part, correlation represents the proportion of variance in the suggestibility measure accounted for by each of the predictor variables after all other variables were in the regression equation.

Table 2. Correlations of Predictor and Criterion Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Yield 1	--												
2. Shift	.23**	--											
3. Total Sugg.	.72**	.84**	--										
4. FSIQ-E	-.29**	-.19*	-.30**	--									
5. VPA	-.25**	-.19*	-.27**	.25**	--								
6. STAI-S	-.04	.02	-.01	-.10	.01	--							
7. IGT	-.11	-.12	-.14	.18*	.24**	.03	--						
8. RTF	.05	.10	.09	-.15	-.06	.01	-.13	--					
9. UOC	.03	.07	.07	.02	.10	-.01	-.07	.03	--				
10. ADR	-.14	-.24**	-.25**	.31**	.22*	.05	.38**	-.23**	-.05	--			
11. CRP	-.08	-.11	-.13	.05	.17*	-.13	.02	-.13	-.01	.22**	--		
12. RSC	-.13	.02	-.06	.23**	.03	-.13	.08	-.04	.05	.29**	.22**	--	
13. RSN	-.20*	.03	-.08	.04	.14	.11	.04	-.03	.04	-.05	-.07	.09	--

Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC), Recognizing Social Norms (RSN), Verbal Paired Associates (VPA), Full Scale IQ Estimate (FSIQ-E), State Trait Anxiety Inventory-State (STAI-S)
** Correlation is significant at .01 level (two-tailed)
* Correlation is significant at .05 level (two-tailed)

The results of the analysis of Total Suggestibility indicate that the overall model was significant, $R^2 = .166$, $R^2_{adj} = .099$, $F(10, 126) = 2.499$, $p = .009$. The summary of the regression coefficients presented in Table 3 indicates that the full scale IQ estimate (FSIQ-E) was the only significant predictor at the .05 level ($\beta = -.218$, $p = .017$). As FSIQ-E increased, Total Suggestibility decreased, indicating that those with higher intelligence are less likely to be suggestible. Verbal Paired Associates (VPA) approached significance ($\beta = -.173$, $p = .055$). As memory performance on VPA increased, total suggestibility decreased, indicating that those with better memory are less likely to be suggestible.

Table 3. Regression Results for Total Suggestibility

	B	β	T	Part r
FSIQ	-.079	-.218	-2.427**	-.198
VPA	-.277	-.173	-1.938*	-.158
STAI-S	-.009	-.023	-.238	-.022
IGT	-.001	-.009	-.097	-.008
RTF	.073	.007	.077	.006
UOC	6.482	.075	.912	.974
ADR	-4.682	-.138	-1.406	-.114
CRP	-3.476	-.074	-.840	-.068
RSC	.510	.049	.546	.044
RSN	-4.474	-.062	-.739	-.060

Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC), Recognizing Social Norms (RSN), Verbal Paired Associates (VPA), Full Scale IQ Estimate (FSIQ-E), State Trait Anxiety Inventory-State (STAI-S)
*** Significant at .01 level
** Significant at .05 level
* Significant at .10 level

As IQ has often been found to be a strong predictor of performance on the Gudjonsson Suggestibility Scale and decision-making tasks, it is possible that the decision-making measures moderate the relationship between FSIQ-E and Total Suggestibility. Seven simultaneous multiple regression analyses each including the main

