

**An investigation into the relationship  
between Schizotypy and crime based  
reasoning in a non-clinical  
population.**

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## **Abstract**

### Introduction

In 2003, 90% of the prison population in England and Wales were categorised as having a mental illness (Birmingham, 2003). The male prison population contained a 1000 prisoners affected by Psychosis and nearly 2000 in need of immediate psychiatric treatment (Birmingham, 2004). Schizophrenia has been associated with an increased risk of criminality (Munkner, Haastrup, Joergensen & Kramp, 2009), high levels of reported aggression and violence during first time episode of psychosis (Harris *et al.*, 2010).

Schizotypal psychopathological characteristics can be found on a continuum (Claridge & Brooks, 1984; Eysenck & Eysenck, 1975) whereby they vary in severity due to a continuous phenotype (Van Os *et al.*, 2000) in contrast to the categorical model. Consequently, a sub-clinical category of psychopathological behaviour has been identified, referred to as Schizotypy (Claridge, 1998).

### Method

This thesis explores the reasoning abilities of non-clinical individuals screened for Schizotypal tendencies using the Peters Delusion Inventory (PDI, Peters *et al.*, 2004). A series of specially designed unique crime based reasoning tasks were created to assess the potential differences, biases and errors in crime based reasoning when comparing high and low scoring individuals for Schizotypal tendencies.

In addition, participants completed a short interview or audio diary, to record their reflections about completing the task, as well as considering any emotional responses.

### Results

An innovative four-part self-referencing scale (me, family, friend & stranger) demonstrated that individuals typically made quicker decisions about themselves compared to making decisions about other people. However, reaction time data suggested that self-reference was unaffected by Schizotypy when engaged in crime based decision making ( $p > 0.05$ ). Reaction times proved to be either unaffected by Schizotypy whilst completing crime based reasoning tasks or an insufficient measure of

the biases associated with Schizotypy. As an alternative, 'data gathering' measures provide a much more sensitive measure which helped to describe and detect the differences in Schizotypy, e.g. a significant main effect of reference level was found using 'data gathering' data ( $p < 0.05$ ) and error score data ( $p < 0.05$ ).

The modality in which the crime based reasoning tasks were presented impacted upon the biases associated with Schizotypy, as opposed to any differences being as a result of dual processing functions placing greater demands on cognitive functional processing.

The qualitative data provided a consistent and coherent account of metacognitive experience of reasoning whilst completing the tasks. The qualitative results have allowed a more coherent overview of the relationship and differences in experiences between high and low schizotypal scorers to emerge, based around the themes of emotion, justification and morality, and reasoning strategies (Wilkinson, Jones & Caulfield, 2011).

## Discussion

Each of the studies within this thesis contributes to a better understanding of the biases that impact upon crime based reasoning, as well as confirmation of a 'jump to conclusions' bias (Dudley & Over, 2003; Dudley & Over, 1997; Huq, Garety & Hemsley, 1988) occurring in those individuals who scored high for Schizotypal tendencies. Furthermore, high scoring individuals demonstrated a reduction in emotive responses to the reasoning task scenarios and in some cases reported seeking the fewest pieces of information upon which to base their decision (Wilkinson, Jones & Caulfield, 2011).

The qualitative methods developed for this research are particularly novel in the field of thinking and reasoning, and proved to be invaluable tools in helping shape the direction of the experimental work as well as providing better insight into the mechanisms involved in crime based decision making.

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### **Author's Declaration**

I declare that the work in this dissertation was carried out in accordance with the regulations of Birmingham City University. The work is original except where indicated by special reference in the text and no part of this dissertation has been submitted for any other degree.

Any views expressed in the dissertation are those of the author and in no way represent those of Birmingham City University.

This dissertation has not been presented to any other University for examination either in the United Kingdom or overseas.

Signed

Date

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# **Chapter One: Literature Review**

**“If men define situations as real they are real  
in their consequences”**

**Thomas (1863-1947)**

## **1.1 General Introduction**

Schizophrenia is a complex mental illness that is yet to be completely and wholly understood. There appears to be a number of differing strands or strains which are defined by the grouping of presented symptoms (see section 1.3 for more details). The positive symptoms of Schizophrenia, rather than the disorder itself, have been associated with an elevated risk of violent behaviour (Kinoshita *et al.*, 2010). However, the aetiological background of individuals diagnosed with Schizophrenia may be shared with other individuals in the general population who also have an elevated risk of violence (Kinoshita *et al.*, 2010). Consequently, there is a need for research to provide a better understanding of how mental illness impacts upon an individual's rationality and ability to reason about crime and criminal behaviour (Louw, Strydom & Esterhuyse, 2005). In order for research to enhance the current understanding of this relationship a number of ethical questions should be addressed, particularly when conducting research on a clinical population. For example, consideration should be given to individuals who are diagnosed with an illness, and the impact that participation in experimental trials might have upon their wellbeing and treatment. Furthermore, it is extremely difficult to derive cause and effect due to the fact that most individuals with a mental illness will have been prescribed medication to control for the symptoms of their disorder (Bennet, 2006). Consequently, it becomes difficult to establish whether any differing results are due to the illness or whether they are a result of the prescribed medication (Jeste, Gladsjo, Lindamer & Lacro, 1996).

A number of studies have implemented alternative methodologies (see section 2.3) in order to escape the issues associated with clinical population samples (Galbraith, Manktelow, & Morris, 2010; Galbraith, Manktelow, & Morris, 2008; Sellen, Oaksford & Gray, 2005). In keeping with the continuum model of mental disorders (Claridge & Brooks, 1984; Eysenck & Eysenck, 1975), a sample from the general population are screened and measured for Schizotypal tendencies. A high scoring group is then identified, the results of this group can provide insight, and therefore inform, into the experiences of individuals who are diagnosed with a mental illness such as Schizophrenia (see chapter 2 for more details). Previously, this methodology has been adopted for studies that have assessed individuals' everyday reasoning (Dudley and Over, 2003; Dudley and Over, 1997; Huq, Garety & Hemsley, 1988), which

demonstrated that individuals with Schizotypal tendencies differ from low Schizotypal scoring individuals in terms of their reasoning in a host of everyday situations.

Whilst previous research has considered the everyday thinking and reasoning of individuals with Schizophrenia and high Schizotypal trait, other research has explored the relationship between Schizophrenia and violence, but a lack of research has considered how individuals with Schizophrenia, or those who score high for Schizotypal traits, are affected by reasoning biases and errors which could lead to a path of offending (Louw *et al.*, 2005).

## **1.2 Mental Health and Crime**

The link between mental disorder and crime has been at the centre of dispute throughout many disciplines and schools of thought. There has been, and continues to be, conflict with regards to definitions of mental disorder, which directly impacts upon how individuals are managed and treated within the criminal justice system. Mental health is not always accounted for by English law, and it is usually left to the discretion of the court or jury to decide whether the term is applicable to a particular case (Pilgrim, 2000). The applicability of the label 'mentally disordered' provokes debate around the concept of freewill and responsibility. An established link between an individual's mental disorder and offending behaviour would impact upon the shaping of social policy and law. If a disorder inhibits an individual's ability to know 'right' from 'wrong' then it could be argued that an individual cannot be responsible for their own actions. This is captured by the term 'Mens Rea' which underpins the English criminal law. An individual can only be classified guilty for a criminal act if they possess a guilty mind, suggesting that they knew, prior to their offense, the implications of the given act would lead to. However, it is argued, that some individuals do not understand the implications of their behaviour and therefore, in such cases, an individual might require treatment for an underlying disorder of the mind. However, when an individual knowingly engages in a criminal act, in the eyes of the law, they should be punished. The opposing view considers individual's acts to be determined either by their biological or social environment factors which raises the issue of whether the individual should be treated rather than, or as well as, being punished (Crow, 2001). From the outset it is evident that the connections between mental disorder and crime are both problematic and accompanied by wider philosophical debates.

A study conducted by Shaw *et al.*, (1999) assessed 500 individuals who had committed murder in England and Wales during the period 1996-1997. They reported that 44% of the offenders had a record of mental health issues at some point in their lifetime. In 14% of the murder cases, the individual expressed symptoms of mental health issues at the time of the offence. A further 8% of the offenders had prior contact with mental health professionals. This suggests a relationship between an individual's mental state and their offending behaviour. On the contrary, 56% of the cases involved individuals with no record of mental health issues, highlighting that criminal behaviour is not automatically assigned to a mental health issue. However, it is crucial to recognise the potential issues with these statistics in terms of their representation. Whilst 56% of the cases involved individuals with no previous history of mental health issues, it is possible that a number of these cases could have involved individuals that had not been diagnosed with a mental disorder despite there being a mental health issue. Indeed, a number of studies have confirmed that mental illness and mental health issues are often under-diagnosed by the prison system (Birmingham, Mason and Grubin, 1996; Birmingham, 2004), and recent research has suggested that more than 90% of prisoners have a mental disorder (Birmingham, 2003). Here, mental disorder refers to any disorder or disability of the mind which includes mental illness, personality disorder and learning difficulties which have been accompanied by severe aggressive or disruptive behaviour (Mental Health Act, 1983, 2007). Equally, such studies are limited by their population size and it is possible that their target sample is biased in one direction or the other.

The media, in terms of news reports, films, series and dramas, has significantly influenced how the public view mentally disordered offenders (Howitt, 2006). Often individual cases are "hyped up" and the outcome of individualised cases are generalised to all individuals diagnosed with disorders such as Schizophrenia (Prins, 2005). Howitt (2006) reports that sixty-eight percent of media reported crimes with perpetrators that have a mental disorder are focused around serious, murderous and sexual crimes that essentially are the more extreme forms of violence. In the United States a social survey was carried out on the general public whereby they were required to read vignettes depicting cases of mental illness. Despite any mention of violence being eliminated,

participant descriptions of Schizophrenia and of major depression frequently evoked negative reactions. Sixty-one percent of respondents describe individuals diagnosed with Schizophrenia as very or somewhat likely to be violent (Angermeyer, Cooper & Link, 1998).

It is clear that the public perceive there to be an association between mental disorder and the existence of criminal behaviour (Angermeyer, Cooper & Link, 1998). However, it is important to note that not every individual diagnosed with a mental disorder engages in violent and criminal activity and furthermore, not every individual that engages in violent and criminal activity has a mental disorder. Nevertheless, it is difficult to ignore the fact that there are individuals who are diagnosed with a mental illness, such as Schizophrenia, that do engage in violent crime(s).

In many ways, research in this area suggests it is less problematic to identify a relationship between mental illness and acts of violence as opposed to a direct link with crime. However, it could be argued that violent acts can lead to offending and therefore crime. Howells and Hollin (1998) define violence as ‘the threat or application of force which has physically harmful consequences’ (p. 8). If the definition of violence as inhabiting physically harmful consequences is pursued, then it might be argued that violence in effect is a criminal act. Research has therefore explored the link between mental illness and different kinds of aggressive behaviour (Howitt, 2002).

Link, Andrews and Cullen (1992) conducted community based research utilising a sample of 500 never treated New York residents compared with a sample of individuals with mental health issues. All of the participants were interviewed using the psychiatric epidemiology research interview (PERI; Dohrenwend *et al.*, 1980) with both groups in order to account for and measure symptoms in relation to violent or illegal behaviour separately to the mental health system. Individuals with psychotic symptoms scored higher on official and self-reported violence and illegal behaviour. Therefore, it appears that there is a relationship between the presence of psychosis and forms of violent behaviour. However, despite this finding, psychosis as a predictor of violence is weaker compared to other socio-demographic factors including; age, education level and gender, all of which have been found to act as stronger indicators (Howitt, 2010).

Eysenck and Eysenck (1975) investigated the link between personality and criminal behaviour. They devised a personality test (Eysenck Personality Questionnaire) which enabled the measuring of three aspects of an individual's personality; Extroversion, Neuroticism and Psychoticism. They supported that both biological and environmental influences effect the development of an individual. Individuals inherit a cortical and autonomic nervous system from their genes that is responsible for the ability to learn from or condition to environment stimuli. Therefore, an individual's ability to learn and develop is shaped by both their biology and environment. To put this into context, Extroverts are cortically (biologically) under aroused and therefore are in search of continuous stimuli (from the environment) to maintain an optimum level of arousal. On the other hand, an Introvert is over aroused and therefore attempts to avoid stimuli from the environment. Extroverts as a consequence are conditioned less effectively by their environment. Individuals with Extrovert traits might engage in high risk activities such as criminal and violent behaviour in order to increase stimulation. Criminality traits are both positively and causally related to high levels of each of the three elements of an individual's personality. However, there are gender differences whereby men are more likely to rate high on Psychoticism when compared to women (Eysenck & Eysenck, 1975). Psychoticism is related to more violent offences suggesting and supporting that men are far more likely to be involved in violent crime (Eysenck & Eysenck, 1975).

Schizophrenia, falling on the psychotic spectrum of disorders, has received the most attention with regards to criminality, and more specifically violence. Hollin (1996) reported that the majority of mentally ill offenders admitted to Special Hospitals were diagnosed with Schizophrenia. Furthermore, Munkner, Haastrup, Joergensen and Kramp (2003) suggested that Schizophrenia makes a significant contribution to the violence that is observed and experienced in communities, concluding that Schizophrenia elevates the risk of a criminal career. More recently, Mullen (2006) notes that there has been substantial support of the correlation between having a Schizophrenia syndrome, and increased rates of antisocial behaviour in general, and violence in particular (Wallace *et al.*, 1998; Hodgins *et al.*, 1996; Angermeyer, 2000). Violence, in some cases, has become a key diagnostic feature of mental illness. It is

therefore inevitable that a link is automatically made between individuals diagnosed with a mental condition and the concept that they are assumed to be therefore violent in nature. However, not all mental disorders have violence as a key feature; in the case of Schizophrenia, violence is considered to be an associated feature. An individual can be diagnosed with Schizophrenia without having been or ever becoming violent in nature. Nevertheless, in those cases where individuals have been clinically diagnosed with Schizophrenia and where evidence of being violent has been presented, it should be questioned whether their violence is a result of the condition or whether violence is a confounding effect from psychiatric medication or other treatment and interventions. In some cases it is thought that medication can cause a state of mind that may lead, or leave an individual susceptible, to a violent episode (Bennett, 2006). Furthermore, mental illnesses develop and change intensity over time, therefore, it is possible that at certain points violence is more prominent and more of an associated feature than at other times (Bennett, 2006). This is particularly relevant when considering that Schizophrenia is an episodic condition. Whilst it has been noted that prescribed medication can have an effect on the level of violence found in individuals with a mental disorder the illegal use of drugs in terms of substance abuse further increases the already elevated risk of crime and violence among persons with Schizophrenia (Tengstrom, Hodgins and Kullgren, 2001). In addition, substance abuse increases the risk of developing a personality disorder (Bartol & Bartol, 2011).

Hafner and Boker (1973) examined the criminal register in Germany, whereby 3% (533) criminals were isolated for being 'mentally abnormal'. Over half of this sample (53%) were offenders diagnosed with Schizophrenia, and 7% were diagnosed with Depression. They found there to be no significant differences between people with mental illness and people without with regards to the likelihood of committing a violent crime. However, Howitt (2006) notes that individuals diagnosed with a mental disorder are often an unstable and vulnerable group. They frequently experience a downward social class movement which can leave them unemployed leading to homelessness. Homelessness may also lead to individuals existing within violent subcultures and therefore they become much more likely to be victims as well as perpetrators of violence. Hiday *et al.*, (2001) conducted interviews with individuals who had severe mental health issues. During the four months leading up to the interviews, 27% of the

individuals had been a victim of a variety of general crimes, however, 18% reported being victims of a violent offence and a further 22% reported being victims of a non-violent offence.

When reviewing cases of victims of violence perpetrated by an individual with mental health issues, Estroff, Zimmer, Lachicotte and Benoit (2004) report that over half were family relatives or the mothers of patients who live in the same household. Walsh and Fahy (2002) suggest that the prevalence rate for violence amongst individuals with a mental disorder is 10%, 8% of whom are represented by individuals diagnosed with Schizophrenia. More recent studies suggest that one out of every twenty violent offences are committed by individuals with mental health problems (Fazel, Langstrom, Hjern, Grann and Lichtenstein, 2006). This figure is problematic as it only accounts for individuals' who have been caught after committing a violent offence and have been diagnosed with a mental disorder or displayed symptoms of a mental disorder that has led to them being referred to professional support. Silver (2006) notes that not all people who are diagnosed with a mental disorder are violent; however, the likelihood of committing violence is greater for people with major mental disorders.

Consequently, over a number of years, the term 'violence' has increasingly appeared in definitions and descriptions of characteristics for mental disorders. For example, the term violence has increased in citation from 2% in Diagnostic and Statistical Manual I (DSM I) through to 47% in DSM III (Bennett, 2006). The increased number of citations not only increases individual definitions of mental disorders being characterised by violence but also distorts the concept of violence being a mental disorder.

The violence that can be presented in individuals diagnosed with Schizophrenia can be further understood by considering Blair's (1995) Violence Inhibiting Mechanism (VIM). Blair (1995) suggests that violence in individuals is controlled and inhibited by a cognitive mechanism that is activated by non-verbal communication signalling stress or distress in another individual. Individuals are inclined to withdraw from a violent attack if the victim shows distress cues. The VIM is dependent on an individual being

able to infer the meaning of a victim's behaviour by understanding their inner emotional and cognitive states. In order to understand the meaning behind a victim's behaviour an individual requires the ability to represent their thoughts, feelings and show empathy towards another individual, which all require Theory of Mind. The functions of Theory of Mind can be inhibited in an individual diagnosed with Schizophrenia and therefore the VIM, as outlined by Blair (1995), ceases to be activated. Empathy plays a crucial role in both the VIM and Theory of Mind functioning. Addy, Shannon and Brookfield (2007) refer to Feshbach (1978, 1987) who defined empathy as a three-part process. The first step requires the individual to 'discriminate' affective cues in others, the second part entails the individual's ability to assume a perspective based on these cues, and the third part is the ability to experience the emotional responses to these cues.

Krakowski, Czobor, and Chou (1999) conducted research with the purpose of examining persistence and resolution of violence in relation to psychotic symptoms. They assessed the psychiatric symptoms and ward behaviours of participants who took part in the study. A group of individuals diagnosed with Schizophrenia or Schizoaffective disorder and a group of non-violent controls were recruited and participants were followed and observed for a period of four weeks. Krakowski *et al.*, (1999) noted that the individuals diagnosed with Schizophrenia presented evidence of persistent violence and had greater neurological impairment when compared to the non-violent individuals. The neurological impairments appear to be more prominent in patients with negative symptoms (Merriam *et al.*, 1990 & Wong *et al.*, 1997 cited by Krakowski *et al.*, 1999).

Abby, Shannon and Brookfield (2007) note how individuals with Schizophrenia demonstrate Theory of Mind impairments, as well as an increased risk of violence, particularly from those individuals diagnosed with paranoid Schizophrenia (Mullen, 1997; Walsh, Buchanan, & Fahy, 2001). Addy *et al.*, (2007) utilised several cognitive tasks in a single case study of an individual. The first task focuses on an individual's ability to read emotions from facial expressions. The 'Reading the Mind in the Eyes Test' (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) comprises 36 photographs of the eyes of famous actresses and actors. The participant is required to use 'motor empathy processes' in order to identify which emotion is being conveyed (p. 300). In

the case study presented by Addy *et al.*, (2007) the participant scored 18/36 demonstrating that he had significant difficulties when trying to identify the emotional meaning in eye expression. The average score in non-clinical controls for recognition is 23.3 (SD, 4.3). Collectively, the research around VIM and motor empathy processes suggests that individuals with psychotic based disorder, such as Schizophrenia, experience biases in emotional processing and in particular when individuals are required to read a displayed emotion.