effects of FSIQ-E and the seven decision-making tasks and an interaction between FSIQ-E and one of the seven decision-making tasks were used to test this prediction. The interaction of FSIQ-E and performance on Consistency in Risk Perception (CRP) was significant in predicting variability in Total Suggestibility. Post-hoc analysis of the simple slopes of Total Suggestibility on FSIQ-E at the mean performance on CRP and one standard deviation above and below the mean indicated that suggestibility decreases as FSIQ-E increases but only for those who performed at the mean ($b_1 = -.097$, $t(127) = -3.069$, $p < .05$) or one standard deviation above ($b_1 = -.161$, $t(127) = -3.609$, $p < .05$) on CRP (see Figure 1). Higher scores on CRP indicate better performance on this task or more consistency in perceiving risk across situations. The relationship between FSIQ-E and suggestibility was not evident for those who showed poor CRP performance.
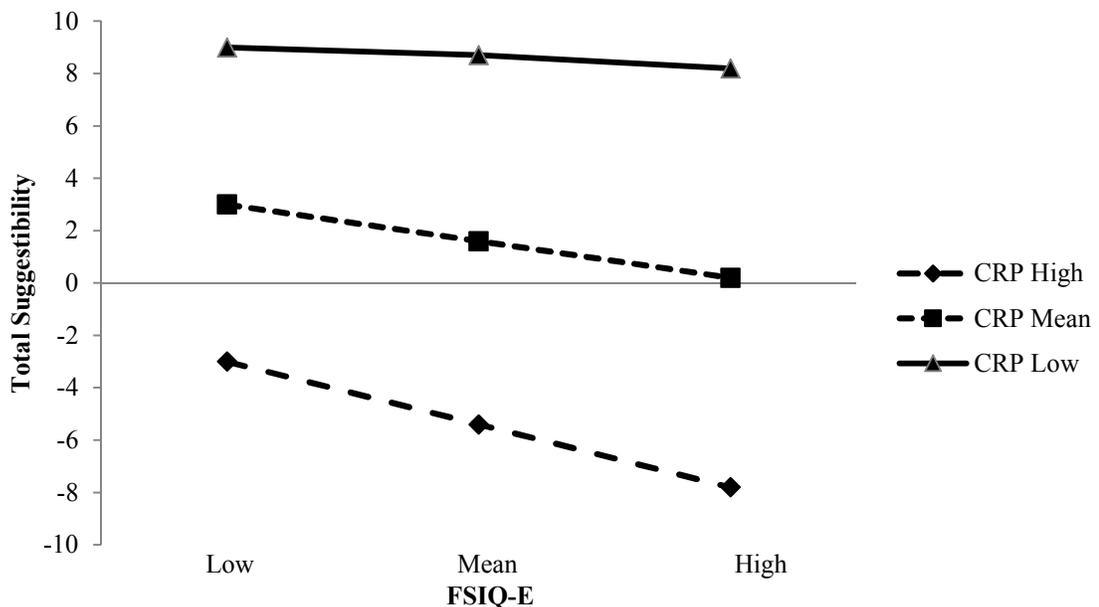
Figure 1. Interaction Results for Total Suggestibility

Figure 1. Post hoc analysis of the relationship between FSIQ-E and Total Suggestibility at high (+1 SD), mean, and low (-1 SD) CRP. Relationship is represented by plotting values of Total Suggestibility at high (+1 SD), mean, and low (-1 SD) values of FSIQ-E. Analysis adapted from Myers, Well, & Lorch (2010).

The results of the analysis of Yield 1 indicates that the overall model was significant, $R^2 = .154$, $R^2_{adj} = .087$, $F(10, 126) = 2.291$, $p = .017$. The summary of the regression coefficients presented in Table 4 indicates that the full scale IQ estimate (FSIQ-E) was again the only significant predictor at the .05 level ($\beta = -.230$, $p = .012$), and Verbal Paired Associates (VPA) approached significance ($\beta = -.153$, $p = .091$). Again the predictive relationships indicate that as intelligence and memory increase, the tendency to yield to misleading questions decreases. These results indicate that Recognizing Social Norms (RSN) also approached significance ($\beta = -.160$, $p = .062$). As performance on this task increased, the tendency to yield to misleading questions decreased. Participants who were better able to accurately recognize social norms and normative peer beliefs showed a decreased tendency to yield to misleading questions.

Table 4. Regression Results for Yield 1

	B	β	t	Part r
FSIQ	-.046	-.230	-2.547**	-.209
VPA	-.135	-.153	-1.703*	-.140
STAI-S	-.013	-.056	-.664	-.054
IGT	-.002	-.019	-.213	-.017
RTF	-.074	-.012	-.141	-.012
UOC	2.52	.053	.643	.053
ADR	-.173	-.009	-.094	-.008
CRP	-1.410	-.054	-.616	-.051
RSC	-.313	-.055	-.606	-.050
RSN	-6.308	-.160	-1.885*	-.154

Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC), Recognizing Social Norms (RSN), Verbal Paired Associates (VPA), Full Scale IQ Estimate (FSIQ-E), State Trait Anxiety Inventory-State (STAI-S)
*** Significant at .01 level
** Significant at .05 level
* Significant at .10 level

Due to the predictive power of FSIQ-E on Yield 1, the interactions of FSIQ-E with each decision-making task were analyzed using the same multiple regression

procedure described previously. Again, the interaction between FSIQ-E and Consistency

in Risk Perception (CRP) was the only interaction to reach significance. Post-hoc

analysis of this interaction showed that FSIQ-E was significantly negatively related to the

tendency to yield to misleading questions, but only for those who performed in the high

range of CRP ($b_1 = -.098$, $t(127) = -2.58$, $p<.05$). Higher FSIQ-E is related to decreased

likelihood of yielding to misleading questions but only for those individuals who are

exceptionally good at consistently perceiving risk.

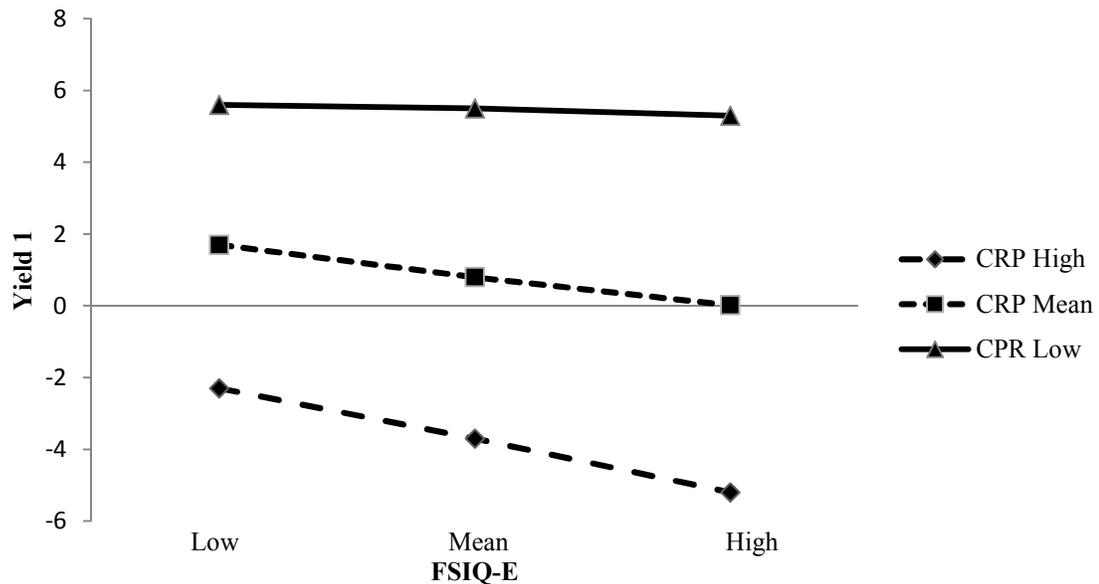Figure 2. Interaction Results for Yield 1

Figure 2. Post hoc analysis of the relationship between FSIQ-E and Yield 1 at high (+1 standard deviation), mean, and low (-1 standard deviation) CRP. Relationship is represented by plotting values of Yield 1 at high (+1 standard deviation), mean, and low (-1 standard deviation) values of FSIQ-E. Analysis adapted from Myers, Well, & Lorch (2010).