A well-known example of a case whereby mental disorder and violence has been disputed is the case of Peter Sutcliffe colloquially known as the ‘Yorkshire Ripper’. Sutcliffe murdered at least thirteen women whilst arguably experiencing command hallucinations instructing him to kill. Active delusions appear to have powerful features whereby there is a reduction in self-control and an increase in dominance of the individual’s mind by perceived forces (Prins, 2005). Despite this active phase, Sutcliffe quite possibly would have appeared quite sane and rational in other aspects of his life (Prins, 2005). Due to Sutcliffe’s delusions he was able to plead ‘diminished responsibility’ for reasons of insanity. His condition, paranoid Schizophrenia, does not excuse his offence, however, there are several points and questions that arise from such cases. Firstly, consideration for the manner in which an individual who offends in this way should be dealt with in terms of the court of law. Secondly, high profile cases like the ‘Yorkshire Ripper’ demonstrate the need for research to enhance the understanding of the links between mental illness and violent offending in order to prevent further cases from occurring. Cases such as these also present questions around diagnosis and the considerations of the historical aspects of individuals’ disorders which are not always accounted for in court (Prins, 2005).

The National Institute of Mental Health (NIMH: 2007) cites Swanson *et al.*, who describe two possible pathways by which individuals with Schizophrenia may become violent. One of the possible pathways is linked to pre-existing conditions, for example, antisocial conduct in childhood, regardless of the presence of psychotic symptoms which may be linked to violent behaviour. The second pathway is characterised by the psychotic symptoms of Schizophrenia that could lead an individual to become violent. However, the NIMH also recognises that violence is associated with alcohol and drug

abuse, unemployment, living with family or in a restricted setting, recent arrest, or recent involvement with the police.

Overall, despite the media's contribution to an exaggerated and misrepresented understanding of the links between Schizophrenia and violence, it has to be acknowledged that there is a wealth of research that indicates there to be an association between certain forms of Schizophrenia (e.g. Paranoid Schizophrenia) and violence. This association is elevated when considering specific symptoms or features of the disorder rather than a diagnostic category (Link & Stueve, 1994), in particular experience of delusions of external control, obsessive thoughts and paranoid notions have been associated with violence (McNeil *et al.*, 1988; Lindqvist and Allebeck, 1990; Swanson *et al.*, 1990; Hodgins, 1992; Link *et al.*, 1992; Wesseley *et al.*, 1994; Taylor, 1995; Monahan *et al.*, 2001; Hodgins and Muller-Isberner, 2001; Hodgins and Gunnar-Janson, 2002; Monahan, 1992; 2002; Louw *et al.*, 2005).

### **1.3 Schizophrenia**

A diagnosis of Schizophrenia is applied to 1% of the general population, with men and women being equally affected (Jablensky, 1995). The onset of Schizophrenia is typically between the ages of twenty and thirty-five, with females developing symptoms around three to four years later than males (Crow, 2001). Schizophrenia is often incorrectly referred to as a 'split personality disorder'. This definition, despite being inaccurate, captures one characteristic that is more widely supported, 'split'. Schizophrenia is rather more like a 'split' from reality disorder, where individuals find it difficult to distinguish between that which is reality and that which are fantasies and thoughts (Prins, 2005). Prins (2005) describes this as a 'splintering of the mind', whereby an individual's 'personality shatters and disintegrates into a mass of poorly operating components rather than a near division into two parts' (p105).

Bleuler (1911) was one of the first researchers to refer to a disorder like Schizophrenia. He supported that there were four main symptoms of 'Schizophrenias', which he suggested was a 'split mind'. The four main symptoms according to Bleuler were ambivalence, disturbance of association, disturbance of mood and a preference for *fantasy over reality*. This definition captures the conflict between two states

recognising there to be a co-existence but conflict between fantasies overriding reality. He describes a splitting of the self, accompanied by a loss of feeling and activity, inhibiting the ability to direct thoughts.

Moritz and Woodward (2005) note how many individuals with both Schizophrenia and delusions tend to dramatically switch their attitude towards the people who are present in their paranoid belief depending on the situational context. For example, Moritz and Woodward describe how a patient can at one time judge their doctor as the devil and sometime later, while still being psychotic, approach him or her and ask for a psychotherapeutic appointment.

Sass and Parnas (2003) argue that Schizophrenia is underpinned by an experience of an exaggerated self-consciousness or hyper reflexivity. This experience is characterised by an extreme focus of awareness towards the self. This can lead to an individual experiencing a disruption in self-awareness i.e. a focus upon the self therefore, reducing the individual's self-awareness. They suggest that 'selfhood' is not a process of self-monitoring or self-consciousness but rather selfhood is 'prereflective'. When applied to a case of delusional thoughts, then individuals may confuse their own thoughts as those of others therefore believing that their own actions are commenced by others.

Lee, Folley, Gore, and Park (2008) compared brain activity in healthy participants and individuals diagnosed with Schizophrenia. Healthy individuals displayed increased activity in the right frontal, temporal and cingulate regions of the brain to remember specific locations, whereas individuals diagnosed with Schizophrenia used a wider network of areas on both sides of the brain, therefore, suggesting that they rely on a more diffused and wider network to achieve the same goal. When healthy participants forgot they became unsure and had no confidence in their response. Furthermore, the brain areas associated with memory remained inactive. However, when individuals with Schizophrenia represented forgetfulness they were very confident that they had remembered and their brain activation pattern looked exactly the same whether they remember correctly or not. Lee *et al.*, (2008) suggested that the evidence

of confidence in an incorrect memory trace might be one way to approach understanding the initiation of delusions.

### 1.3(a) Diagnostic criteria for Schizophrenia

#### *Psychological perspectives*

There are two main diagnostic manuals that assist in the diagnosis of disorders by clinicians. These manuals have both similarities and differences in their approach to the categorisation of conditions. The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR, 2000) defines Schizophrenia as the following: "Schizophrenia is a disorder that lasts for at least 6 months and includes at least one month of active-phase symptoms". According to DSM IV-TR an individual has to present two or more symptoms from the following three groups for at least a significant period of time within one month. The symptoms of Schizophrenia can be categorised into three main groups: positive (Type I), negative (Type II) and disorganised. Positive symptoms are added characteristics that an individual with Schizophrenia can present when compared to an individual without Schizophrenia. For example, symptoms such as delusions of control, grandeur and reference, hallucinations that are usually auditory in the form of a voice, and the feeling of thoughts being placed into one's mind. Moller and Husby (2000) and Blackwood *et al.*, (2004) maintain that delusional thinking is in part accompanied by an exaggerated focus on the self and stimuli that are related to the self. This in part ties one of the symptoms of Schizophrenia, delusions, with the cognitive process Theory of Mind. Diagnosed individuals commonly show signs of delusions whilst being unable or unaware of other individuals' 'mental state concepts' (Baron-Cohen, 1999). There is a negative group of symptoms that include characteristics that are absent from individuals with Schizophrenia when compared to individuals without Schizophrenia. These include symptoms such as poverty of speech, apathy and withdrawal in terms of social participation. The final group of symptoms are 'disorganised' in nature. These include disorganised speech and neologisms, disorganised or catatonic behaviour (Bennett, 2006).

Table 1.0: Categories of Schizophrenia according to DSM IV-TR

Disorganised	disorganised speech & behaviour
Paranoid	stable, paranoid delusions & auditory hallucinations
Catatonic	psychomotor disturbances, dreamlike state & hallucinations
Residual	Disturbance & negative symptoms

Each of these classifications places emphasis on the positive, negative or disorganised symptoms of Schizophrenia. The diagnostic manual DSM IV-TR (2000) works on a multi-axial classification system. There are 5 axes on the DSM structure which all account for different aspects of a mental illness. A judgement is required, by the clinician, on each of the axes in order to diagnose and consider a broad range of information. Axis I consists of all the diagnostic categories apart from personality disorders and mental retardation, which together make up axis II. Axes II and I together comprise the classification of abnormal behaviour. Axes III, IV and V exist in order to assess broad life experiences of the individual's disorder. Axis III relates to any general medical conditions which might be linked to the cause of any diagnosis made on axis I. For example, it might be that an individual is diagnosed with Depression, which is linked to a medical condition relating to a hormone imbalance. Axis IV provides the opportunity to consider psychosocial factors and environmental problems such as occupational or economic problems. The final axis entails a global assessment of functioning places on a scale. The Global Assessment of Functioning Scale is one method of the clinician calculating the individual's current level of adaptive functioning. This includes considering social relationships, occupational functioning and the time that the individual spends on leisure activity (Kring, 2007).

The International Statistics Classification of Diseases and related health problems is in its 10<sup>th</sup> edition (ICD-10). This provides an international guide to the clinical assessment of disorders and health problems according to the World Health Organisation. ICD-10 describes Schizophrenia as a severe mental disorder that is characterised by disruptions in thinking, language, perception, and the sense of self. Furthermore, in its severe form, individuals with Schizophrenia encounter psychotic

experiences, such as hallucinations and delusions. According to the ICD-10 manual Schizophrenia is assigned to the F 20 categories ranging from 20 – 29 (see appendix A1).

#### *Limitations of the diagnostic procedure*

The issue of diagnosis is clearly a problem when encountering any link to mental illness. There are fundamental problems in terms of subjectivity when an individual is clinically diagnosed with a mental illness. Essentially, despite training, a clinician is making a judgement according to the diagnostic tool as to whether, in their opinion, another individual is carrying the symptoms that suggest they have a mental illness. Rosenhan's (1973) observational study demonstrates the subjective nature of both diagnosis and treatment when Rosenhan and his colleagues were referred to a mental institution. A number of further studies have questioned the reliability, in particular inter-rater reliability, of the diagnosis process (Crom, 2001).

Schizophrenia is an episodic disorder and consequently, the symptoms are not always present. Symptoms of Schizophrenia display themselves in episodes that can last as little as a few weeks or as much as several months. Consequently, diagnosis becomes problematic as it relies heavily on the patient's memory and own accounts for their behaviour and symptoms. It is almost impossible to account for the intentions of another person's behaviour purely from a meeting with little observations (Ainsworth, 2000).

There are several considerations that should be made when diagnosing Schizophrenia. Firstly, the diagnosis of Schizophrenia is often considered to be controversial and misused. Furthermore, there is a tension that exists between whether or not individuals diagnosed with the disorder are helped or hindered (Bennett, 2006). In order for an individual to be treated or receive help they have to undergo a clinical diagnosis. However, once diagnosed, individuals can find it increasingly difficult to gain employment and consequently can feel left at the edge of society.

## **1.4 Clinical populations**

There are a number of issues that arise when testing a sample of individuals diagnosed with clinical disorders (e.g. Schizophrenia) in order to explore possible connections to crime and violence. First, individuals may either have a record of consuming illegal substances or it is likely that they are undergoing treatment and therefore consuming prescribed medication (co-morbidity). Either way, it becomes difficult for research to identify a cause and effect, and therefore it is increasingly difficult to establish whether the condition is the root cause of their finding, or whether another influential factor is taking effect (for a full discussion of the issues associated with the study of clinical populations see section 2.2 page 53).

Recent research has made attempts to alleviate this potential problem by using a sample of 'non-clinical' participants who undergo a psychometric test in order to measure their psychopathological tendency with regards to their personality as a representation of some of the characteristics associated with Schizophrenia (Sellen, Oaksford & Gray, 2005; Galbraith, Manktelow & Morris, 2008). Schizotypal psychopathological characteristics can be found on a continuum (Claridge & Brooks, 1984; Eysenck & Eysenck, 1975), in which they present themselves to varying degrees. Van Os *et al.*, (2000) suggest that this is due to a continuous phenotype which opposes the categorical approach of mental illness which maintains that symptoms are either present or not. Consequently, there exists a major sub-clinical category of psychopathological behaviour, referred to as Schizotypes (Claridge, 1998). Schizotypes share a number of common characteristics with Schizophrenia, for example, Phenomenology (Kendler, 1985) and performance deficits on the Wisconsin Card-Sorting Task (Lenzenweger & Korfine, 1994), which Tsakanikos (2004) notes are largely associated with the negative symptoms of Schizophrenia. Executive functioning deficits have therefore been detected in non-clinical participants who score highly on psychometric measures of Schizotypy (e.g Poreh, Ross, & Whitman, 1995; Suhr, 1997; Tsakanikos & Reed, 2003). Impaired performances on executive functioning tasks have been specifically associated with negative Schizotypy (Poreh *et al.*, 1995; Suhr, 1997; Tsakanikos & Reed, 2003), and Roitman *et al.*, (1997) provide evidence for the common biological, phenomenological, and cognitive similarities that exist between Schizophrenia, Schizotypal Personality and Schizotypy. Their research particularly

highlights the abnormality in attention that is common in both Schizophrenia and Schizotypy.

#### 1.4 (a) Schizotypy

Schizotypy is a sub-clinical category that captures individuals who present schizopsychopathological characteristics but do not acquire a clinical diagnosis. In some cases it appears that individuals may progress through Schizotypy, as a prodromal phase/state, before entering and developing into an active phase of Schizophrenia (Yoon, Kang & Kwon, 2008). Schizotypes are often characterised by an individual being quirky but awkward in social interaction, showing signs of ‘odd’ behaviour and language (Bentall, Claridge, & Slade, 1989).

A number of approaches have been developed in order to assess Schizotypy in non-clinical populations. These approaches have in most cases resulted in psychometrics which aim to measure features of Schizotypy according to a particular approach and theory. Many of the studies have used variations of factor analysis to explore the factors and constructs that relate to Schizotypy, confirming that Schizotypy is a multifactor construct (Claridge, McCreery, Mason, Bentall, Boyle, slade & Popplewell, 1996). The number of constructs differ between models but contemporary studies have explored a five factor model, however, this has largely been inconsistent and therefore not conclusive (Vollema and van den Bosch, 1995).

#### 1.4(b) Three-factor construct of Schizotypy

It is generally accepted, by psychologists and increasingly by psychiatrists that, Schizophrenia and SPD symptoms are clustered around three factors: positive symptoms; negative symptoms; and disorganization (Peters, Joseph, Day, and Garety, 2004). Similarly, various studies suggest that Schizotypal features are also clustered on 3 factors in the general population (Gruzelier et al., 1996; Chen et al., 1997; Reynolds et al., 2000), in accordance with Raine’s 3-factor model (Raine et al., 1994). This model suggests a very similar structure to the 3-dimensional model of Schizophrenia (cognitive-perceptual, interpersonal, and disorganization). Alternative theories also suggest 3-factor structures (Bergmann et al., 1996; Battagliaet et al., 1997), for example, Bergmann’s model (1996) of cognitive-perceptual, interpersonal, and paranoid

dimensions. Despite an increasing support for a three factor model of Schizotypy, recent studies have explored four and five factor models, however, these have generated inconsistent findings and therefore non-conclusive evidence for additional factors.

#### 1.4 (c) Four-factor construct of Schizotypy

Other research has explored Schizotypy as a four-factor construct (Bentall, Claridge, & Slade, 1989; Vollema & Van den Bosch, 1995). The first three dimensions correspond to a three-factor model of Schizophrenia (Liddle, 1987): a positive ('Unusual Experiences'), a negative ('Introverted Anhedonia'), and a disorganized dimension ('Cognitive Disorganization'), and the fourth dimension ('Impulsivity Non-conformity').

##### *Unusual experiences:*

Unusual experiences, also referred to as a positive dimension, is characterised by a disposition to have unusual perceptual and other cognitive experiences. The experiences are usually reflective of the positive symptoms associated with psychosis, for example, hallucinations, delusions, magical or superstitious beliefs and interpretation of events (Bentall, Claridge, & Slade, 1989; Vollema & Van den Bosch, 1995).

##### *Introverted anhedonia:*

The construct known as introverted anhedonia refers to the tendency for introverted, emotionally flattened and asocial behaviour, usually associated with a deficiency in the ability to feel pleasure from social and physical stimulation. This dimension is reflective of the negative symptoms that are associated with psychotic disorders such as Schizophrenia (Bentall, Claridge, & Slade, 1989; Vollema & Van den Bosch, 1995).

##### *Cognitive disorganisation:*

Some individuals often experience or display a tendency to mix up their thoughts, or for their thoughts to become disorganised or divergent. In other words,

their cognitions and cognitive processing becomes disorganised (Bentall, Claridge, & Slade, 1989; Vollema & Van den Bosch, 1995).

*Impulsivity non-conformity:*

Impulsivity non-conformity refers to the disposition for unstable mood and behaviour particularly with regard to rules and social conventions. This links to the impulsive and aggressive aspects of psychosis, based on the ‘Psychoticism’ scale (Eysenck & Eysenck, 1975).

1.4(d) The development of Psychometric Tests

Various studies have confirmed that high-Schizotypy scorers, as identified by the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE, Mason et al., 1995) sub-scales, demonstrate neuro-cognitive deficits similar to those of individuals with Schizophrenia (Burch, Steel, & Hemsley, 1998; Goodarzi, Wykes, & Hemsley, 2000; Rawlings & Goldberg, 2001; Tsakanikos & Reed, 2003). The O-LIFE measures individual’s feelings and experiences on a four part scale reflective of the four-factor construct (Bentall, Claridge, & Slade, 1989; Vollema & Van den Bosch, 1995): Unusual Experiences; Impulsive Nonconformity; Cognitive Disorganization; Introvertive Anhedonia.

The development of tests such as the Peters Delusions Inventory (PDI: Peters et al., 1999) and the O-LIFE (Mason et al., 1995) has enabled research to be conducted on non-clinical populations (see section 2.4 for more details), alleviating problems such as co-morbidity but still informing, and providing a platform for, research knowledge about disorders such as Schizophrenia and Psychosis (Le Pelley et al., 2010). Therefore, there is a lot to be learned from sub-clinical populations who score high for Schizotypal tendencies. This particular sub-clinical group is also referred to as ‘at risk of delusions’ and ‘psychosis prone’ (Sellen, Oaksford, and Gray, 2005).

Recent research found that Schizophrenia and individuals scoring high for Schizotypal tendencies share a number of common reasoning deficits. For example, Galbraith *et al.*, (2008) report that individuals with subclinical delusional ideation

exhibit a self-reference bias when engaging in everyday reasoning tasks. In addition, Sellen *et al.*, (2005) found that individuals who score high for the dimension of Schizotypy ‘Impulsive Nonconformity’, dismissed a number of counterexamples when providing responses to a problem, and therefore adopted a ‘jump to conclusions’ style of reasoning.

## **1.5 Reasoning**

The research studies that have explored Schizotypy have indicated that high scores for Schizotypal traits experience cognitive deficits which resemble those experienced by individuals with Schizophrenia. More specifically, individuals experience biases and deficits in reasoning abilities which could impact upon everyday reasoning and therefore reasoning processes that occur in the real world. This section will outline a number approaches to reasoning from a cognitive psychology perspective and the developmental psychology perspective in order to gain a broader view of reasoning theories and models that could be applied to crime based problems.

### **1.5 (a) The Cognitive Perspective**

The cognitive theories of reasoning focus on the mental processes and structures that are involved when embarking upon a given reasoning problem. Consequently, the cognitive theories attempt to explain the mechanisms associated with this process.

Humans are constantly reasoning as they approach situations in their everyday life. A simple task such as deciding which coffee to order, what time to leave the house, whether to take a coat and whether a friend really meant what they said, entails a process of reasoning. Eysenck & Keane (2005) suggest that reasoning is the process of making a calculation of the outcome or conclusion when accounting for a given set of information. Accordingly, a person’s behaviour is navigated by their ability to reason and calculate what the most likely outcome will be if they follow a certain pattern of behaviour. Reasoning therefore can be applied as a label to any situation where an individual is faced with considering the outcome of a situation in light of the contributing factors. The process of reasoning naturally lends itself to the domain of cognitive psychology, which focuses on assessing the processes occurring in the human’s brain in an attempt to make sense of the environment around us and consequently initiate a suitable action. These internal processes include thinking,

attention, memory, learning, perception, problem solving and reasoning.

Reasoning, according to cognitive psychology, can be categorised into two groups: Deductive reasoning and Inductive reasoning. Deductive reasoning is based on a conclusion that is certain. Manktelow and Over (1993) suggest deductive reasoning is dependent on three principal skills; the individual must first understand or comprehend some initial information; they must be able to generate a supposed conclusion, and finally they must be able to consider the validity of the conclusion. Over and Jessop (1998) maintain that individuals should be certain about the validity of their conclusion whenever they are certain about the premises. The premises are the grounds and basis on which an individual's conclusions are drawn and the information on which a decision is made. An example being, there are 32 books on the top-shelf of the bookcase, and 12 on the lower shelf of the bookcase. There are no books anywhere on the bookcase. Therefore, there are 44 books in the bookcase. Deductive reasoning tasks present participants with arguments that are neither valid nor invalid. The participants have to decipher the truth of the conclusion based upon the truth of certain premises. Manktelow & Over (1993) describe the deductive mechanism as being 'rapid' as the reasoning task is reliant purely on the information presented to the individual and places as minimal a load as possible on memory processes.

The second method of reasoning is built on a conclusion that is probable rather than certain. Inductive reasoning uses a process of hypothesis testing that involves inducing or formulating a rule based on limited information in order to evaluate the likelihood of the conclusion. Bisanz, Bisanz and Korpan (1994) note that inductive reasoning engages individuals with hypothesis generating processes that mimic the characteristics of scientific investigations. Inductive reasoning does not have a logical movement from premise to conclusion, however, the premises are possible explanations that are worthy of convincing an individual of the conclusion whether the conclusion in fact is correct or incorrect. Therefore, inductive reasoning is used when formulating theories and discovering new relationships and connections.

Beller & Spada (2003) considered the impact of social rules on the way that individuals reason. People reason by thinking about which action an individual might

or should perform in terms of conforming to social rules, referred to as Deontic reasoning. In order for an individual to reason a mental model is constructed which presents the 'meaning of' a premise or premises. Johnson-Laird (1983) suggests that humans form a mental model or representation from the premises that are provided in a problem. Individuals therefore rely on the mental models to solve or conclude a problem rather than using a set of rules. Mental models are, therefore, representations in the mind of real or imaginary situations. Johnson-Laird (1999, as cited in Eysenck and Keane, 2005) states that

'...each mental model represents a possibility, and its structure and context capture what is common to the different ways in which the possibility might occur' (p. 516).

In other words, an individual constructs a mental model by the description of a given situation, the conclusion to a given situation is generated and an attempt is made to create alternative explanations that will falsify the conclusion. If an alternative explanation is not generated or does not falsify the conclusion then the conclusion is assumed to be valid. In a deductive reasoning task several mental models are created which places demands on working memory. Working memory (Baddeley and Hitch, 1974) outlines the system of temporary storing and processing information.

According to Abstract Rule Theory individuals use mental logic when confronted by a reasoning task. Logic, therefore, is a natural mechanism used by individuals when faced with a problem, however, errors can occur if an individual 'misunderstand' or 'misrepresent' the reasoning task (Braine, 1978, 1994, 1998). Braine defines human reasoning through the use of schemas. Since they provide a cognitive framework or concept that help individuals to organise and interpret information. They allow the interpretation of vast amounts of information rapidly but can also lead to information being excluded, as there is a natural favour towards stimuli that confirm existing beliefs. Categories and schemas provide individuals with ways of talking about expectations and their effects. Individuals therefore approach a given situation with an assumption surrounding the way in which they should behave and the possible effects that their behaviour will have. However, these can sometimes be dramatically incorrect. The schema theory supports a top down, conceptually driven

process whereby previous knowledge or data is applied to stimuli. As Fiske and Taylor (1991) propose, schemas give individuals a sense of comfort as they provide a concept of understanding the world.

Braine (1978, 1994, 1998) suggests that individuals interpret the premises of a given problem and encode it into a mental representation in working memory. Abstract Rule schemas are utilised in order to assess the premises and create a conclusion. A series of schemas are used in order to encode the fundamental reasoning rules and create conclusions for 'core' schemas. According to this approach there are three main reasons for errors to occur whilst reasoning. The main issue lies around understanding the reasoning problem in terms of an incorrect interpretation of the premises leading to an incorrect conclusion. It is however, possible for errors to occur due to both a failure to attend fully to the task and if participants process the reasoning task in an incorrect way (heuristic inadequacy).

#### 1.5 (b) The Developmental Perspective

The developmental psychology perspective provides an alternative approach to the cognitive theories of reasoning in the form of theories of moral reasoning (Palmer, 2003). This approach is interested in an individual's development and experiences which form the basis for their morality. Ultimately, an individual's morality guides and informs the individual's decisions and consequently their behaviour.

Developmental psychology is concerned with how individuals develop as they progress through, and experience, life. Kohlberg's (1958, 1969) theories combines elements of the developmental approach, in terms of how an individual progresses, with elements of cognitive psychology, in terms of the level at which an individual reasons. The process of progression to the next stage is referred to as 'equilibration'. Kohlberg's theory was an extension of Piaget's (1985) early research focusing on children's development. Piaget believed that children had to strike a balance between 'assimilation' (previous knowledge) and 'accommodation' (changing behaviour) which is achieved through a mechanism called 'equilibration'.

Moral reasoning theories consider how individuals are subject to different domains of rules. For example, there are *moral rules* that are designed to protect

individuals and are based on what behaviours are morally right and wrong, *social conventional rules* based on behaviour traits that are agreed upon by a cultural group to ease interaction, and finally, *personal rules* (Smetana, 1995 & Turiel, 1998). Piaget (1969) contributed to moral reasoning theory through a cognitive developmental approach, based on research that he had conducted on the development process of children's logical thinking. He proposed that children's moral reasoning developed from the perception of fixed rules that were external to the individual. As children develop their thinking matures and they begin to realise that the fixed rules are more adaptable (Crain, 1985). Kohlberg (1969, 1976, 1978) revised and extended Piaget's theory creating further stages that encapsulate adolescence and adulthood. Kohlberg maintained that an individual's ability to reason develops qualitatively as they mature through each stage. He proposes a six-stage development process grouped into three levels: pre-conventional reasoning, conventional reasoning and post-conventional reasoning.

<p><b>Level 1: Pre-conventional or pre-moral</b></p> <p>Stage 1 - <i>Obedience and punishment orientation</i> - Right action consists of obedience to rules backed by punishment administered by powerful others.</p> <p>Stage 2 - <i>Instrumental purpose and exchange</i> - Right action is what serves someone's immediate interest. Emphasis on meeting one's own needs while recognising those of others.</p>
<p><b>Level 2: Conventional</b></p> <p>Stage 3 - <i>Interpersonal accord and conformity</i> - Right action consists of living up to one's expected roles. Behaviour judged in terms of good intentions, trust, loyalty, concern.</p> <p>Stage 4 - <i>Social accord and system maintenance</i> - Right consists of fulfilling one's agreed duties, upholding laws and contributing socially.</p>
<p><b>Level 3: Post-conventional or principled</b></p> <p>Stage 5: <i>Social contract</i> - Right action is what upholds general rules and values as part of the social contract.</p> <p>Stage 6: Universal ethical principle - Right is defined in terms of self-chosen and universal ethical principles of justice, human rights and dignity.</p>

Figure 1.1: Levels and stages of moral development (Kohlberg).

Ashkar and Kenny (2007) report that offenders reason at a lower level of morality than non-offenders, moreover, their level of morality correlated with the nature of their offence and offending context. This would suggest that an offenders morality,

according to Kohlberg's theory, does not develop and therefore offenders rarely progress from level one.

An alternative theory to consider is Theory of Mind by Baron-Cohen (1999). Baron-Cohen (1999) has applied Theory of Mind to further understand cases of Autism. Interestingly, Autism and Schizophrenia were not differentiated in early versions of DSM used for diagnosing mental disorders (Bennett, 2006; Browning & Caulfield, 2011). Baron-Cohen (1999) defines Theory of Mind as a cognitive process that enables individuals to have the capacity to imagine or represent their own and others' states of mind. He suggests that individuals can never be certain of what they or other people are thinking but it is easy to imagine what another person is thinking or feeling by reading other people's moods, behaviour and psychological states. He calls these cognitive attributes 'mental state concepts'. By around the age of four a 'normal' child has developed Theory of Mind which is demonstrated through their ability to work out what people might know, think and believe (insight). An example of how Theory of Mind is applied by an individual is outlined by Scholl and Leslie (1999: 131):

'If you see a person running to catch up with a just-departing train, for example, you interpret the person as an intentional agent, who *believes* that there is a just-departing train, and who *wants* to get on it'.

Scholl and Leslie (1999) maintain that Theory of Mind is reliant both on cognitive modules and development. Traditionally, Theory of Mind from a cognitive perspective was defined as an attribute that was thought of as static and deriving from an innate, encapsulated and domain specific part of the brain (Baron-Cohen, 1994, 1995; Leslie, 1987, 1991, 1994). However, more recent studies argue that Theory of Mind is a developmental process (Bartsch and Wellman, 1995). Scholl and Leslie (1999) argue that Theory of Mind might be grounded as a cognitive module and yet still affords development through developmental sequences. An important aspect of Theory of Mind is the ability to understand that one can make mistakes about the world. In other words individuals have the capacity to believe in a false belief (Perner and Lang, 1999) that has arisen from incorrect reasoning about given premises. Prior to developing this ability children appear incapable of comprehending how individuals who obtain a false belief will frequently make wrong choices when in pursuit of a goal.

### 1.5 (c) Cognitive Reasoning Tests

Many cognitive tests have been implemented in an attempt to measure reasoning abilities in individuals. The majority of these tests are linked to one or sometimes a few theoretical perspectives that address the ways in which people reason about the world in which they live. The inductive reasoning approach adopts a process that involves generating and testing a hypothesis. This method of reasoning is demonstrated using the selection task problem originally devised by Wason (1966, 1968). The standard procedure of the Wason Selection Task consists of four cards that are presented to the participants. Each of the four cards has either an A, K, 2 or 7 printed on them (see figure 1.2). Participants are then presented with a rule: ‘if there is an A on one side of the card, then there is a 2 on the other side of the card’. Participants are then asked to choose which two cards need to be turned over in order to decide if the rule is correct or incorrect (Rogers 2003: 41).

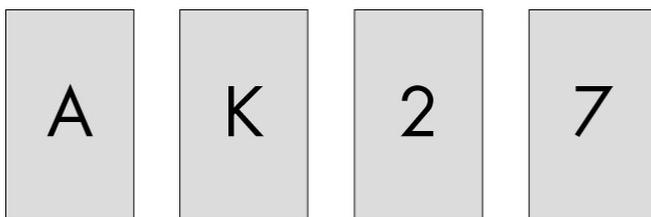


Figure 1.2: Examples of the Wason Selection Task (Wason, 1966, 1968).

This demonstrates the process of hypothesis testing. The cards that have ‘A’ and ‘7’ on them are the logically correct cards to turn over because turning over the ‘A’ card would confirm the rule if there is a ‘2’ on the other side of the card. Turning over the ‘7’ card refutes the rule if there is the letter ‘A’ on the other side. However, a common mistake made by some individuals is that they choose to turn over the ‘2’, despite the fact that the rule does not state that there must be an ‘A’ on the other side. It is thought that 46% of participants choose ‘A’ and ‘2’ (Evans & Lynch, 1972). Eysenck (2005) notes how the Wason Selection Task includes a type of conditional rule (indicative rule) that individuals often make mistakes on as they fail to think logically. It is also argued that the selection task has an abstract nature that makes the hypothetical problem difficult to solve. Oaksford & Chater (1994, 1998, 2001) note that individuals

make errors when participating in laboratory tests because they do not use logic in their everyday reasoning, rather, they reason in terms of their beliefs and prior experiences in order to calculate how likely something is (Probabilistic Theory). According to this theory, when an individual reasons they calculate a relevant conditional probability (Oaksford, 2005) whereby, they draw on what they believe to be true and what their experiences have previously informed them of in order to create a conclusion.

The principles of Deontic Reasoning can be applied to the original non-deontic selection task (Wason, 1996) previously mentioned. In the original task participants are required to select two cards that need to be turned over in order to find out whether a conditional rule is true or false. Beller and Spada (2000: 3) cite an adapted more ecologically valid version of the task.

Imagine that you are a police officer on duty. It is your job to ensure that people conform to certain rules. The cards in front of you have information about four people. On one side of a card is a person's age and on the other side is what the person is drinking. Here is the rule: If a person is drinking beer, then he or she must be over 19. Select the card(s) that you need to turn over to determine whether people are violating the rule (Griggs & Cox, 1982).



Figure 1.3: Example of an adapted Wason Selection Task (Griggs and Cox, 1982).

The cards that are presented to the participants show 'drinking beer', 'drinking Soda', '25 years', and '17 years' (see figure 1.3). The Deontic version of the selection task yields 70-90% of correct responses. The Deontic Mental Model suggests that individuals are able to construct mental models that inform them of which people or cards need to be checked because the drinking age 'rule' can be mapped to a normative

rule. The rule can be broken by an individual who is under the age of 19 and drinking beer, therefore participants can check this rule by selecting the appropriate cards; '17' and 'Beer'.

Fiddick (2004) claims that research needs to go beyond an exclusive focus on the selection task to make connection with the moral reasoning literature. He notes the difference in results that are observed between the original selection task, with fewer than 10% of participants giving the logically correct answer, and the deontic reasoning task, which has a substantially higher performance rate, that can be accounted for through several explanations. The pragmatic reasoning theory suggests that deontic content is the product of goal-directed schemas which supports the idea that reasoning draws on past experiences (Cheng & Holyoak, 1985). This theory explains reasoning as being dependent on pragmatic reasoning schemas. Individuals use schemas of previous experiences to develop an abstract rule at a pragmatic rather than logical level. An individual occupies clusters of abstract rules that are generalised but are defined by different relationships and goals.

The Wisconsin Card Sorting Task is an experimental design implemented to investigate reasoning (Everette, Lavoie, Gagon, Gosselin, 2001) by measuring 'concept formation' and 'cognitive flexibility'. Concept formation is regarded as the developed ability to respond to common features of categories, objects or events. Cognitive flexibility according to Spiro & Jehng (1990) is the ability to spontaneously restructure an individual's own knowledge in a variety of ways, in an adaptive response to radically change the demand of a situation. In the Wisconsin Card Sorting Task participants are instructed to sort cards into categories (see figure 1.4). For example, participants might be asked to sort cards into categories that represent shapes. The researcher then records how well the cards are sorted into the stated category. This element of the task measures 'concept formation' abilities of the individual. On completing the task the researcher might suggest a further category to sort the cards into, for example, representations of colour. The change of category assesses the individual's 'cognitive flexibility'. If the individual is able to respond to the change in category and hence sort the cards into colour rather than shapes they demonstrate a high level of cognitive

flexibility. However, if an individual continues to sort the cards again into the first category they demonstrate a low level of cognitive flexibility.

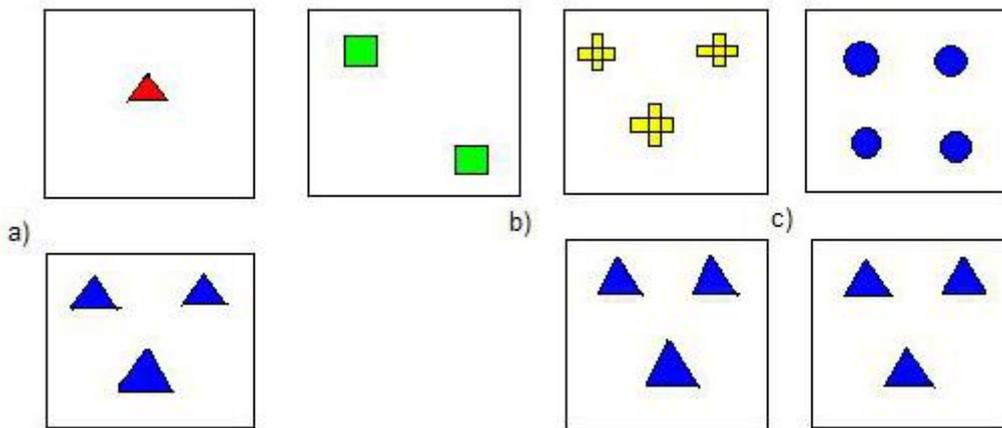


Figure 1.4: Example of the Wisconsin Card Sorting Task (Everette *et al.*, 2001).

There have been many replications of this design with further adaptations that have led to measuring the effects of training and instructions on task performance. Everette *et al.*, (2001) maintain that individuals who had Schizophrenia were successful at fewer categories, made more errors and needed more trials. They concluded that their study was consistent with the hypothesis of frontal dysfunction in individuals with Schizophrenia. Executive or frontal functioning is a part of the brain that allows individuals to interact and react to the environment around them. It is responsible for triggering an appropriate response to change in everyday life. Everette *et al.*, (2001) support that this function is impaired in individuals with Schizophrenia but they maintain that the perseverative deficit that is associated with both Schizophrenia and the performance on the Wisconsin Card Sorting Task can be overcome by verbal reinforcement. Hellman, Kern, Neilson and Green (1998) support the concept of verbal reinforcement acting as a beneficial factor whilst noting that contingent monetary reinforcement, outcomes linked to a causal behaviour, yield no benefits. Thurston-Snoha and Lewine (2007) conducted a study whereby they examined individuals with Schizophrenia who could perform adequately on the Wisconsin Card Sorting Task, which they suggest is usually challenging for individuals with Schizophrenia due to executive dysfunction. They found that patients with intact performance were more

similar than different from patients with impaired performance. However, scores differed significantly on the results from Andreasen's Scale for the Assessment of Negative Symptoms (SANS) and the Hamilton Depression Rating Scale (HDRS). The scores from the tests for positive symptoms were below significant. They conclude that individuals with intact Wisconsin Card Sorting Task performance skills present fewer negative symptoms than those with impaired performance.

This Wisconsin Card Sorting paradigm is a rule based task which focuses on measuring cognitive flexibility. The task is completed without the need for context and therefore is difficult to apply to real life scenarios, such as a criminal offense, where individuals make decision in a given setting, with complimentary, conflicting and coexisting arguments for or against a given decision. This kind of decision making requires a more broad approach, particularly given the previous findings on Schizotypal thinking and the jump to conclusion bias (Dudley & Over, 2003).

The Syllogistic reasoning task, also known as the logical reasoning task, requires deductive reasoning deducing a conclusion from the given premises. Syllogistic reasoning consists of two premises or statements followed by a conclusion. An example of a syllogism is:

*'All prudent men shun hyaenas, all bankers are prudent men, all bankers shun hyaenas'* (Lewis Carroll).

When presented with a syllogism an individual has to decide whether the conclusion is valid in light of the premises. This reasoning task measures several different kinds of reasoning. The first type, conditional reasoning, is a type of deductive reasoning that generates a conclusion based on the conditions that are applied to the premises. For example, a problem solved by conditional reasoning might follow the line of thought that 'if A is true then B is true'. The second type, categorical reasoning, like conditional reasoning uses a deductive reasoning approach. It suggests that individuals reason through categorising and making links as to what defines each category. For example, conditional reasoning might maintain that 'if A is in C then B is in C'. The final type is disjunctive reasoning. Disjunctive reasoning is based on the premise that 'if A is true then B is false'. Individuals diagnosed with Schizophrenia

performed poorer at such reasoning tasks compared with those who were not diagnosed with Schizophrenia (Domarus, 1994; Williams, 1964). Individuals commonly make errors in syllogistic reasoning tasks due to biases. These biases are centred on what they believe to be a plausible conclusion to the problem. Individuals accept the believable conclusion and reject an unbelievable conclusion irrespective of their logical validity or invalidity (Evans, Barston and Pollard, 1983). This suggests that in certain conditions individuals follow a conclusion on the basis of what they believe to be the conclusion rather than what makes a logical answer.

One of the earliest reasoning task designs presented a simple ‘problem’ using beads. Whilst there have been many variations (Menon, Pomarol-Clotet, McKenna & McCarthy, 2006; Broome *et al.*, 2007), one of the earliest designs was conducted by Huq, Garety and Hemsley (1988) and consisted of 2 jars of beads. One of the jars of beads contained a majority of black beads and the other jar contained a majority of white beads. Participants were instructed that a number of beads would be taken from one of the jars and they had to guess which jar the beads derived from (see figure 1.5).