     The results of the analysis of Shift indicate that the overall model was not

significant, $R^2 = .103$, $R^2_{adj} = .032$, $F(10, 126) = 1.449$, $p = .167$. The summary of the

regression coefficients presented in Table 5 indicates that none of the predictor variables

were significant, but Applying Decision Rules approached significance ($\beta = -.184$, $p =$

.073). This relationship indicates that as performance on the ADR task increases, the

tendency to shift responses following negative feedback decreases. As the ability to apply

decision rules and logic increases, the tendency to change responses to questions

following negative feedback decreases. As none of the predictors were significant at the

.05 level, no interactions were analyzed.

Table 5. Regression Results for Shift

	B	β	t	Part r
FSIQ	-.031	-.120	-1.290	-.109
VPA	-.135	-.117	-1.261	-.106
STAI-S	.006	.019	.221	.019
IGT	.000	.000	.002	.000
RTF	.172	.021	.243	.021
UOC	3.845	.062	.724	.061
ADR	-4.492	-.184	-1.805*	-.152
CRP	-2.010	-.059	-.650	-.055
RSC	.856	.114	1.226	.103
RSN	1.361	.026	.301	.025

Iowa Gambling Task (IGT), Resistance to Framing (RTF), Under/Overconfidence (UOC), Applying
Decision Rules (ADR), Consistency in Risk Perception (CRP), Resistance to Sunk Costs (RSC),
Recognizing Social Norms (RSN), Verbal Paired Associates (VPA), Full Scale IQ Estimate (FSIQ-E),
State Trait Anxiety Inventory-State (STAI-S)
*** Significant at .01 level
** Significant at .05 level
* Significant at .10 level

CHAPTER IV

DISCUSSION

The primary results indicate that intellectual ability is highly predictive of performance on Total Suggestibility and the Yield component of suggestibility, but it is not predictive of performance on the Shift component of suggestibility. Also, verbal memory approached significance as a predictor of both Total Suggestibility and Yield. Overall, those with higher intelligence estimates and better verbal memory performance showed lower levels of suggestibility and decreased tendency to yield to misleading questions. However, neither intelligence estimates nor verbal memory showed a relationship with the tendency to shift answers following negative feedback. Also, neither state anxiety nor any of the decision-making tasks significantly predicted performance on suggestibility, yield, or shift.

These results are generally consistent with previous research that suggests a strong relationship between intelligence and suggestibility. Previous research indicates a strong negative relationship between intellectual ability and interrogative suggestibility. Gudjonsson (1983, 1990) has consistently found full scale IQ as measured by the WAIS-R to be negatively related to total suggestibility and the tendency to yield to misleading questions. Others have also supported a strong negative relationship across a full range of IQ scores (Søndenaa, Rasmussen, Palmstierna, & Nøttestad, 2010). Similarly, Frumkin and colleagues (2012) found intellectual ability to be more closely related to the tendency to yield to misleading questions than the tendency to shift answers following negative

feedback. This is consistent with the present findings that FSIQ-E predicted performance on Yield but not Shift performance.

Memory has also been a consistent predictor of suggestibility across multiple studies with the general conclusion that memory is negatively correlated with suggestibility (Gudjonsson, 1987b; Gudjonsson, 1988; Gudjonsson & Clare, 1995; Sharrock & Gudjonsson, 1993). The current results show a consistent pattern with previous research indicating that while intelligence and memory are related, they appear to contribute individually to the prediction of suggestibility (Gudjonsson, 1983; Sharrock & Gudjonsson, 1993). The full scale IQ estimate was consistently a strong predictor while verbal memory only approached significance. The current research also did not support a relationship between state anxiety, measured immediately after GSS administration, and suggestibility. This relationship has been documented in the past (Smith and Gudjonsson, 1995), but the lack of significant results in this analysis may be due to the strong relationship between cognitive ability and interrogative suggestibility.