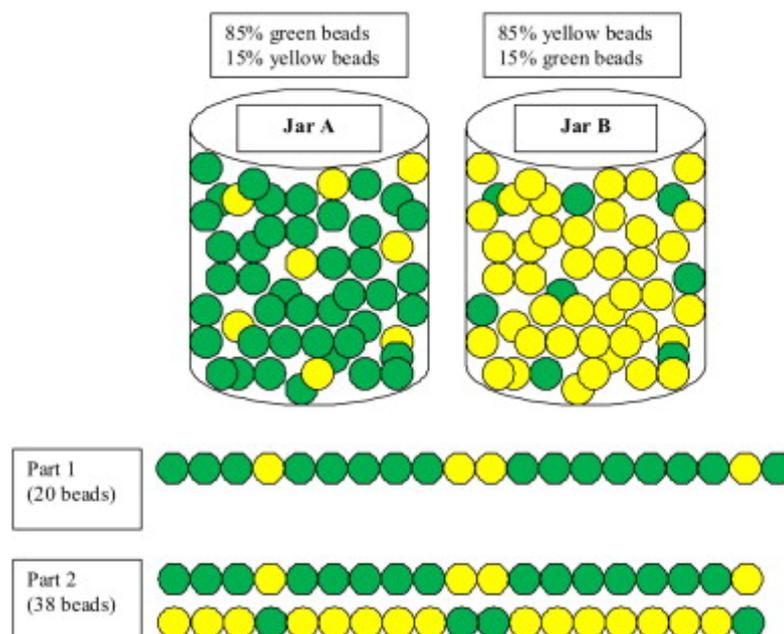


Figure 1.5: Example of the Beads Task (Rodier *et al.*, 2011)

This experiment procedure was conducted on individuals with delusions. According to Pridmore (2007) delusions are false beliefs that individuals believe despite evidence suggesting that they are false (these are beliefs which are not held by the general public, or any sub-group of the community). Delusions, according to Bennett (2005) can take form and present themselves in a variety of different ways, with bizarre delusions often being characterised by being absurd and factually not possible. Grandiose delusions on the other hand may be beliefs that an individual has great intelligence and influence over other people. Paranoid delusions are typically based around the belief that an individual is being watched and monitored. Often an individual will believe that there are some kind of ‘external body (ies)’ that are watching them. It was suggested by Dudley and Over (1997) that participants who had delusions were hasty to come to a conclusion requesting fewer beads, and therefore information, before deciding which jar the beads were being extracted from. The results from this study were significant in suggesting that participants with delusions do not reason differently from those participants without delusions but rather they base their decisions on less evidence in comparison to non-deluded individuals.

However, this method of research is not without criticism. Reasoning tasks such as these lack ecological validity, as they do not replicate the kinds of reasoning problems that individuals are likely to face in real life situations. It is also suggested that beads are not likely to be linked to delusions and therefore the findings of this study imply that deluded participants have more generalised reasoning differences.

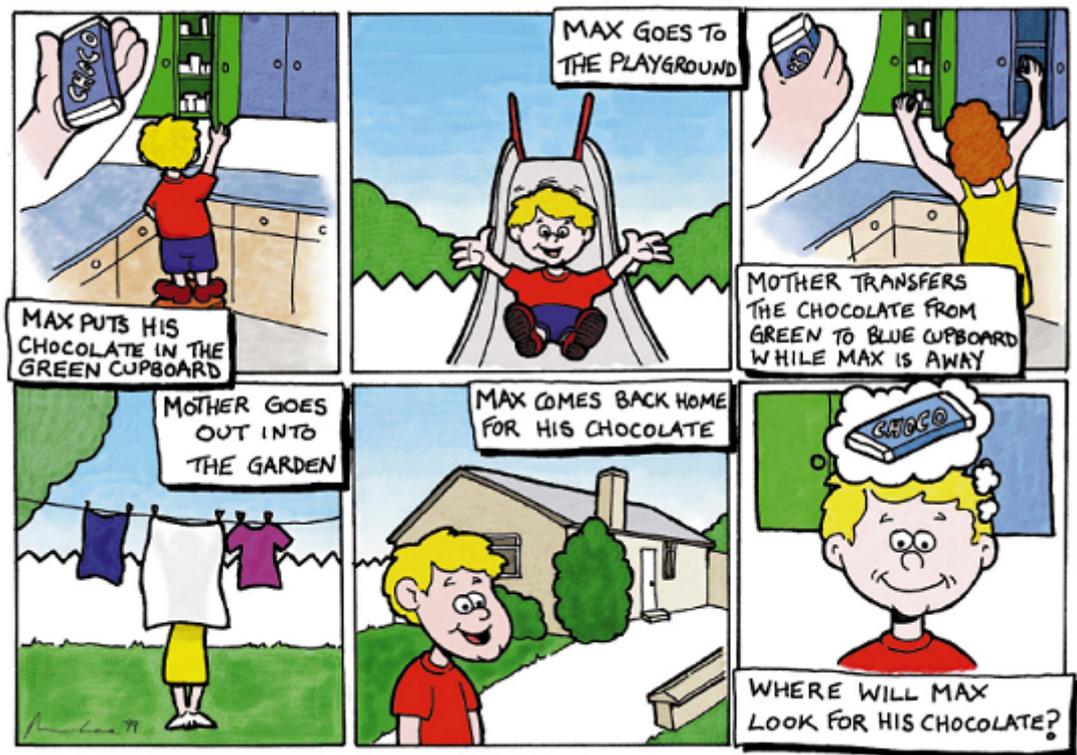
This research design has been replicated by Dudley and Over (2003) but has also been specifically adopted to investigate reasoning skills in individuals with Schizophrenia (Mortimer, 1996: cited in Dudley and Over, 2003). Moritz and Woodward (2005) reported that 40% to 70% of deluded patients make a decision after being presented with only one bead. They explore the issue of individuals with delusions having a ‘jump to conclusions’ bias. This is characterised by individuals having a tendency to make a quick decision based on very little evidence, supporting the idea that patients with Schizophrenia who show signs of delusions not only respond hastily in their decision-making but also need less time compared to controls when making definite judgments. This research design however, should be used with caution

in order to ensure that the Rosenthal effect does not occur during the implementation of the task. This effect occurs when the experimenter manipulates, intentionally or unintentionally, the participant's task performance via suggestive remarks.

Moritz, Woodward and Lambert (2007) conducted a selection of multiple bead tasks on patients with Schizophrenia in order to assess under what conditions individuals 'jump to conclusions'. A sample of 37 individuals with Schizophrenia compared with 37 individuals without Schizophrenia. They concluded that out of the different bead tasks that they utilised, two of the tasks provided further evidence to suggest that individuals with Schizophrenia are more hasty when drawing a conclusion and base their decisions on less evidence.

#### 1.5 (d) Developmental Reasoning Tests

Whilst the cognitive approach analyses reasoning through a number of tasks that focus on cognitive function, the developmental approach has utilised tasks that are more ecologically valid. A number of the tasks entail some kind of 'problem' that individuals might encounter whilst going about everyday life. The following task design relates to the concept of Theory of Mind (Baron-Cohen, 1999). This task explores one way that researchers can examine the ability that an individual acquires to read not only their own but other individuals' mental states. Dennett (1978) argues that an individual's understanding of beliefs can be tested by examining whether an individual can account for another individual holding a 'false belief'. The 'False Belief Task' is a test that is designed to measure this aspect of Theory of Mind in individuals. Participants are required to comment on a series of pictures that outline a scenario. Below (figure 1.6) is an example of a False Belief Task cited by Perner and Lang (1999).



*Figure 1.6: Example of a False Belief Task (Perner and Lang, 1999).*

The above scenario (figure 1.5) presents an individual with a story about a character called Max. Max places his chocolate in the green cupboard in his kitchen. Max's mother moves the chocolate from the green cupboard to the blue cupboard whilst Max is at the playground. The individual is required to state where Max will look for his chocolate on his return back to the kitchen. An individual who has Theory of Mind capability will understand that Max will look for his chocolate in the green cupboard on his return, despite the fact that the chocolate is now located in the blue cupboard. Therefore, this task requires the individual to understand Max's viewpoint and knowledge in order to respond correctly. An individual without Theory of Mind capability will not be able to understand that Max has a different level of understanding about the chocolate compared with the participant who can see the whole story.

There have been a number of similar tasks developed to explore 'false belief'. For example, Roth and Leslie (1998) created the 'screens task'. Individuals taking part in this task were presented with a box and a basket. The individuals witness a marble being placed into the box. The box and basket are then covered over by a screen. A

replica box and basket are placed in front of the screen. A marble is placed in the replica box, and then moved to the replica basket. Individuals are then asked ‘where is the marble behind the screen?’ Individuals are required to put to one side the current situation and generate an answer that is based on the previous situation.

Bloom and German (2000) maintain that the False Belief Task is difficult and relies heavily upon task demands of memory and attention that are only a small part of the reasoning skills utilised by Theory of Mind. The False Belief Task only accounts for one aspect of the capacity to reason about the mental states of others. They further criticise the task for lacking realism, as it does not capture reasoning skills in naturally occurring situations. However, this task is interesting in terms of examining the thought processes that individuals with Schizophrenia may go through when reasoning about a situation, but more importantly, how an individual transfers their own cognitive abilities in order to read and understand what another individual believes, thinks, feels, desires, intends and so on.

Bora *et al.*, (2007) explored Theory of Mind using ‘the Eye Test’. This test measures an individual’s ability to identify mental states requiring inferences about other individuals’ intentions and beliefs. This is tested by showing individuals photographs of people’s facial expressions capturing the eye region only. The individuals are requested to choose an appropriate response that best describes the mental state of the person in the photograph. Bora *et al.*, conducted the ‘Eye Test’ and the ‘False Belief Task’ on individuals diagnosed with Schizophrenia. They support that Theory of Mind deficits may be related to poor insight associated with Schizophrenia, suggesting that impaired Theory of Mind may contribute to the unawareness of their illness through inappropriate attribution. It is likely that the ability of an individual to be aware of their own disorder and its consequences requires the skills and abilities to evaluate ‘the self’ from another individual’s perspective.

Kohlberg and Colby (1987) devised an assessment tool called the Moral Judgement Interview (MJI), which comprises short stories to paint a picture of a moral dilemma. Participants are required to consider the situation and answer a series of questions relating to what decisions characters within the scenarios should make in light

of morality and society. Kohlberg analyses the participants' reasoning in terms of how they *justify* the answers that they give for each question rather than whether an answer is correct or incorrect. He supports that to some extent there are no right or wrong answers but rather what is important is how an individual qualifies and justifies why they have reached their conclusion. The MJI assesses individuals' justifications and explanations which are interpreted and assigned to one of the six stages that are outlined in Kohlberg's moral reasoning theory. Kohlberg's theory maintains that an individual's ability to reason around moral issues develops qualitatively as they mature through each stage and this is evident in the way that they perform on the MJI test.

The MJI is a well-used resource that has received much support in terms of its validity and reliability (Colby and Kohlberg, 1987; Rest, 1979). However, the main problem with the MJI method of assessment is the cost in terms of the amount of time it takes to conduct the interviews. An interview can take up to two hours to complete, and the marking and scoring of the test is considered to be both complex and time consuming. Furthermore, Gilligan (1982) notes how males and females have different moral orientations. Males tend to focus on 'justice' and 'fairness', whilst females are more concerned with 'caring' and 'empathy'. Therefore, Kohlberg's theory is biased in the way that it does not account for the differences between genders (Lifton, 1985; Nunner-Winkler, 1984). Kohlberg's theory is further criticised due to its bias against non-western cultures. The cultural bias that is supported by Snarey (1995) is centred again on the issues of 'justice' and 'fairness' which are pivotal concepts to western thought. However, the MJI is supported by Ashkar and Kenny (2007) who suggest that the MJI yields rich quality responses that measure an individual's ability to reason through a structured method of analysis that minimizes subjectivity.

#### 1.5 (e) Defining Issues Test (DIT) Rest (1979)

The defining issues test, like the MJI, contains a series of moral dilemmas. However, the DIT and MJI differ in terms of the required responses from participants. The DIT utilises a multiple-choice questionnaire in order to reduce the amount of time that it takes to complete the test when compared to the MJI. The DIT contains just six moral dilemmas, each followed by twelve statements. Participants are required to rate each statement in terms of its relative importance.

Participants are scored on the pattern of their responses and choices in terms of how important they rate each statement. A mature level of moral reasoning is concluded when individuals rank the higher moral stage items as being most important. The DIT test is considered to have both high validity and reliability (Palmer, 2003) in terms of the replications of results and internal consistency. The results that are gathered from the DIT are far more manageable in comparison to the MJI results. However, interestingly the correlations between the DIT and MJI scores are not considered to be very high. As Elm and Weber (1994) note the DIT and MJI tests are built in different premises. The DIT is concerned with measuring recognitions whereas the MJI is concerned with measuring the production and justifications of responses.

#### 1.5 (f) Reasoning Deficits in Schizophrenia

The cause of Schizophrenia remains unclear, and accordingly, the severity and extent of the associated deficits in cognitive skills are to some extent still uncertain. Recent research has suggested that individuals diagnosed with Schizophrenia experience deficits in reasoning as demonstrated through biases when completing traditional reasoning tasks. For example, Schizophrenia patients demonstrated differentiated scores on tests such as the Wisconsin Card Sorting Task (Everette *et al.*, 2001) where individuals failed to attend to new instructions (see section 1.5 page 41 for more details). Dudley and Over (2003) found that individuals diagnosed with Schizophrenia made decisions, when completing the Beads Task, based on the presentation of one or two beads (see section 1.5 page 43 for more details on the Beads Task). In addition, Schizophrenia patients generally perform poorly at syllogistic reasoning (see section 1.5 page 43 for more detail) tasks compared to ‘healthy’ individuals (Domarus, 1994; Williams, 1964). This suggests that Schizophrenia affects an individual’s executive functioning and consequently impacts upon their ability to reason and problem solve. This could potentially have serious implications on individuals’ everyday interactions, and consequently, a better understanding of the ways in which individuals with Schizophrenia reason is required.

Research conducted by Conklin, Curtis, Katsanis and Lacono (2000) explored aspects of working memory in individuals with Schizophrenia, first-degree relatives and

a non-psychiatric control group. As spatial working memory deficits appear to be well replicated within research, Conklin *et al.*, focused on verbal working memory. This area of research has led to less consistent results when considering individuals with Schizophrenia and therefore it is unclear whether working memory deficits in Schizophrenia are aspects of a limited 'spatial modality' or more generalised. Conklin *et al.*, include first-degree relatives in their research as they claim that if cognitive deficits are a reflection of the genetic underpinning for Schizophrenia then first-degree relatives are likely to share some of the same genetic material. Prior research, for example Stratta *et al.*, (1997), found differences between individuals with Schizophrenia compared to those without psychiatric disturbances. However, previous research did not test the relatives of individuals with Schizophrenia.

Conklin *et al.*, (2000) required individuals to complete the Wechsler Digit Span Task. They recruited a sample of 52 individuals with Schizophrenia, 56 first-degree relatives and 73 non-psychiatric individuals. Their results suggest that individuals with Schizophrenia as well as their first-degree relatives showed impairment on the backward digit span task. Both of these groups showed a significant difference in performance when compared to the non-psychiatric group. However, only the group containing individuals with Schizophrenia showed impairment on the forward digit span task. They conclude that the forward and backward digit span tasks tap into different cognitive abilities within the working memory model.

Perry *et al.*, (2001) suggest that there should be a distinct difference highlighted between 'transient "online" storage' and 'Executive Functioning'. They define the first as the process of information entering into short term storage and then being retrieved shortly after. Executive functioning differs as information is stored, then manipulated and finally retrieved. It has been suggested that working memory deficits have been highlighted in individuals with Schizophrenia which supports the idea that the prefrontal cortex, which is one area of the brain associated with working memory function, is impaired in patients with Schizophrenia (Goldberg *et al.*, 1993, Gold *et al.*, 1997 and Park *et al.*, 1999). The backwards digit span task places a greater demand on the central executive compared to the forward digit span task which requires a simple hold and repeat mechanism.

Kyllonen and Christal (1990) suggest that working memory and reasoning ability, core aspects of intelligence, are similar if not identical. Reasoning ability, therefore, has a primary influence over how much an individual will gain from instruction. There remains considerable debate as to what exactly working memory is and how researchers and clinicians can test working memory functioning in individuals. Schizophrenia patients tend to show varied performance when participating in tests of executive function (e.g. WCST) which suggests that they have a more generalised neuropsychological dysfunction.

### 1.5 (g) Insight deficit

Insight deficit is often linked to the cognitive features that are a part of Schizophrenia. The deficit is rooted in the concept of individuals being unaware of their own mental state. Research suggests that insight deficit is a 'state or mind'. Schwartz (1998) notes how insight has been interpreted in different ways. The tension is between lack of insight being a cognitive deficit or a psychological defence. This stems from more prominent debate concerning whether insight deficit is a unitary concept or a multidimensional construct. Amador and Strauss (1993) note how insight deficit can present itself as denial of illness which is relatively common in individuals with Schizophrenia and has profound implications on the effectiveness of therapy. Insight gave clinicians a fairly significant predictive power with regards to treatment and compliance and the course the condition would take.

### 1.6 Theories of processing

Cognitive psychology has presented a number of theoretical approaches and models to account for the ways in which the human mind processes information. Some of these models, for example the computational model, are based around the workings of a computer system. Others have utilised computerised programmes to form complex diagrams and systems (Braisby, 2005). These models and theories have ranged from localised to distributed models, parallel to rule based systems, but possibly the most central to this thesis are the theories that focus on modularity and dual processing. These concepts will be explored in more detail below.

### 1.6 (a) Modularity theory

Modularity theory adopts a pluralists approach to explaining the processes of the human brain. They maintain that the human mind is made up of many specialised modules, each autonomous, each with a distinct phylogenetic and/or ontogenetic history, and each with its own input conditions, specific procedures, and characteristic outputs (Braisby, 2005).

The innate modules are usually associated with aspects of learning, for example, the language faculty. Consequently, they execute their function by using the environmental inputs to construct acquired modules. This is evident when learning the grammar connected to a particular language. There is an assumption that inferences are carried out in domain-specific modules, to avoid applying inferential procedures that would be inappropriate in other domains, rather than inferences being carried out by one or two systems. Modularity theory assumes that the same premise is processed successively or in parallel by several modules.

There are a number of limitations that have been argued against the modularity theory of processing. Fodor (2001) maintains that human inferences cannot be performed by a modular mind. He suggests that individual modules, by their very nature, have very little or no context-sensitivity. Human inference on the contrary is characterized by high context-sensitivity: the same input can yield quite different conclusions in differing contexts, a major feature of human cognition (Sperber & Wilson, 1995).

From a modularist point of view, attention is not the output of a distinct 'attention mechanism' which allocates resources to specific modules, but as the result of a process of competition for such resources among modules. Certain modules, therefore, may hold a permanent advantage in the competition because their inputs have higher expected relevance, for example danger detectors. That said, other modules may have an advantage at a particularly time in accordance with a decision to attend to their potential inputs.

### 1.6 (b) 'Dual processing' theory

Dual process theories have emerged and provide an alternative view to previous theories which maintain that cognitive processes such as reasoning are governed by a single system (Braine, 1990; Rips, 1994), or mental models (Johnson-Laird, 1983). Dual process theories, to some extent, stand in contrast to modular models of human cognition (Barrett & Kurzban, 2006; Carruthers, 2006; Sperber, 1994; Tooby & Cosmides, 1992).

Dual processing accounts of reasoning and human behaviour have been developed by both cognitive and social psychologists and are current and evolving (Manktelow, 2012). Consequently, dual processing accounts have been applied in many differing ways which makes providing a coherent overview both complex and challenging (Evans, 2008). The relevance of dual process theories to this thesis is the theoretical application to 'higher' cognitive processes which include thinking, reasoning, decision making, and social judgment (Evans, 2008). Despite the vast array of applications, all dual process theories share the common idea that there are two differing modes of processing which are usually labelled as System One and System Two (Kahneman & Frederick, 2002; Stanovich, 1999). More recently, Evans (2008) has referred to these systems as the old mind and the new mind in line with evolutionary ideas about the development of the mind as it is suggested that System One cognition evolved prior to System Two processing (Evans & Over, 1996; Epstein & Pacini, 1999; Reber, 1993; Stanovich, 1999). Executive functioning is thought to be a relatively new skill and process that has developed along with the frontal lobe (Manktelow, 2012) and is involved in analytic processes as well as reasoning and problem solving.

The first system, occasionally referred to as the heuristic system (De Neys, 2006), solves problems based on an individual's prior knowledge and beliefs. The second system, sometimes referred to as the analytic system, allows reasoning according to logical standards, which requires access to a central working memory system of limited capacity. As a result, System One is assumed to operate rapidly and automatically, whereas the operations of the analytic system are believed to be slow and heavily demanding of resources (De Neys, 2006). These two systems can act in concert and consequently the heuristic system will usually provide a fast, frugal and correct conclusion. However, heuristic processing can lead to biased reasoning in situations

that require more elaborate and analytic processing. This occurrence leads to conflict between the two systems (Stanovich & West, 2000).

Whilst there is a common agreement, throughout dual process theories, of two processing systems, not all authors have explicitly outlined the attributes, but when they do they tend to make comments that are remarkably consistent from theory to theory (Evans, 2008). There are a number of differing dual process theories that have been developed. These theories and differing approaches provide alternative explanations of how the two systems run alongside each other, whilst maintaining the same key concepts about the processing systems, as highlighted above. Some authors have proposed only dual process distinctions without considering the assumptions that underlie the cognitive systems, whilst other authors have proposed parallel and some sequential relationships between the two processes (Osman, 2004; Evans, 2008).

#### 1.6 (c) Dual Process Theory (Evans & Over, 1996)

Evans (1984) suggests that heuristic processes are preconscious, and their role is to select representation relevant to a particular problem space. This is in contrast to Tversky and Kahneman's (1974) proposal of strategy heuristics that provide shortcuts to a solution. Analytic processing is conscious and therefore, can be classified as deliberate, explicit thinking. This function serves to operate on representations considered to be relevant by heuristic processes that are then used to generate inferences and form judgments (Evans, 1995; 1996).

Evans's (1996) dual process theory of reasoning is underpinned by previous dual process proposals (Evans, 1989) which accounted for the distinctions between cognitive systems set out by implicit learning theorists (Berry & Dienes, 1993; Reber, 1993). Evans's (1996) proposes that System One, which is pragmatic in nature, is based on prior experiences, beliefs, and background knowledge. It accomplishes objectives reliably and efficiently without necessarily accompanying consciousness.

System Two is explicit, sequential, controllable, and makes high demands of working memory (Evans, 1996). Typically, System Two operates outside of normative logical conventions, however, it has the ability of accomplishing solutions to logical, hypothetical, forecasting and consequential problems (Evans, 1996). In comparison to

System One, System Two is slow, however, its speed facilitates flexibility and controllability.

In addition to the two systems of cognitive processing, Evans and Over (1996) proposes there to be two forms of rationality. One form is personal in nature and identifies reasoning behaviour that is reliable and efficient, the other form is impersonal, and requires a level of acting when there is a rationale for a given behaviour. This is particularly interesting when considering the moral reasoning dilemmas, that might depict acts of violence and criminal offences.

#### 1.6 (d) Dual-System Theory (Sloman, 1996; 2002)

Sloman's (1996, 2002) dual system theory adopts a differing focus to that of Evan's (1996). Sloman (2002) suggests that the two systems differ in terms of their basis for processing. System One encodes and processes statistical regularities, frequencies, and correlations in the surrounding environment. System Two is rule based. The representations in this system are symbolic and unbounded, in that they are based on proposals that can be combined together to form more complex sets of propositions.

The computational differences between System One and System Two are explained by Sloman (1996) using a connectionist framework. As a result, system 1 is representative of an intuitive processor whilst System Two is representative of a conscious rule interpreter. System One, therefore, is characterised by associative and automatically generalizable representations allowing for fast inferential processes. According to Sloman (1996), the systems operate in concert but are developed to suit different types of knowledge and result in different outcomes that are each useful in different ways.

#### 1.6 (e) Two-Systems Theory (Stanovich and West, 2000; 2002; 2003)

Stanovich and West (2000, 2002, 2003) propose a two systems theory of reasoning, which is primarily concerned with the causes of differences in the way individuals reason. Individual responses to reasoning tasks differentiate according to how they construe them (Osman & Laming, 2001), their prior knowledge (Galotti, Baron, & Sabini, 1986), the strategies they use (Klayman & Ha, 1987), cognitive and

personality styles (Stanovich & West, 1998, 1998), and their ability (Guilford, 1959; Stanovich & West, 1998).

Stanovich and West propose that individuals' poor performance on reasoning tasks reflects irrational tendencies (Nisbett & Ross, 1980; Tversky & Kahneman, 1974). However, this is in contrast to the view that individuals fail to perform well because of superficial cognitive slips in attention, or memory lapses (Cohen, 1981). Consequently, System One is considered to be implemented automatically, is unconscious, and is context dependent. Therefore, this system, according to Stanovich and West, relies upon heuristics (Evans, 1989). System Two adopts a controlled process that is purely analytical and is based on making abstractions that do not rely on context.

System One processing can lead to *fundamental computational bias* (Stanovich, 1999), which is the tendency to automatically contextualise problems. This prevents individuals from reasoning about a task according to its logical properties; instead, they rely on cues from its context, which are interpreted in relation to real-life situations. Evans (2007) suggests that this override function makes the Stanovich theory an example of a *default-intervention* theory, whereby our responses tend to be processed by System 1 until this process is overridden.

#### 1.6 (f) Reasoning and dual processing

Table 1.1 provides a collective list of attributes or properties that have been associated with the two systems account of processing. To some extent, each of these attributes can be applied to reasoning (Evans, 1984; Evans & Over, 1996; Stanovich & West, 2000) and potentially provide an explanation for the biases and errors that may occur (Oaksford, 2005).

Table 1.1: Typical properties of the two systems in dual system theories of thinking

<b>System One</b>	<b>System Two</b>
Implicit knowledge	<i>Explicit knowledge</i>
<i>Belief-based, pragmatic reasoning</i>	<i>Logical reasoning</i>
<i>Associative</i>	<i>Rule-based</i>
<i>Unconscious / preconscious</i>	<i>Conscious</i>
<i>Automatic</i>	<i>Controlled</i>
<i>Fast, parallel</i>	<i>Slow, sequential</i>
<i>Not linked with language</i>	<i>Linked with language</i>
<i>Contextualised</i>	<i>Abstract</i>
<i>High capacity</i>	<i>Low capacity</i>
<i>Independent of working memory</i>	<i>Depends on working memory</i>
<i>Not correlated with intelligence</i>	<i>Correlated with intelligence</i>
<i>Evolutionarily old</i>	<i>Evolutionarily recent</i>
<i>Shared with animals</i>	<i>Distinctively human</i>

Source: Manktelow (2012), Evans (2009) and Frankish and Evans (2009)

Some of the above attributes listed in Table 1.1 have been mentioned previously (see section 1.6) in the context of general processing. For example, Evans (2008) parallel competitive structure which accounts for heuristic – analytic processing that is implicit and explicit. Sloman (1996, 2002) considers an associative and a rule-based system. System One processing is intuitive which relates to the fact that it seems to operate outside of consciousness, being aware that one has responded in some way but not being sure how. This is in contrast to System Two which is reflective and therefore operates within conscious thought (Manktelow, 2012). This relates to the next two properties on the table (automatic-controlled and fast, parallel – slow, sequential) which suggest that deliberative reasoning can be monitored and adapted but intuitive reasoning cannot.

Stanovich’s dual system theory is underpinned by the notions of contextualised – abstract processing. This relates to System One processing that is influenced by beliefs. Stanovich suggests that we are prone to a fundamental computational bias,

however, he claims that reasoning should adapt to the form of the current problem in addition to its content and context. This process of decontextualisation is a prime System Two activity.

The next few properties from Table 1.1 relate quite closely to one another. Stanovich has researched cognitive ability quite extensively. Abstract or logical thought depends on the cognitive resources that are available to a person and therefore individuals who have acquired higher intelligence levels are more likely to provide the logical answer to a problem when the problem demands System Two processing (Manktelow, 2012). System Two thought is acquired through the means of education and effort, as opposed to System One which is acquired through evolutionary means or direct experience.

## **1.7 Conclusion**

There are a number of questions highlighted by the literature reviewed in this chapter which form the basis for the aims and research questions that run throughout the studies cited in this thesis. The first question, which exists across the wider topic area, is whether a link can be established between mental health and violence. Whilst the evidence suggests that there is little difference in general crime rates between individuals with a mental disorder and the general population, a wealth of evidence points to higher incidence of violent crimes among those with Schizophrenia (Allebeck & Lindqvist, 1990; Brennan, Mednick & Hodgins, 2000). Therefore, along with the increased presence of violence in the DSM criteria, it seems there is a connection between violence and mental disorder. This thesis aims to explore whether thinking and reasoning theories, such as Schizotypal thinking, can provide an explanation for the proposed complex relationship between mental health and offending behaviours.

Additionally, there is an increasing amount of support for the claim that individuals with Schizophrenia, or Schizotypal tendencies, experience biases and deficits on reasoning tasks (Galbraith *et al.*, 2010) which demonstrate the reasoning difficulties experienced in everyday life. However, there is a lack of research investigating whether these biases and deficits still exist when reasoning about criminal

acts. Therefore, this thesis aims to explore the application of previously found theories of everyday reasoning to specific crime based reasoning in order to explore and account for errors and biases which could create or lead into a pathway to offending.

Given findings from previous studies and the wealth of literature which suggests alternative processing explanations that could account for some of the previously documented reasoning biases, there will also be an exploration of the systems which are activated during the reasoning process (Wason, 1984). The latter studies in this thesis aim to investigate the impact that dual tasking, derived from dual process theory (Evans, 2007), has on biases and errors in crime based reasoning. Schizotypal tendencies appear to reflect some of the characteristics associated with System One processing (see table 1.1) and therefore, the latter studies explore the relationship between Schizotypy, dual processing and crime based reasoning.

# **Chapter Two: Methodology**

## **2.1 Overview of Chapter Two**

This chapter provides an overview of the key methodological points relevant to this research. While each data chapter provides a detailed description of the methodology relevant to that particular study, throughout the research process a number of methodological issues emerged and consequently, a number of decisions were made that are documented in this chapter. These decisions were made in light of previous research evidence and practices, and in light of the learning process that has taken place during the development of the research presented in this thesis. This chapter provides a detailed account of the rationale behind the decisions that were made, which subsequently impacted upon the methodological approach adopted. The main issues that will be discussed in this chapter are the use of clinical population samples, the use of relevant programming software, and the use of qualitative research to complement an experimental design.

## **2.2 Participants**

### **2.2 (a) Clinical population sample**

The research contained in this thesis utilised a non-clinical population sample, as there are a number of issues that arise when experimenting with a clinical population sample. The recruitment and experimentation on clinical samples creates a number of ethical and methodological complications which subsequently could impact upon the reliability and validity of the results collected. It is important to consider the well-being of the patients taking part in such research studies, particularly when recruiting patients who experience psychotic symptoms. Unnecessary stress or distress could provoke an episode of intense symptoms. Consequently, it can be difficult to gain access to individuals who experience such symptoms as they are protected in order to maintain personal well-being and minimise the chances of being exposed to unnecessary stress (Swanson & Ward, 1995). As a result, gaining access to clinical samples can be both a time consuming and a complex procedure. In addition to these barriers, one of the most difficult factors to overcome when working with clinical populations is accounting for the effects of prescribed medication. Individuals diagnosed with a psychotic based disorder are almost always prescribed medication to control the positive symptoms associated with psychosis (Blanchard & Neale, 1992). As a result, it becomes difficult to establish whether experimental tests are measuring differences that occur due to the

disorder or capturing the effects that medication has on cognitive skills. Furthermore, individuals diagnosed with complicated disorders, such as Schizophrenia, can sometimes experience a comorbidity of disorders, in other words, several disorders taking effect at the same time.

There are, therefore, many issues to negotiate with clinical population samples, particularly given the starting point of this research. It would have been inappropriate to have recruited and tested a clinical population during the developmental stages of the reasoning tasks and overall methodological design. The problems that arose from the experimental design needed to be addressed before testing a clinical population, and therefore, an experiment should exist in the final format prior to the recruitment of clinical samples. Particularly, given that it is highly unlikely that access to such samples would allow for testing multiple times.

#### 2.2 (b) The experiment population sample

The studies included in this thesis recruited individuals from Birmingham City University. Initially, students were recruited from the School of Social Sciences; however, after conducting Study One it was noted by the University Research Degrees Committee that a population recruited from across the whole university may provide a more representative sample of the general population. Therefore, Studies Two, Three and Four comprised a more diverse and broader sample collected from across the University campus. The coordination of students' availability as well as transport made including students from other campuses virtually impossible. However, the student population comprised individuals from a range of ethnic backgrounds and ages. Full details of each sample are provided within each data chapter.

#### 2.3 Design

The nature of this research topic naturally lends itself to a quantitative approach which is evident in the range of pre-existing reasoning tasks (Broome, 2007; Van Dael, Versmissen, Janssen, Myin-Germeys, Van Os, and Krabbendam, 2005). Traditionally, these studies have measured the techniques and strategies adopted by individuals whilst reasoning or completing problem solving tasks (Wisconsin Card Sorting Task: Everette, Lavoie, Gagon, & Gosselin, 2001; Wason Selection Task: Griggs & Cox, 1982; The Beads Task: Dudley & Over, 2003). Alternatively, qualitative studies have focused on

measuring the level at which an individual reasons about a specific dilemma (Kohlberg, 1958, 1969, 1976, 1978), focusing on an individual's 'justifications' for their decision. However, combining qualitative and quantitative methods allows researchers to gain a fuller understanding of specific phenomena and their causes. Therefore, a substantial proportion of the research conducted in this thesis stemmed from the positivistic Hypothetico-Deductive Model (Griggs and Koenig, 2000; Popper, 1954) with the aim to gather quantifiable and *objective* data (The Open University, 2007) about the ways in which humans reason about crime, criminal behaviour and violence. An objective measure allows for a comparison and identification of any significant differences that occurred in reasoning outcomes between individuals who scored high and low for Schizotypal tendencies on the Peters *et al.*, (1996) Delusions Inventory.

For each of the studies, participants were required to complete a qualitative element of feedback about the way in which they engaged with the reasoning task delivery in part one (quantitative experimental element). In Study One the qualitative data was collected in the form of a semi-structured interview. However, in Study Two, Three and Four the data was collected in the form of an audio diary (please see *section 2.4 (g)* for more details). The focus of these elements was to capture individuals' emotional responses, and how, and if, these responses affected the way in which they reasoned during the completion of the reasoning task.

Consequently, the qualitative element assisted in the creation of a more complete picture about the links between Schizotypy, reasoning and violence by taking into account a possible confounding variable that to a large extent cannot be accounted for by the quantitative stage of research. Recent research has suggested that aspects such as learning, intelligence, memory and reasoning are affected, and in some cases overridden, by emotions (LeDoux, 1996; Pert, 1999; Damasio, 1995). The exploration of emotional effects on reasoning is best investigated by a qualitative research approach in order for individuals to self-assess, reflect and consider their own personal experience (Ponterotto, 2005). While an element of subjectivity is created by personal accounts, combined with the quantitative element to this study, the interviews and audio diaries helped to capture deeper meaning and a better understanding of the processes at work whilst individuals completed the various reasoning tasks.

A mixed methods approach to research in this field is extremely novel, however, it provides particular benefits when exploring issues. As MacKay and Campbell (2004) note, in some cases different methods of research are appropriate at different stages of the investigation. For example, focus groups can be used to explore a particular topic at the starting phase, in order to understand a phenomenon and therefore guide and help to formalise a quantitative hypothesis tested in phase two. In other cases, experimental designs can be used to establish key significant differences in phase one and then explored further using qualitative methods to elucidate underlying mechanisms (Creswell & Clark, 2007).

A mixed methods approach therefore provides an additional viewpoint on a given phenomenon. Each methodological paradigm has a limited view of a given phenomenon, and therefore a combining of methods provides a more complete or improved understanding. In cases where the findings unite across methods there can be greater confidence in the accuracy of the results. However, in situations where the findings are contradictory, there are new opportunities and new research questions to pursue (MacKay & Campbell, 2004; Tashakkori & Teddlie, 2003).

## **2.4 Materials**

A range of materials were used in the collection of data in this thesis. Some of the materials have been chosen for their design, reliability and validity rates, and other elements have been purposely designed to fill a gap where no other test materials have existed previously. This section will introduce the main materials that were used throughout the studies contained in this thesis.

### **2.4 (a) Background information and self reported crime**

Participants taking part in each of the studies completed a background information sheet. The background information sheet collected information such as age, gender, ethnicity, nationality and religion. An additional section was added in order to collect information regarding criminal convictions and charges (see appendix A8). It must be stressed that no option was made available to disclose a crime for which an individual had not been convicted. Furthermore, the forms were only identifiable by participant number and did not record the individual's name. It was also thought helpful to collect information with regards to criminal convictions and charges

as it would have been interesting, given the right circumstances, to compare results of someone who has committed a crime with an individual who has not committed a crime. However, this comparison was dependent on two things. Firstly, a comparison could only have been made if a participant(s) had previously committed a crime, and secondly, if an offending individual was willing to disclose this information. There were eight individuals in Study Three who disclosed that they had a criminal conviction or caution (2 male and 6 female). However, these individuals fell into the mid category for Schizotypal traits and therefore their results were discounted from the overall statistical tests (see section 2.4 (a) for the methodological information).

#### 2.4 (b) Peters Delusions Inventory (Peters *et al.*, 1999)

The Peters Delusions Inventory (PDI) was carefully chosen based on a combination of the strengths and limitations, as well as reliability and validity. It was concluded from a review of relevant psychometric tests of Schizotypy that the PDI was the most appropriate tool for the research topic and question and therefore the studies that are presented in the following chapters utilise the 21-item PDI format. The PDI tool is specifically designed for use on a non-clinical population and is easy to administer as the test consists of a questionnaire, accompanied by simple instructions, for participants to complete. For a summary of the available psychometric tests and their advantages and disadvantages with regards to the format of this study please see Table 2.0. Many of the other tests were specifically designed for clinical samples and therefore are not deemed suitable for non clinical use. In some cases, the test requires specific training in order to administer and score, consequently these tests take much longer to complete and hence in conjunction with other experimental components would contribute to a fatigue effect. The 21 item PDI is a self-report completed by the participant, quick to complete and simple to score (Peters *et al.*, 1999).

Table 2.0: The advantages and disadvantages of delusion ideation measures for this study.

<b>Name of test</b>	<b>Author</b>	<b>Strengths</b>	<b>Limitations</b>
Peters Delusions Inventory 40-item	Peters <i>et al.</i> , (1996)	Specifically designed for a non-clinical population measuring Schizotypal tendencies, good internal validity and consistency, confirmed construct validity	Uses 'feel' rather than 'believe'
Peters Delusions Inventory 21-item	Peters <i>et al.</i> , (1999)	High validity, high reliability, reduced administration time compared to 40-item PDI, maintains the same properties as the 40 item but with fewer items to complete (Peters <i>et al.</i> , 1999, 2004)	
CIDI (Composite International Diagnostic Interview)	The World Health Organisation	Designed for use by lay interviewer, cross cultural	More concerned with mental disorder and not psychosis
MINI (Mini International Neuropsychiatric Interview)	Sheehan <i>et al.</i> ,(1998)		Designed for clinical trials
PSQ (Psychosis Screening Questionnaire)	Bebbington & Nayani (1995)	Used on clinical and non-clinical populations	
SAPS (Scale for the Assessment of Positive Symptoms)	Andreassen (1984)		Psychiatric measures that are directly related to clinical diagnosis of positive symptoms
Magical Ideation Scale	Eckblad & Chapman (1983)		Samples a mixture of first-rank symptoms, which are rarely endorsed in general population (Eaton, <i>et al.</i> , 1991) and superstitious beliefs which are so common they cannot be regarded as delusional.
DSSI (Delusions –symptoms – State Inventory)	Foulds & Bedford (1975)		designed for clinical diagnosis and items include symptoms not appropriate for use in the general population (Peters <i>et al.</i> , 1999)

The Peters Delusions Inventory (Peters *et al.*, 2004) is a tool that can be used to screen a ‘non-clinical’ population for Schizotypal tendencies, which is in keeping with the continuity model of mental illness (Claridge, 1988; Claridge & Beech, 1995; van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009; Pelley *et al.*, 2010; Freeman *et al.*, 2010) which argues that psychotic symptoms represent extreme versions of everyday behaviours. For that reason, some individuals within the general population have a predisposition towards psychosis, but are not subject to sufficiently ‘extreme’ experiences to be classed as mentally ill (Galbraith, Manktelow & Morris, 2008). Therefore, as discussed in section 1.4 there are commonalities of experience between those with Schizophrenia and Schizotypal Personality Disorder and those who score high for Schizotypal tendencies. Consequently, the PDI provides a way of finding out more about clinical disorders by screening for, and highlighting, a subclinical population which can be tested and compared against individuals who score low for Schizotypal tendencies.