FSIQ-E was the strongest predictor of both Total Suggestibility and Yield, and none of the decision-making tasks significantly predicted performance on any measure of the GSS. While the multicollinearity diagnostics did not indicate significant collinearity among predictors, it may be that FSIQ-E accounts for so much of the variability in the GSS measures, that any additional variance explained by decision-making tasks is statistically insignificant. This may also be due to the strong positive relationship between decision-making ability and intellectual ability noted in previous research. For example, performance on each of the six tasks of the ADMC was found to be related to higher levels of cognitive ability (Bruine de Bruin et al., 2007). Similarly, performance

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on tasks similar to those of the ADMC have been found to positively correlate with SAT score, Raven's matrices, and reading comprehension tasks (Stanovich & West, 1998).

Suggestibility is often differentiated from, but closely linked with, compliance and acquiescence. It may be that decision-making ability is more closely tied with compliance or acquiescence. Compliance does not include acceptance of the information as true, but it is the decision to comply with the information for secondary gain (Gudjonsson, 2003). Perhaps this process more closely relates to a decision-making process, in which the person must choose the course of action that will increase personal gain and decrease cost, and thus relies upon similar abilities. Acquiescence, as a personality trait consistent with submissiveness (Finlay & Lyons, 2001), may also be more closely tied with decision-making abilities as acquiescent individuals may show limits in certain decision-making skills that require independent thought such as assessing beliefs and values.

With FSIQ-E being such a strong predictor of suggestibility, it is possible that the relationship between intelligence and suggestibility is moderated by decision-making ability rather than decision-making ability having a direct relationship with suggestibility. The results of the interaction analysis indicate that one decision-making task significantly interacted with FSIQ-E to predict Total Suggestibility and Yield but not Shift scores. Consistency in Risk Perception moderates the relationship between FSIQ-E and Total Suggestibility so that FSIQ-E and Total Suggestibility are only related for those who perform at or above the mean on Consistency in Risk Perception. Intelligence is only predictive of suggestibility for those who consistently perceive risk; for those who do not consistently perceive risk, intelligence does not predict suggestibility.

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The same interaction was found for the prediction of yielding to misleading questions. Again, Consistency in Risk Perception acted as a moderator between FSIQ-E and Yield. The relationship between FSIQ-E and Yield was only significant for those who performed in the high range of Consistency in Risk Perception. Intelligence predicts the tendency to yield to misleading questions but only for those who most consistently perceive risk. This indicates that intelligence is not an important predictor of yielding to misleading questions for individuals who are average or poor at consistently perceiving risk.

Consistency in Risk Perception was the only decision-making task to interact with FSIQ-E to predict Suggestibility and Yield. As with the other decision-making tasks, Consistency in Risk Perception has been found to be related to cognitive ability (Bruine de Bruin et al., 2007). This task depends on the general decision-making skill of belief assessment which involves consistently judging the likelihood of outcomes. The specific task assesses the ability to follow probability rules.

Risk perception is important to the Gudjonsson-Clark model of interrogative suggestibility. According to this model, the interrogative situation is defined by a high degree of uncertainty that is related to the cognitive ability of the individual (Gudjonsson, 2003). In this way, the results of the present study are consistent with the model; individuals with higher intelligence and better than average probability understanding, were less susceptible to suggestibility.

Coping strategies are another basic component of the Gudjonsson-Clark model. An individual's tendency toward suggestibility depends in part on the ability to generate adequate coping strategies in the context of uncertainty. Specific coping strategies have

been found to be related to a reduced tendency toward suggestibility in the context of uncertainty. Active-cognitive and active-behavioral coping strategies in which the individual actively manages thoughts and critically responds to the situation have been related to reduced suggestibility while avoidance and emotion-focused coping in which the individual avoids criticism within the situation has been related to increased suggestibility (Gudjonsson, 1988a; Howard & Hong, 2002).