#### 2.4 (c) The 21-item Peters Delusions Inventory (2004) & 40-item Peters Delusions Inventory (1999)

The 21-item PDI (Peters Delusions Inventory; Peters *et al.*, 1999) enabled participants to be measured and screened for their Schizotypal tendency rating. Participants were then grouped into low scoring and high scoring groups for Schizotypal tendencies.

The PDI is set out in a questionnaire format that is designed to measure and score delusional ideation. It is specifically intended for administration on a ‘normal’ non-clinical sample, rather than a clinical or psychiatric population. Individuals are required to read each of the questions and respond by indicating a ‘yes’ or ‘no’ answer to each item. The initial ‘yes’ or ‘no’ response indicates whether an individual relates to, or has a tendency towards, a certain psychopathologic condition or situation. When an individual’s initial response is a ‘yes’ they are required to further indicate levels of ‘distress’, ‘preoccupation’ and ‘conviction’ on a five-point scale. As a result, the questionnaire scores range from 0 to 336. The questionnaire assesses the following three areas of ideation:

The 'distress rating' is reflective of the amount to which an individual finds the given situation or condition distressing. This is indicated along a progressive scale, where 1 is equal to not at all distressing, and 5 is equal to very distressing.

The 'Preoccupation rating' is an indication of the prominence of a thought or condition and the amount of attention and emphasis that an individual places on that thought or condition. Again, like 'distress rating', this is measured on a 1-5 scale where 1 is equal to not at all and 5 is equal to very.

Finally, the 'Conviction rating' is reflective of the extent to which an individual believes that a situation or condition is true. In a similar fashion, the 'conviction rating' is measured on a 1-5 scale, where 1 is equal to not at all, and 5 is equal to very.

As the PDI screening tool is presented in a questionnaire format, individuals complete the questionnaire by themselves. This means that there is no subjective opinion made by the experimenter as to whether an individual falls into the high, mid, or low group for Schizotypal tendencies, alleviating any risk of experimenter bias. Subsequently, the experimenter is required to simply count the number of 'yes' answers and the '1-5' rating scales to produce a total PDI score.

#### 2.4 (d) Reliability of the 21-item PDI

The 40-item PDI (Peters *et al.*, 1999) was designed to fill a void between the kinds of symptoms that previous tests had included and the type of populations that previous tests could be administered to. As a result, the PDI was specifically designed for the administration and measure of non-clinical non-psychiatric populations. Peters *et al.*, (1999) maintained that the original 40-item PDI had good psychometric properties, and therefore, a principal component analysis (PCA) was conducted on the 40 items, allowing for the construction of an abbreviated version based on the highest loading items (21-item PDI, Peters *et al.*, 2004), for example the theme of paranoia with the three item components of persecution, suspiciousness and paranoid ideation.

A number of studies have successfully implemented the 21-item PDI. For example, when investigating the occurrence of delusional ideation (Verdoux *et al.*,

1998a; Verdoux *et al.*, 1998b), twin studies (Linney *et al.*, 2003), and a comparison of cognitive performance of low and high scorers on the PDI (Linney *et al.*, 1998; Green, Williams, & Davidson, 2001; Colbert & Peters, 2002; Lawrence & Peters, 2004). Peters *et al.*, (2004) confirm that the 21-item PDI remains a reliable and valid tool for measuring delusional ideation in the general population. Previous studies confirm internal consistency and validity were more than adequate, and test-retest reliability was demonstrated by the test being used on two separate occasions up to one year apart. The convergence validity was confirmed by its relationship with the Delusions-Symptoms-States Inventory (DSSI: Foulds and Bedford, 1975).

#### 2.4 (e) Grouping individuals for high and low PDI scores

There have been a number of ways that individuals have been grouped in previous research studies when using the PDI tool. For example, individuals have been assigned to a high or low group for Schizotypal tendencies based on a median split along the scale of participants' total scores on the PDI (Galbraith *et al.*, 2008; Galbraith *et al.*, 2010). Other studies have utilised the top and bottom 15% (Cella, Dymond, & Cooper, 2009) again, based upon individuals' total score for the PDI. After much consideration it was decided that the research contained in this thesis would adopt a widely used method of utilising samples made up of those individuals falling into the top and bottom thirds (33%) of total scores on the PDI (Oertel *et al.*, 2009; Ziegler, Rief, Werner, Mehl, & Lincoln, 2010; Reed, Wakefield, Harris, Parry, Cella, & Tsakanikos, 2008). This method ensured that the reasoning task results, included within the analysis, derived from individuals who were distinctly high or low scorers, whilst taking into account the number of participants required for each study sample. Utilising the top and bottom 33% ensure that both the high and low participants deviated from the median to ensure that these individuals were significantly different with regards to Schizotypal traits, whilst ensuring that a smaller overall sample was required compared to the top and bottom 15%.

#### 2.4 (f) Experimental software

Each of the studies consists of a unique and original crime based reasoning task. The reasoning tasks were designed, programmed and executed using psychological stimulus software. The software programmes not only ensured that accurate measuring and data collection were made consistently for every participant,

but also it ensured that each participant was presented with exactly the same information to ensure the validity of the results. The reasoning tasks themselves enabled quantitative measures of individuals' reasoning abilities to be made. Initially, in Study One, Superlab (see figure 2.0) software was used for the programming and administration of the Graduation Reasoning Assessment Task (GRAT: see section 3.3c). Superlab is a computer based stimulus presenting software, and was chosen mainly for its availability and reliability when recording individuals' reaction times (MacWhinney, St. James, Schunn, Li & Schieder, 2001). The GRAT was administered to one person at a time using a laptop. However, the implementation of Study One highlighted a number of limitations with the software programme. For example, if a participant pressed a key that had not been programmed with a response then the programme would automatically move onto the next screen despite the fact that this occurrence would lead to a non result within the results file. This was problematic as a participant could complete the whole reasoning task whilst pressing a key to agree with a statement but accidentally press the key next to it. Consequently, any result files that showed this error had to be deleted from the overall results, which ultimately wasted research time.

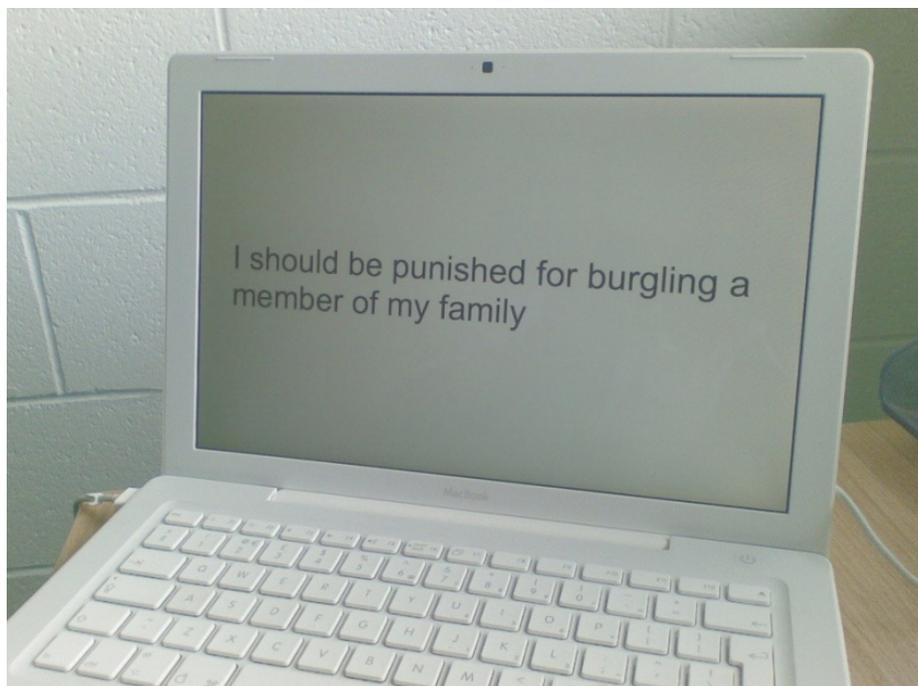
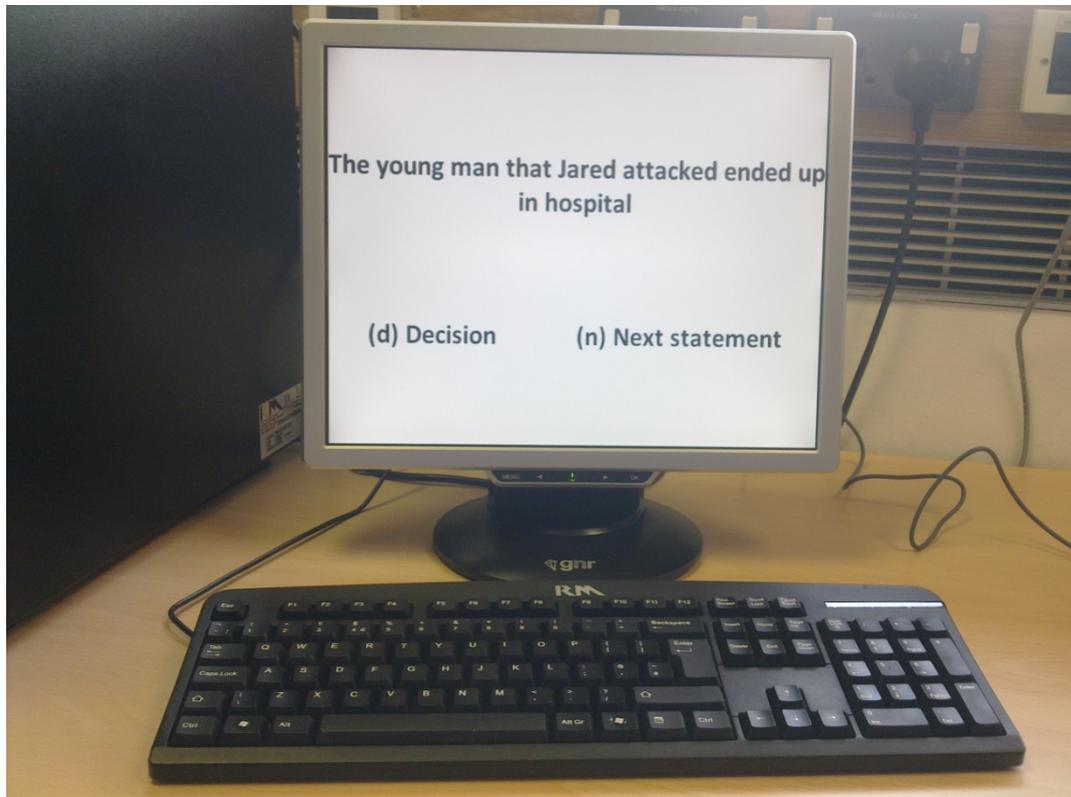


Figure 2.0: Photograph of Superlab Study One

Studies Two, Three, Four, Five and Six utilised Eprime software (see figure 2.1) for the programming and administration of the reasoning tasks. Eprime is a stimulus presenting software for Windows operating systems. At this stage the Psychology Division had been furnished with a computer suite consisting of eight computers with Eprime software available. As a result, the computer suite was used for studies Two, Three and Four, which helped to speed up the data collection process. This was possible as up to eight participants could complete the computerised reasoning task at any given point in time. In addition to the availability of software, the use of Eprime avoided the difficulties experienced by Superlab in Study One where incorrect keys could be pressed. Eprime has additional functions that allow only certain keys on the keyboard to be responsive, and in the event that a different key is pressed the programme does not move on. In addition to this, Eprime is more widely used, flexible, and enables more advanced programming (MacWhinney, St.James, Schunn, Li & Schneider, 2001).



*Figure 2.1: Photograph of Eprime Study Three*

#### 2.4 (g) Experimental crime based reasoning tasks

Each of the data chapters contains an experiment based reasoning task. These tasks relate to one another, but more importantly the reasoning tasks created in studies two, three and four are created in response to the results and limitations of the task in the previous chapter. Therefore, each data chapter contains more specific information about the technology and resources used during the creation and administering of that specific reasoning task.

#### 2.4 (h) Interviews and Audio Diaries

In Study One semi-structured interviews were used as a tool to capture individuals' emotional and strategic reactions to the statements in the Graduation Reasoning Assessment Task (GRAT – see section 3.3), the experimental part of the study. The interview procedure allowed individuals to be guided through the process of reflecting upon the task that they had previously completed. However, due to the nature of the research process and access to laboratories, some individuals were not able to be interviewed immediately after completing the task. While this delay was at most ten minutes, some participants had more time to reflect or forget about aspects of the GRAT and their given reactions which may have affected the feedback given. The time lag also contributed to exhaustion effects. As a result of this limitation, the remaining studies pioneered a relatively unique way of capturing individuals' thoughts, emotional responses and strategic plans whilst completing the reasoning tasks. Individuals were asked to complete an audio diary (Worth, 2009; Hislop, 2004) immediately after completing the reasoning task (this process occurred in Study Two, Study Three and Study Four).

The audio diaries were recorded individually in a room that was set up purposefully for this task. High quality audio recording equipment ensured that individuals' reflections were captured clearly as they talked out loud in a diary format. The rooms were set up with a set of instructions accompanied by key questions spaced out across the walls of the room. Individuals were instructed to make their way around the room whilst reading each of the questions out loud and to talk about their thoughts to these questions (for photos of these questions please see appendices A12 & A13).

There were a number of advantages of using audio diaries rather than the standard semi-structured interview. Some participants from Study One reported feeling uneasy with completing a one-to-one interview as they thought that the situation was ‘too intense’. Audio diaries remove the intensity that a one-to-one interview can place on a participant whilst answering questions (Worth, 2009). Furthermore, it has been demonstrated that diaries, including audio diaries, have provided a more effective method by which participants of experiments can be reflective about the experiment process (Hislop, 2005; Meadows, 2005). A number of audio diary rooms were set up, in exactly the same way, which meant that all individuals were able to complete an audio diary entry immediately after completing the reasoning task. This considerably reduced the amount of time that was required for individuals to complete the whole research process, which as a result reduced the effects of fatigue experienced in Study One (see Chapter Three for more details).

#### 2.4 (i) The development of specific interview and audio diary questions

The audio diaries, and interview, were based around the same four key questions. These questions were designed to specifically encourage individuals to talk about the processes that were occurring whilst completing the reasoning task. Therefore, the audio diaries were completed immediately after completing the computerised reasoning task.

The first question was intended to prompt individuals to consider their feelings and emotions experienced whilst completing the reasoning task, as emotions could potentially impact upon an individual’s information processing (Tiedens & Linton, 2001). Naturally, individuals could only describe their conscious emotional experiences and responses.

#### **1. How did you feel whilst completing the reasoning task (computer task)?**

- **What emotions did you experience?**
- **Why might you have experienced those emotions?**
- **How do you understand those emotions?**
- **Where do emotions come from?**

The second question explored individuals' focus during the reasoning task. This was important as it has been suggested that individuals with high Schizotypal tendencies might be inclined to read as little information as possible before they made a decision (Dudley and Over, 2003). Therefore, individuals may focus on particular aspects of the task or statements. For example, individuals may focus on the type of crime, and therefore disregard information such as the perpetrator. Individuals may have therefore created strategies for completing the task as quickly as possible.

**2. What were you thinking about or focusing on during the task?**

- **Did you concentrate on a particular feature of the task?**
- **Did you devise a strategy for completing the task?**

The third question allowed individuals to freely express themselves after completing the reasoning task. As the reasoning task only allowed for individuals to select specific responses, individuals were not given the opportunity to explain their answers whilst completing. Therefore, this question was designed to allow individuals to explain and justify their responses should they wish to or feel the need to.

**3. Was there anything that you wanted to verbally say whilst you were completing the task?**

The final question explored individuals' general responses to crime and criminal behaviour. This question aimed to capture how individuals viewed crime and criminal behaviour more generally.

**4. What are your thoughts about crime and criminal behaviour in general?**

- **What causes crime?**
- **Where has crime emerged from?**
- **How should we categorise crime?**
- **Is it as easy as saying that certain behaviour traits are criminal?**
- **Where do we learn right from wrong?**

## **2.5 Procedure**

There were a number of ethical issues that needed to be addressed before conducting research of this nature in order to ensure that participants remained safe. The practices implemented throughout this research were in line with the BPS guidelines for conducting research (Code of Ethics and Conduct: The British Psychological Society, 2009). In particular, the research contained in this thesis was in line with the four key areas that must be obeyed. These areas are: respect, competence, responsibility and integrity. In addition, the research was approved by the University Faculty Ethics Board (Education, Law and Social Sciences).

The research followed the standard procedures of informed consent, debriefing, confidentiality and the right to withdraw. It was ensured that materials or questions that could have been particularly provocative or emotive were avoided.

### **2.5 (a) Participant anonymity**

The nature of this research study required that the participant's identity was protected in order for individuals to feel safe. As a result, participants were given a participation number which they were instructed to use in place of their name on each of the components of the given research study. The identification number was used to identify individuals' PDI scores and reasoning task results during the analysis phase.

### **2.5 (b) Informed Consent**

Individuals were informed of the research process and requirements prior to taking part. They were given an information sheet and were encouraged to ask any questions. Once the research process was understood participants were required to sign a consent form (Appendix A3).

### **2.5 (c) Results of the PDI and Reasoning Tasks**

Prior to taking part in any of the research studies, participants were informed that they would only have access to a summary of the results collected as part of that study. This was to ensure that individuals did not attempt to interpret their own results, and therefore avoided the possibility of any stress or distress caused by the results of the PDI or reasoning task.

## **2.6 Analysis**

### **2.6 (a) Quantitative Research**

Each of the six studies presented in this thesis contains a novel reasoning task which generated quantitative results. These results were analysed statistically to identify whether there was a significant difference between the identified variables. This analysis was accomplished using SPSS (Statistical Package for the Social Sciences), and a description of each analysis is provided with each data chapter.

### **2.6 (b) Qualitative Research and Thematic Analysis**

The interviews conducted in Study One, and the audio diaries recorded in the remaining studies produced qualitative data which ultimately needed to be analysed. Thematic Analysis was deemed the most appropriate method of analysis given the type and amount of qualitative data generated and collected through these methods. This method is appropriate when the researcher is interested in what the participants say, as opposed to how they say it, which is appropriate for this research project given that the aim of the qualitative data was to collect additional descriptive information about the biases and problems that participants experienced whilst completing the reasoning tasks. Thematic analysis, therefore, allowed participant's responses to be themed highlighting the common and contradictory descriptions made by the participants across different groups. NVivo 8 software was utilised in order to organise and structure the Thematic Analysis process in a systematic way. A training course was attended to ensure full competency with the programme.

There are a number of different types of Thematic Analysis, however, they all follow similar basic steps and principles. Thematic Analysis focuses on what is said rather than how it was said. The general view is that thematic analysis highlights key themes that flow throughout the interview diary scripts. However, Braun and Clarke (2006), Howitt and Cramer (2008), and Howitt (2010) have formulated more systematic and transparent approaches to this method. Thematic Analysis, due to its broad nature and reduced theoretical 'baggage' (Howitt, 2010) occupies the middle ground between quantitative and qualitative analysis. Therefore, this method of analysis sits well with the mixed methods approach adopted by the research conducted as part of this thesis.

Howitt (2010) maintains that Thematic Analysis broadly consists of 3 main steps: transcription; analytic effort; identifying themes and sub-themes. Each stage has a degree of flexibility in terms of the researcher going back – and – forward between stages. Braun and Clarke (2006) have provided the most systematic account of doing thematic analysis to date. The Braun-Clarke model consists of 6 steps to analysis. These steps are displayed in figure 2.2:

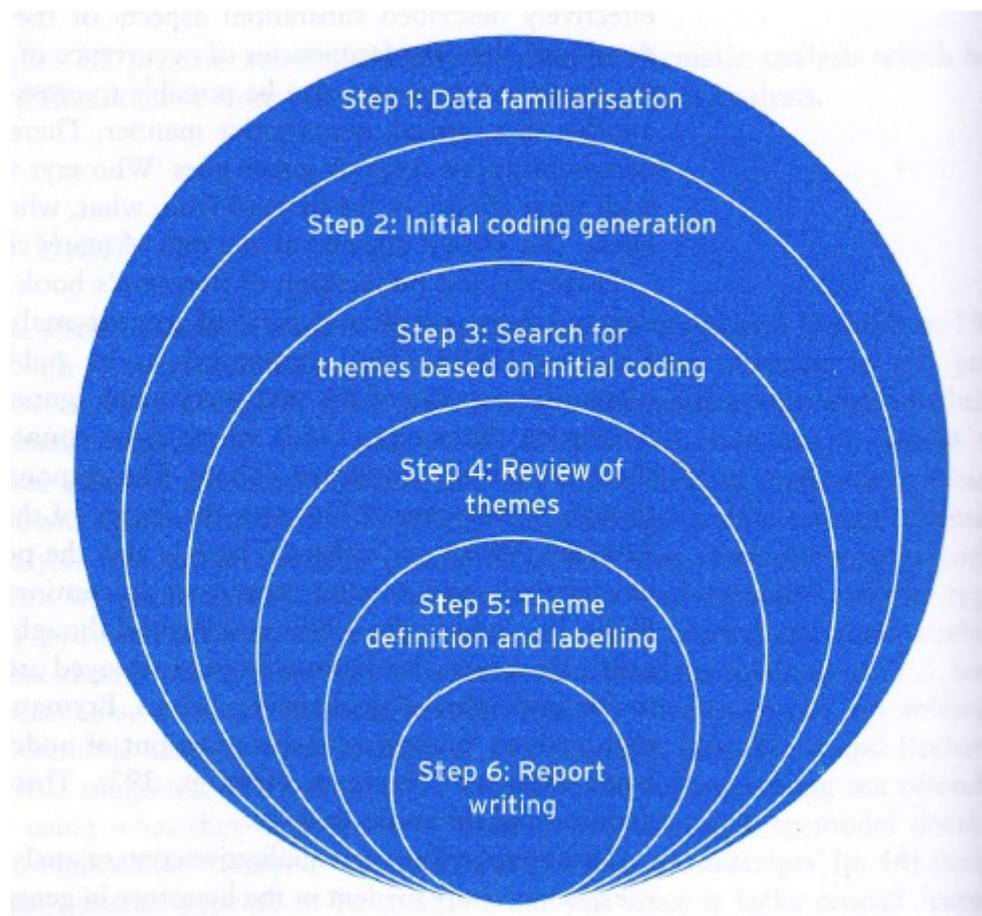


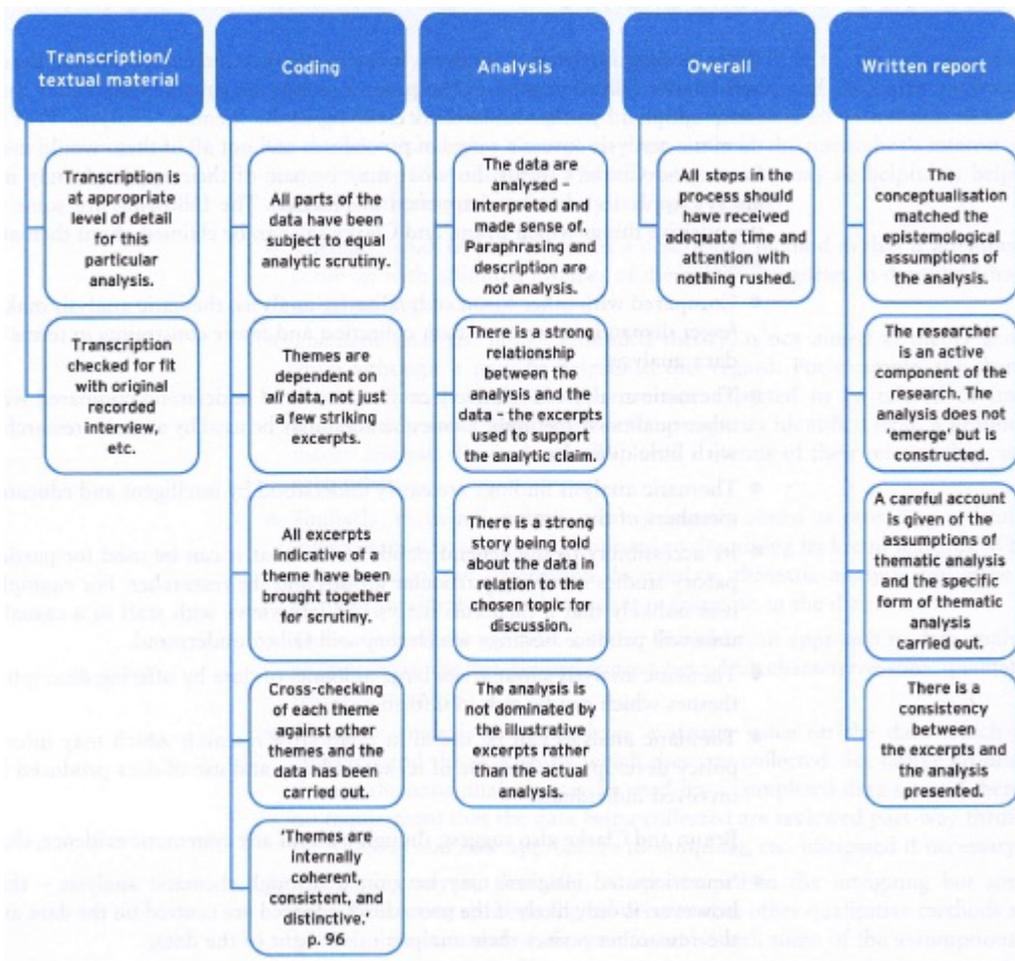
Figure 2.2: Braun and Clarke's model of Thematic Analysis (Howitt, 2010).

Step one of the analysis required a familiarisation with the data collected. The qualitative data in this thesis was captured through interviews in Study One, and audio diary entries in the remaining studies. One of the main differences between these two data capture techniques was that the interviews generated data that the interviewer was already familiar with by the analysis stage, whereas the audio diaries were

recorded privately and therefore the researcher had to engage with the familiarisation process rigorously to become familiar with the data. However, both of these data capture techniques required the data to be transcribed from a recording, which enhanced the familiarisation of the data. Thematic Analysis requires a literal transcription of the data.

Step two entailed the initial coding of the data whereby themes were generated. This step entailed carefully going through the entirety of the data gathered line by line and highlighting any emerging themes. Braun and Clarke (2006) maintain that this can be done in a *data led approach* or a *theory led approach* (cited by Howitt & Cramer, 2008). A data led approach was applied to the qualitative data that was collected in each of the studies that form this thesis. Step three consisted of searching for themes. Here, the initial coded themes produced in step two were assessed to consider whether there were any commonalities that suggest there to be a relationship between the codes. Themes, therefore, represent a coding of the initial coding (Howitt & Cramer, 2008). At this stage the aim was to produce the overarching themes that had emerged from the interviews and audio diaries data.

Once a list of themes was highlighted, step four entailed a review of the themes. At this stage it was important to consider whether there was sufficient evidence in the data to support the overarching themes that had emerged. If there was not sufficient data then that theme was abandoned, in other cases some themes had to be sub themed. By step five there should be an identification of the key themes and therefore it was essential to add a description to these themes to define what it was about that theme that made it distinct and key. This process related closely to the data from which the themes had emerged from. This process is better illustrated in figure 2.3. Data from each study was analysed through this method and is presented within each data chapter.



*Figure 2.3: Thematic Analysis (Howitt, 2010).*

## **2.7 Chapter Summary**

This chapter has provided an overview of the key methodological considerations relevant to the research in this thesis. In addition, a detailed account of the rationale behind the decisions that were made has been discussed, which subsequently impacted upon the methodological approach adopted. The main issues that were discussed in this chapter were the use of clinical population samples, the use of relevant programming software, and the use of qualitative research to complement an experimental design. Further information about the methodologies employed for each individual study can be found within the relevant study chapter.

# **Chapter Three: Study One, Graduation Reasoning Assessment Task (GRAT)**

### **3.1 Overview of Chapter Three**

The aim of Study One was to identify whether Schizotypy impacts upon crime based reasoning when considering individual's self-reference levels. Previously (Galbraith, Manktelow & Morris, 2008), 'self-reference' levels have been divided into a two part scale including 'me' and 'other'. Study One explored whether self-reference can be broken down further to create a four-part reference scale including 'me', 'family', 'friend' and 'stranger'.

### **3.2 Literature Review**

The symptoms associated with psychosis are extreme versions of everyday behaviours according to the continuity model of mental illness (Claridge, 1988; Claridge and Beech, 1995; Van Os, Linscott, Myin-Germeys, Delespaul & Krabbendam, 2009). Schizotypy is a sub-clinical category of experience which captures individuals who present schizo-psychopathological characteristics but without the presence of mental illness (Claridge, 1997). Consequently, Schizotypy is also referred to as psychosis proneness, psychotic experiences or at-risk mental states (Meehl, 1962; Siever *et al.*, 1993; Chapman *et al.*, 1994; Claridge, 1997; Crow, 1998; Kwapil, 1998; Verdoux *et al.*, 1998; Van Os *et al.*, 2000; Stefanis *et al.*, 2002; Vollema *et al.*, 2002; Yung *et al.*, 2003). In some cases it appears that individuals may progress through Schizotypy, as a prodromal phase/state, before entering and developing into an active phase of Schizophrenia (Yoon, Kong & Kwon, 2008). This is in contrast to the categorical view of psychosis. The continuity perspective maintains that there are no clear differences between sanity and madness (Bleuler, 1908) therefore everyone falls at a different point on a continuum of Schizotypy.

The continuity approach to mental disorder assumes that experiencing symptoms of psychosis such as delusions and hallucinations is not inevitably associated with the presence of disorder (Van os, Linscott, Myin-Germeys & Krabbendam, 2009). A presence of a disorder is thought to be dependent on symptom factors such as intrusiveness, frequency and psychopathological co-morbidities along with social and personal factors such as coping with illness (Johns & Van os, 2001) all of which is accounted for within the DSM IV-TR (2000) assessment. However,

what remains significant is that subclinical psychotic experiences and the related concept of Schizotypy show a similar pattern (Van Os *et al.*, 2000).

A study into psychopathological tendency with non-pathological individuals conducted by Galbraith, Manktelow & Morris (2008; 2010) suggested that individuals with high Schizotypal tendencies (high delusional ideation) can be tested as a representative sample of individuals who experience the symptoms and deficits associated with delusional type disorders such as Schizophrenia. Therefore, psychotic disorders such as Schizophrenia can be further understood by comparing individuals with high delusional ideation against individuals with low delusional ideation. This methodological approach is achieved using a psychometric test to screen for Schizotypal tendencies, and therefore alleviating the accompanying issues of medication effects, motivation, and the nature and severity of the symptoms and experiences over time (Galbraith *et al.*, 2010) faced when testing a clinical sample (Thurston *et al.*, 2008). Furthermore, clinical populations can experience cognitive decline over a substantial period of time (Galbraith *et al.*, 2010).

Previous research has suggested that individuals who experience psychosis, or are at risk of psychosis and therefore score high for Schizotypal tendencies, require less information when making a decision and are more likely to change their decision when presented with disconfirmatory information (Galbraith *et al.*, 2008; Garety *et al.*, 1991). Furthermore, clinical patients' performance declines on more realistic tasks (Dudley and Over, 2003). The link between mental illness and crime has been at the centre of dispute for some time, however, it is far less problematic to identify a link between mental illness and violence (for example, Swanson *et al.*, 1990). In addition, recent research has suggested there to be a specific link between the violent behaviour presented by some individuals and their diagnosis of Schizophrenia accompanied by biases in reasoning (Louw *et al.*, 2005).

Traditional developmental studies (Piaget, 1962; Kohlberg, 1958; Kohlberg, 1978) have focused on individuals' moral decision making. These studies usually consist of moral dilemmas that deal with a conflict situation, real and hypothetical, that in some way require a moral judgement (Harding, 1985). A number of these

studies have developed into scales that have been utilised to measure moral judgement both qualitatively and quantitatively (see for example the Moral Judgement Interview: Kohlberg and Colby, 1987). Moral judgement in relation to offenders is important since offending populations, according to Ashkar and Kenny (2007), tend to reason at a lower level of morality than non-offending populations. According to Speicher (1992), moral development is cultivated in a social context through experiences that provide an opportunity for perspective taking and cognitive conflict. Consequently, the interaction with parents, family and peers plays an important role. Given this interaction, the current study attempts to assess reasoning biases across an extended self-reference level composed of 'me', 'family', 'friend' and 'stranger'. This design went beyond the previous two part reference levels of 'me' and 'other' (Galbraith *et al.*, 2008) in order to get a more global understanding of reasoning about crime. Developmental studies have reported qualitative differences in reasoning with offending populations. This combined with the evidence of differences in the processes of emotion in individuals experiencing psychosis suggests that further studies should aim to capture both qualitative and quantitative differences when reasoning.

There are a number of issues that accompany the traditional reasoning task, which can be divided broadly into those that have emerged as a result of the developmental and cognitive perspectives. Those tasks that derive from the cognitive perspective tend to lack ecological validity in the sense that they are not representative of how an individual would reason in everyday life. Conversely, the tasks derived from the developmental perspective are often extremely time consuming, and where adaptations have been made correlations between results have not been very high (Elm and Weber, 1994), for example, between the Moral Judgement Interview and the Defining Issues Test. There is a particular need to develop reasoning tests that can be applied to forensic and/or clinical populations. These tests need to assess the differences and biases that occur in reasoning as a result of, or in conjunction with, a mental disorder. Given the deficits in reasoning found in individuals with disorders it would be highly beneficial to find out more about the scale of the biases including the boundaries of where such biases occur. Consequently, reasoning tests need to be both ecologically valid and relevant to the impact that Schizotypy has on reasoning skills.

### 3.2 (a) Research Question and Hypothesis

This study aims to address the question of whether individuals with high delusional ideation, scoring high for Schizotypal tendencies, reason about crime in a different manner to individuals with low delusional ideation, therefore scoring low on Schizotypal tendencies. Consequently, there were a number of expectations and hypotheses made about the study:

1. High Schizotypy scoring individuals will produce faster reaction times compared with the low Schizotypy scoring group.
2. High Schizotypy scoring individuals will make more errors in reasoning when compared with the low scoring group (control).
3. Individuals will make quick decisions about themselves compared to making decisions about other people e.g. friends, family and strangers.
4. Individuals will make accurate decisions about themselves compared to making decisions about other people e.g. friends, family and strangers.
5. Crime based decision will generate automated, and therefore quick, reactions as opposed to everyday decisions which are more ambiguous.

### **3.3 Pre-experimental focus group**

The focus group was conducted in order to produce a list of crime words for the generation and creation of the crime based reasoning task. Therefore, the sessions were designed as a tool to motivate individuals into thinking about criminal activity and crime, and to discuss the nature and categories of crime. The list of crime words needed to be representative of crime(s) but also relevant and meaningful to the target experiment sample.

### 3.3 (a) Ethics

Due to the nature of the topic there were a number of ethical issues that were considered and a number of requirements fulfilled in order to minimise the potential for stress or distress to individuals taking part in the focus group activities. Initially, participants were given a full participant information sheet (see Appendix A2) that outlined the reasons for conducting the focus group sessions to allow individuals to

make an informed decision as to whether they would consent to taking part in the study. It was made abundantly clear that the topics discussed could potentially be of a sensitive nature. At this stage, individuals were made aware of their right to withdraw should they wish to at any point during the process. Participants were also required to read and complete a consent form (see Appendix A3) which ensured that they fully understood the nature of the research and topic, what was expected of participants who agreed to take part, and ensured that they had no further questions about the process. Any questions from participants were answered and points clarified if required.

At the end of the focus group, participants were made aware of relevant helplines, support and counselling services should they feel any stress or distress caused by discussion. Business cards with the relevant information were provided along with student's copies of the consent forms.

### 3.3 (b) Participants

Sixteen participants (6 males and 10 females), were recruited from the undergraduate student population at Birmingham City University. The participants were recruited on a voluntary basis whereby participants signed up to attend a given session (see Appendix A4).

### 3.3 (c) Materials

The focus groups consisted of three activities. The first activity required participants to reflect and think individually about different categories and types of crimes. This provided participants with the opportunity to record a comprehensive list of crime words either in a list or mind map format and provided participants with an opportunity to record their own recollection prior to being exposed to other people's ideas.

Activity two was designed to give participants the chance to share their own ideas and discuss their thoughts in a group setting. The aim of this activity was to aid memory recall and to expose any differences in the types of crimes that people had recorded and prioritised.

The final activity required participants to collectively decide on the seriousness of the crimes and criminal activities that were listed by the group.

Participants were given the categories of ‘not at all serious’, ‘less serious’, ‘serious’ & ‘very serious’ and as a group had to rate each crime word.

### 3.3 (d) Procedure

The focus groups consisted of three activities that were guided by the moderator using a moderator guide (see Appendix A5). Each activity was designed to engage participants in thought and discussion around the topic of crime and criminality. Each activity was led by the participants responses and was audio recorded, as well as writing the crime words onto A5 paper during activity two. This enabled a visual presentation of the crime words for activity three where the group had to classify the seriousness of the crime.

### 3.3 (e) Results

The focus group produced a list of ten main crime words which were utilised for the main experiment (see table 3.0 crime word list). Activity three of the focus group also highlighted that the main way that individuals categorise the severity of a crime was by considering its level of direct impact upon another individual, usually measured by the level of violence.

Table 3.0: Crime word list.

<b>Crime Words</b>
Murder
Rape
Defraud
Blackmail
Assault
Terrorize
Stab
Burgle
Wound
Hijack

### **3.4 Pilot study method**

#### **3.4 (a) Participants**

Ten undergraduate students (7 female and 3 male) from Birmingham City University took part in the initial pilot study. Their age ranged between 20 and 27 (M= 22) and they were based in the School of Social Sciences.

#### **3.4 (b) Measures**

##### *The Peters Delusions Inventory (Peters et al., 1999)*

The Peters Delusions Inventory was used to measure Schizotypy level (see section 2.4(a) for more details).

##### *Graduation Reasoning Assessment Task (GRAT)*

The Graduation Reasoning Assessment Task (GRAT) was designed to incorporate aspects of traditional cognitive tests with moral reasoning tasks that derived from a developmental approach. Therefore, the task required individuals to make a choice as to whether a particular given statement is morally right or wrong. The statements were based on words that represent different types of crimes, which were gathered during the pre-experimental focus group sessions (see table 3.0 Crime word list).

#### **3.4 (c) Procedure**

Participants were provided with information sheets (see appendix A6) prior to volunteering and consenting (see appendix A7) to take part in the study. They were also given the opportunity to ask any questions about the research before they agreed to take part.

##### *Peters Delusions Inventory (PDI: Peters et al., 1999)*

The first stage of the pilot study required participants to complete a paper version of the PDI by following the author's instruction which accompanied the questionnaire.

### *Graduation Reasoning Assessment Task (GRAT) pilot*

The GRAT was designed and programmed specifically for this study based on the information collected during the pre-experiment focus group session. The GRAT recorded individuals' accuracy and response time when reasoning about different types of crimes and criminal activity. The task was presented to individuals as a series of statements based around the crime list. The statements related the different crimes across the four part self-reference spectrum, therefore questioning individuals about their response to me, family, friend and stranger.

#### 3.4 (d) Results

Whilst the reaction time scores and error scores were recorded the intentions of the pilot study were to highlight any potential problematic issues with the unique reasoning task which needed to be rectified before collecting a full data set. This process proved to be extremely useful as a number of issues were raised.