Performance on the consistency in risk perception task has also been found to be related to certain decision-making styles, which are similar to coping strategies in a decision context. Specifically, risk perception has been positively correlated with behavioral coping and rational decision-making and negatively correlated with avoidance coping and spontaneous decision-making (Bruine de Bruin et al., 2007). It appears as though behavioral and rational strategies are important for success in both risk perception and suggestibility while avoidance strategies impair performance in both contexts. Perhaps individuals who are more intelligent and who also tend to use these cognitive and active-behavioral coping strategies more accurately perceive risk and are more consistent in their responses even in uncertain situations such as an interrogation.

Another possible explanation of the interaction between intelligence and risk perception in predicting suggestibility is that those who are both more intelligent and good at probability judgment do not feel the general reluctance to respond with uncertainty. Gudjonsson (2003) notes that people often believe they must provide a certain answer, but perhaps those who are intelligent and understand probability know that certainty is unlikely in regard to memory and are thus more likely to respond to misleading questions appropriately or with a response of "I don't know". These

individuals may be more aware of the actual probability related to their own memory ability and thus better able to cope with the unrealistic expectation that they should be more certain. It is the inconsistency between perceived probability or unrealistic expectations and actual probability that often results in poor risk perception (Slovic, Peters, Finucane, & MacGregor, 2005).

The interaction may help explain why some studies have found range effects to impact the relationship between intelligence and suggestibility (Gudjonsson, 2003). For example, previous research has been mixed with some finding a relationship between intelligence and suggestibility only for those with average or below average intelligence (Gudjonsson, 1988b) and others showing a relationship with the full range of scores (Søndenaa et al., 2010). The present sample had a representative range of FSIQ-E scores from 70 to 139, with a mean and standard deviation close to that of a normative sample (M=102 and SD= 13). Taking into consideration the interaction between FSIQ-E and Consistency in Risk Perception, this relationship is only consistent in predicting suggestibility and yield for average to above average intelligence. This may explain why some samples that only included higher intelligence scores and did not measure risk perception did not show the relationship between intelligence and suggestibility (Gudjonsson, 1988b). Analyses without variables that may moderate the relationship between intelligence and suggestibility, present an incomplete picture of the relationship between these variables.

Given previous and the present research, adequate measurement of intelligence and memory ability are important components of any assessment using the GSS for clinical or forensic decision-making. The present research also indicates consideration of

the individual's risk perception and understanding of risk. In the context of suggestibility and false confession, if the individual does not perceive the risk involved in the situation, perhaps he or she may be more likely to falsely confess. This would constitute poor decision-making as the negative consequences of falsely confessing to a crime are severe including the confessions impact on the interpretation of other evidence (Elaad et al., 1994; Dror & Charlton, 2006), the testimony of the witnesses (Hasel & Kassin, 2009), and the increased likelihood of conviction (Bedau & Radelet, 1987; Garrett, 2011; Kassin, 2008).

Limitations and Future Research

The Gudjonsson Suggestibility Scales were developed for a specific forensic application of determining an individual's tendency to be suggestible and potentially falsely confess to a crime in an interrogative situation. Thus, the scales were developed for use with a forensic sample. The present sample was limited to undergraduate students, most between the ages of 18 and 23. Recent research using cross-sectional data from the National Longitudinal Survey of Youth 1997 indicates that the risk of arrest by age 23 is about 30% (Brame, Bushway, Paternoster, & Turner, 2014). While the age range of the current sample is representative of the population with the highest arrest rates (Snyder & Mulako-Wangota, 2013), the current undergraduate sample is perhaps different in other ways including socioeconomic status, education level, gender, and other demographic variables. The undergraduate sample included a higher proportion of women compared to the forensic population in which men show substantially higher arrest rates than women across ages but also in the 18-24 year age range (Snyder & Mulako-Wangota, 2013; Brame et al., 2014). Furthermore, research suggests that African-American males

between the ages of 18 and 23 exhibit significantly higher cumulative arrest prevalence than white males of the same age range (Brame et al., 2014).

The current, predominately white female, sample misrepresents the ethnic diversity in a forensic sample. Future research about the relationship between suggestibility and decision-making should be conducted with a forensic sample. Preliminary analysis from a small sample of incarcerated individuals using the same protocol as the present study found that incarcerated individuals were more likely to respond to negative feedback by changing their answers to misleading questions and those who were highly suggestible performed worse on the decision-making tasks of Resistance to Framing and Applying Decision Rules (Ertelt et al., 2014).

The present study did not include personality or emotional predictors other than state anxiety, which was not a significant predictor of any measure from the GSS. Frumkin and colleagues (2012) found that Shift tends to be more closely associated with personality and emotional factors than Yield and Total Suggestibility, which is somewhat consistent with the present findings. Future research should further explore which personality traits are important for predicting the tendency to change answers in response to negative feedback. This would also be important for understanding suggestibility as a decision-making process, as personality features such as impulsivity and anxiety have been found to be related to both decision-making (Bensi et al., 2010; Maner et al., 2007; Miu et al., 2008) and suggestibility (Gudjonsson, 1983; Gudjonsson, 1984c; Gudjonsson, 1988a; Haraldsson, 1985; Smith & Gudjonsson, 1995; Wolfradt & Meyer, 1998).

Given the significant interaction between intelligence and risk perception in predicting suggestibility, it would also be important for future research to more fully

explore the relationship between probability judgment as it relates to suggestibility and risky behavior. The relationship between risk perception and risk behavior is complex. Greater risk perception is often related to protective behavior, but exposure to risky situations also decreases risk perception (Brewer, Weinstein, Cuite, & Herrington, 2004). Increased risk taking behavior results in subsequent reduced risk perceptions (Brown, 2005). The complex relationship may be due to the presentation and processing of the information. For example, eliciting specific memories of risky behaviors produces a positive correlation between risk perception and risk taking while eliciting gist, or global, non-specific, memories of risky behaviors produces a negative correlation between these constructs. Furthermore, viewing risk as relative, or contextual, is related to greater risky behavior than viewing risk as all-or-none, or global, which is negatively related to risky behavior (Mills, Reyna, & Estrada, 2008). This indicates that an individual's risk perception is based on memories of past experiences, the type of risk-relevant memory cue (specific or global), and the individual's ability to recall previous specific experiences and global representations of risk. Within an interrogative situation, those who draw upon specific memories may be more likely to falsely confess (i.e. engage in the risky behavior) because their previous experiences indicate that the risk is low while those who draw on gist, or global, memories may be less likely to confess because their memories indicate that it is a risky behavior that should be avoided. Furthermore, those who frequently engage in risky behaviors that may place them in an interrogative situation may be more likely to falsely confess because they perceive the risk of consequences as low due to their specific memories of previous experiences. Understanding this

relationship and its impact on an individual's tendency to falsely confess would be important for intervention at all levels.

Conclusions

The primary results indicate that intellectual ability is highly predictive of suggestibility, specifically the tendency to yield to misleading information. Also, accuracy in risk perception appears to act as a moderating variable between intellectual ability and suggestibility. The results are based on a sample of undergraduate students, and thus are limited in their application to forensic populations. Future research should focus on suggestibility and decision-making ability within a forensic context. The results indicate need for adequate assessment of multiple facets of cognitive functioning when assessing individuals in supposed false confession cases. The current results point to the importance of adequate measurement of risk perception and intelligence in determining the individuals propensity to suggestibility. Understanding the individual's perception of risk and general decision-making ability would be important for assessing the validity of their confession. Given the many detrimental legal consequences of false confessions (Kassin, 2008), it is important to consider the individual differences that would contribute to this phenomenon.

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