First, it became apparent that the mundane words and crime words were not alike. The crime words were 'verbs' or action words, for example stealing, which involves an act or interaction between two people. The mundane words did not conform to the same type of language and therefore were not particularly comparable.

In addition, the positive and negative statements were not evenly poised due to the nature of the core statements. There were more negatively phrased statements than positively phrased statements and therefore collectively appeared unbalanced. Participants were therefore required to reason about more negatively phrased statements, such as 'you should be punished for burglary' as opposed to positively phrased statements.

#### 3.4(e) Discussion

A number of methodological issues were highlighted as a result of the pilot study. These issues revolved around the statements which were presented in exactly the same order for every participant. Consequently, the results collected from the participants could have been impacted by order and practice effects, as well as posing issues with regards to the level at which an individual engaged with the statements. Participants were presented with the phrase combinations consecutively, for example

‘You should be punished for’ statements together, which meant that they could disengage until the next core phrase was introduced.

### **3.5 Method (The experiment)**

#### **3.5 (a) Participants (experiment)**

A priori power analysis indicated that a total sample of One hundred and two participants was required in order to reach 95% power for detecting a medium sized effect when employing the traditional .05 criterion of statistical significance.

One hundred and twenty-five undergraduate students (44 males and 81 females) from Birmingham City University took part in the initial screening process, completing a psychometric test measuring for Schizotypal tendencies (21-item PDI, Peters Delusions Inventory, Peters *et al.*, 1996). The PDI allowed for individuals to be grouped into low and high scoring for Schizotypal tendencies. The age of the group ranged between 20 and 51 (mean = 23.4). Eighty-eight individuals (44 high and 44 low) were placed in either the high or low scoring group and therefore were invited to take part in the second phase of the study. Fifty-seven of the eighty-eight volunteered to return and completed the Graduation Reasoning Assessment Task (GRAT) and interview process.

#### **3.5 (b) Measures (experiment)**

##### *The Peters Delusions Inventory*

This measure was utilised to score participants for the Schizotypal traits and therefore to categorise participants as high, mid or low. The mid group was omitted from the final analysis and the high and low scorers were compared for differences in reasoning. For more details about this measure please see section 3.4 (b).

##### *The Graduation Reasoning Assessment Task*

The GRAT was used to measure participants crime based reasoning (see section 3.4(c) for more details).

### *The development of the Graduation Reasoning Assessment Task (GRAT)*

The GRAT was created using Superlab (an experimental stimulus program). This allowed statements to be clearly presented to individuals completing the task, along with precise recordings of reaction time and accuracy measures. The instructions for the reasoning task were displayed on the screen prior to completing the task. This ensured that every participant received standardised instructions and therefore provided a level of consistency between participants.

A pilot study of the reasoning task was conducted on a small group of ten participants separate to the participants who completed the main study in order to test the data collection and procedure. It was clear from the pilot study that there were a number of changes that needed to be made in order to ensure that the reasoning task measured people's ability to reason and eliminated patterns of answers that would result in a reduction in the time needed for an individual to think about a given statement. For example, the formation of the programmed test did not allow for randomisation of statements within each reference level. Consequently, participants were presented with a series of statements that were the same apart from the replacement of the crime word in each case. For example, 'it is wrong to murder' followed by 'it is wrong to burgle'. It was necessary to change the current programming formation in Super lab, in order alleviate this problem. This was achieved by reducing the number of 'Blocks' from 16 to 4. Each block therefore represented a self-reference level that encapsulates statements in the first and third person. The statements required both 'agree' and 'disagree' responses. In changing the programming structure of the experiment the statement events within each block could be randomised in order to eliminate both predictability and practice effects.

The pilot study further exposed the need to involve words and statements that were not centred on a negative theme. This was highlighted by individuals, despite being required to reason in terms of whether they 'agree' or 'disagree' with the consequences of a negative action, beginning to reason in less depth by discovering that there was an apparent pattern. Two additions were made in order to alleviate this problem and to ensure that participants would need to read the complete statement taking into account both the activity i.e. 'murder', 'burglary', 'rape' and the

instruction i.e. 'should be punished', 'should not be punished', 'is wrong'. First, an additional list of positive words were introduced that were not connected to acts of crime and criminality i.e. 'smiling', 'appreciating' and 'respecting'. This ensured participants had to think about whether the words were representative of something that was 'positive' or 'negative' rather than just assuming the words were all negative in nature. Secondly, an additional two statement blocks, 'should be rewarded' and 'should not be rewarded', were added to each of the reference levels. This provided additional statements such as 'I should not be rewarded for Murder' and 'I should be rewarded for Rape'. Previously the statement blocks had consisted of 'wrong', 'right', 'should be punished' and 'should not be punished'. Furthermore, this addition ensured that a deeper level of reasoning and attention was required in order to arrive at a response.

When reflecting on the additional 'positive' word list it was noted that all the words were emotions based which had the potential to significantly impact on the research by overriding individuals' cognitive abilities to perceive and process sensory information. It was also possible that the emotive language would affect the way that individuals thought about the negative words such as 'murder', 'rape' and so on. The original list contained words such as 'smile', 'sympathise', 'empathise', 'consider', and so on (see table 3.1).

Table 3.1: List of doing or verb words.

Entertain
Eat
Cycle
Cook
Dance
Give
Listen
Relax
Study
Read

Whilst these words were neutral and avoided the issue of emotional influence highlighted about the first list during the pilot study, there were still a few words that created some problems. When comparing the ‘crime’ words with the ‘positive’ words it was clear to see that all the crime words were an action towards another individual, whereas a word such as ‘cycle’ was an action potentially performed with another individual. Therefore, five of the words from the list above were replaced creating the final list of words (see table 3.2) which were more comparable with the original crime words.

Table 3.2: Final list of mundane and Crime words.

<b>Mundane words</b>	<b>Crime Words</b>
Entertain	Murder
Work	Rape
Lend	Defraud
Cook	Blackmail
Shop	Assault
Give	Terrorize
Listen	Stab
Support	Burgle
Perform	Wound
Read	Hijack

### 3.5 (c) Procedure (experiment)

Participant information sheets (see appendix A6) were distributed to potential participants fully explaining the purpose of the research and the use of the data collected from the research process. Participants were given the opportunity to ask questions or for clarification prior to completing the PDI. Participants were reminded of their right to withdraw and the consent forms (see appendix A7) were explained and completed.

#### *Peters Delusions Inventory (PDI: Peters et al., 1999)*

Individuals were required to complete the PDI questionnaire in the first instance. Those individuals who scored high or low on the questionnaire were invited to complete the reasoning task and interview section (see below).

#### *Graduation Reasoning Assessment Task (GRAT)*

The second part of the experiment was specifically for individuals who had fulfilled the criteria for low or high Schizotypal tendencies (delusional ideation)

according to the PDI. High and low scorers were established by using the top and bottom third across the range of results. In response to an invitation, individuals volunteered to complete the Graduation Reasoning Assessment Task (GRAT). The GRAT was designed specifically for this study based on the information collected during focus group sessions. This task focused on individuals' reasoning accuracy and response time when relating specifically to different types of crimes and criminal activity. The GRAT task presented individuals with a series of statements based around the crime list generated in part one. The statements related the different crimes across the self-reference spectrum, therefore questioning individuals about their response to family, friend and stranger. For example, when focused on 'me', statements such as 'to murder is wrong', 'to murder a member of my family is wrong' were used.

Every precaution was made to ensure that the individuals responded to the reasoning task by pressing the correct keys. For example, a template was made which exposed the two keys that were required throughout the experiment. Standardised instructions (see appendix A10) were given both orally and visually and a template ensured that the required keys were visible and labelled. However, one participant's data file had to be omitted as the analysis of the results collected by Superlab suggested that one participant did not press the correct key to agree or disagree in 2 conditions.

### *Interview*

The final stage was a short follow up interview. The interview provided an arena for individuals to engage and reflect on their emotions, feelings and thoughts whilst completing the reasoning task and reading a short article about a crime case taken from an online newspaper article (see appendix A9). The aim of the newspaper article was to aid and capture responses to a real life, and therefore ecologically valid, case study. The questions focused on capturing the participants' 'feelings' whilst reading the newspaper story. Furthermore, the interview setting provided a space to expose the techniques and processes that individuals adopted whilst faced with the reasoning task. This allowed for the exploration of potential differences in thinking behind individuals' reasoning that would not be captured through the GRAT. The

interviews were based around the following three open questions in order for individuals to share as much information as they wished to:

- (1) *How were you feeling whilst completing the reasoning task?*
  - *What were you thinking about/focusing on during the task?*
  - *Was there anything that you wanted to say whilst completing it?*
  
- (2) *What are your thoughts about crime and criminal behaviour in general?*
  
- (3) *What kind of feelings and thoughts does this article provoke?*
  - *How might you understand those feelings? /why might you have reacted in that way?*

Prompts were used throughout in order to encourage individuals to share more information or to give more detail. Finally, individuals were provided with the opportunity to share any thoughts or information that they had not had the chance to voice or express previously in this study. The interviews were analysed using NVivo 8 software highlighting common topics covered by individuals using thematic analysis.

### **3.6 Results**

The results are presented from the reasoning task and followed by the interviews.

#### **3.6 (a) Reasoning task**

##### *Descriptive Statistics*

The results below are based on the data collected from the fifty-seven participants who completed the GRAT. The low groups' (7 males and 22 females) ages ranged between 20 and 39 years (mean = 23.6 SD = 2.1) and the high groups' (19 females and 9 males) ages ranged between 20 and 42 years (mean = 23.2 SD 2.2).

Descriptive statistics for the reaction time and error scores can be viewed in table 3.3 below:

*Table 3.3: Reaction time descriptive statistics.*

Self-Reference Level	PDI Group	Mean Reaction Time (s)	Reaction Time Standard Deviation (SD)	Mean Errors	Errors Standard Deviations (SD)
Me	Low	500.56	125.11	9	6.44
	High	437.17	897.67	10.73	6.82
Family	Low	566.35	181.93	8.06	8.06
	High	465.52	672.96	9.94	9.94
Friend	Low	528.45	240.47	7.15	7.15
	High	416.48	813.2	10.25	10.25
Stranger	Low	558.78	244.15	12.58	12.38
	High	478.32	128.94	13.6	11.77

Descriptive statistics suggest that whilst there are differences between high and low delusion ideation groups when considering reaction time and error scores across the self-reference levels, with high PDI scorers demonstrating marginally faster reaction times and consistently more errors than low PDI scorers, observed differences are unlikely to be significant.

*Inferential Statistics: reaction time data*

Although the assumptions for parametric testing (homogeneity of variance and normal distribution) were violated ( $p < 0.05$ ), the unrelated t-test was adopted to test as a method of analysis as a Mann-Whitney test was not appropriate in this instance. Due to the acknowledged violations, extreme caution was exercised when interpreting the statistical outputs. There were no significant differences in the mean reaction time scores for any of the self-reference levels (me, family, friend and stranger) between high and low-PDI scorers and violent and non violent crime ( $p > 0.05$ ).

Further analysis showed an effect size of me (0.09), family (0.20), friend (0.19) and stranger (0.41).

### *Inferential Statistics: error score data*

The error score data compiles participant's incorrect responses to statements according to British law. Although the assumptions for parametric testing (homogeneity of variance and normal distribution) were violated ( $p < 0.05$ ), the unrelated t-test was adopted to test as a method of analysis as a Mann-Whitney test was not appropriate in this instance. Due to the acknowledged violations, extreme caution was exercised when interpreting the statistical outputs. There was a significant difference found between high and low scorers when reasoning about non crime and the family (low  $M = 7.64$   $SD = 7.33$ , high  $M = 13.03$   $SD = 11.27$ ,  $t(54) = -1.16$ ,  $p < 0.05$ ) and non crime and friends (low  $M = 8.10$   $SD = 8.09$ , high  $M = 13.50$   $SD = 13.41$ ,  $t(54) = -1.81$ ,  $p < 0.05$ ). All other results were non-significant ( $p > 0.05$ ).

### 3.6 (b) Interviews

Qualitative descriptions were generated from the interviews that were conducted with the same fifty-seven participants who completed the reasoning task. Therefore, the quantitative and qualitative data together represent individuals with high and low PDI scores. A number of themes emerged from the interview data, and therefore the following section presents the three main themes: *emotions, reasoning techniques and reference level*.

#### *Emotions*

Ten high scorers of the PDI reported no emotional response whilst a further six reflected on their reaction to the reasoning task itself rather than the impact of the given statements or scenarios. For example, when asked how they felt whilst completing the task two separate participants commented:

*P017H: it's strange. Yea. It just made me feel a bit fidgety and bit sick. I dunno. Just like the same thing going through my head I dunno just gave me a funny feeling. I dunno just felt all funny like. Dunno why (laughter).*

*Interviewer: How did you feel whilst completing the task?*

*P033H: emotions wise or generally?*

*Interviewer: both?*

*P033H: I didn't feel much emotions to be honest. I was just answering the questions and going through the motions. After a bit you feel like you know what the next question is going to be even though you don't because you are wrong every time. Ah gosh that's hard to answer.*

When the same question was asked to low PDI scorers nine responded with comments about how the specific details of the scenarios within the task affected them. For example, one participant commented:

*Interviewer: how did you feel whilst completing the task?*

*P028L: erm, I did sort of think about different scenarios, and think about friends and families whilst doing it. So I thought about that and how I'd feel if it was done to them.*

### *Reasoning techniques*

During the interview participants were asked about what they were focusing and concentrating on whilst completing the reasoning task. Twelve of the high scoring participants commented about putting themselves into the scenario, the wording of the statements.

*P005H: situations that I might have been in that would affect my choice. Trying to put myself in it giving myself examples that might help me answer the question.*

*P019H: erm the wording to be honest yea erm when it said I should not be rewarded or I should be punished*

*P033H: not really I mean, it was only after I pressed the button that I thought oh maybe I should have taken more time.*

When asked the same question, eight of the low scoring participants suggested that in some cases they read the statements twice and if not they ensured that they read the whole statement, taking in more information about the scenario which links to the ‘jump to conclusions’ bias experienced by individuals with delusions (Huq, Garety and Hemsley, 1988).

*P033L: I don't know I think I was doing it quite quickly, like I just read and responded, some of them I had to read twice but that's it really.*

*P003L: I had to read the whole thing because that's how I get to things, I had to read the whole thing that as well. So that's me it takes a bit longer so I read the whole thing and think about the question for a while. I should think about what it's asking me.*

#### *Reference level*

The final theme that emerged from the interviews was the way in which individuals reflected upon the self, family, friends and strangers. Reference level acted as one of the independent variables for this study and therefore statements were specifically designed to encourage individuals to reflect on scenarios relating to themselves, a member of their family, a friend or a stranger. Whilst the reasoning task found no significant difference in reaction time or accuracy between high and low PDI scorers, it was interesting that high PDI scorer's commented on the differences between reasoning about themselves compared to a friend, family and stranger.

*P018H: it was just having thoughts a lot like how like like a lot of the time when I started doing friends and family I thought you would treat them the same really but you don't do ya.*

*P033H: The family one, I noticed that it moved from family, friend to stranger and I noticed the levels of concentration changed depending on whether you were asking about, I spent more time on friends and family than I did the stranger.*

*P033H: I think the attachment that we have to friends and family, we have no obligations to strangers really so it's a clean no answer but with family you have to think about the the for example with lending you have to think about would you lend or wouldn't you lend depending on the circumstances. Certain parts of the family I would lend but second thoughts I wouldn't lend to family cos I wouldn't get it back (laughter). I mean what did actually stand out were the questions about murder because I answered the same for each. But the other questions it would depend on the situation.*

Interestingly, few comments were made by low scorers with regards to the difference in reasoning along the reference level.

### **3.7 Discussion**

The reasoning task results revealed no statistically significant differences between the reference levels: 'me', 'family', 'friend' and 'stranger' when considering reaction times. This suggests that individuals who scored high for Schizotypal tendencies did not reason significantly differently from those individuals who scored low, in terms of response time. There were, however, two significant differences noted between when reasoning about non crime statements related to family and friends with high scorers making an increased number of errors compared to low scorers.

The follow up interviews captured some clear differences in the high and low scorers reasoning techniques. High scorers reported differences in the way that they reasoned along the self-reference levels, commenting upon how the importance and emphasis of a scenario changed depending on how closely they were related to the individual(s). This links to Theory of Mind functions (Baron-Cohen, 1999) as individuals showed signs of contemplating other people's perspectives and

perceptions. Low scoring individuals tried to take in as much information as possible from the statement by ensuring that they read the whole statement, or some even suggested that they read the statements twice, before making a decision. This finding is supported by the ‘jump to conclusions’ bias experienced by individuals who experience delusions (Huq, Garety & Hemsley, 1988). In some cases high scorers worked out the minimum amount of information that was needed in each case to make a decision, for example, they highlighted key words from the statements that shaped the scenario i.e. ‘murder’, ‘should not be’, and ‘punished’. A decision was made based on the three selected key elements. Similar findings were gathered from the interview questions relating to the newspaper article. In some cases, individuals focused purely on the crime committed and the resulting consequence in order to generate their own thoughts about the article. Low scoring individuals considered more aspects of the story, including previous offences and possible circumstances to instigate the offence.

Despite there being no significant differences from a quantitative perspective, between individuals with high and low Schizotypal tendencies, there were clearly a number of differences from a qualitative perspective. These differences appear to stem from the differing approaches that high and low scoring individuals adopted whilst completing the reasoning task. Whilst the statistical results suggested that high scoring individuals did not have significantly faster reaction times, therefore suggesting that the experimental hypothesis should be rejected, the qualitative results are in line with the theory supporting ‘quick decisions’ in Schizotypal individuals. The majority of the research in this area predominately adopts a quantitative methodology and as such captures quick decision making, represented by System One of dual processing theory (Evans, 2007). However, the qualitative element of this research study captures individuals accounts, particularly from low PDI scoring individuals that demonstrate elements of System Two processing (Evans, 2007) as high scoring individual made attempts to make a considered and well informed decision.

The reasoning task was structured around a reference scale that was spread across four parts ‘me’, ‘family’, ‘friend’ and ‘stranger’. Whilst one of the aims of this

study was to capture at which point on the reference scale the bias occurred it could be quite possible that the four-part scale diluted the results. Previous tests have found significant differences using a two-part reference level 'self' and 'other'.

Whilst careful consideration was given with regard to the presentation and structure of the computerised reasoning task, individuals were not presented with practice trials prior to completing the task. This could have impacted upon the speed at which people reason about themselves 'me' as this condition was the first condition that was presented to all individuals. Theoretically, there is an expectation for individuals to reason about themselves more quickly than other individuals, however, this effect could have been reduced by individuals 'getting used to' the technology and layout of the reasoning task. Consequently, the measurement of reaction times for the 'me' reference level could have overall been significantly higher than a true reading would have been.

The reasoning task was lengthy and therefore individuals reported feeling fatigued towards the latter end of the task. The results, therefore, may reflect individuals' attention spans and energy levels during the completion of the task causing the reaction time and accuracy rates to fluctuate throughout. Furthermore, if individuals felt fatigued part way through the task they could have responded more quickly towards the end in an attempt to finish sooner (Toms, Morris & Ward, 1993).

It is possible that the quantitative measure of response time was influenced or at least affected by an individual's reading speed. Certain individuals could have read the statement twice in the same amount of time that it took for another individual to read part of the statement once. Reading speed was not a measured or controlled factor in this study, however, recent studies have screened for intelligence levels (Galbraith *et al.*, 2010). Related to controlled factors, it was not possible to control for toxicity levels, sleep and alcohol affects in this experiment. However, any difference should have been alleviated, to some extent, given the size of the sample for this experiment.

The experiment was designed and programmed in a format that enabled the

independent variables 'self-reference level and PDI' to be explored. It is possible that the reasoning task became over complicated and therefore the measurement of these variables could have been affected by confounds. One possible confound could be wording. Individuals commented on 'wording' during the interview sessions, suggesting that the way in which statements were worded affected the way in which they responded. The action words used within the statements were a combination of mundane everyday task type words, and words that describe a criminal act. Certain action words could have stimulated individuals by triggering sensation seeking and risk taking mechanisms (Zuckerman, 1994).

The non-significant results, although possibly confounded, collected from the reasoning task are still informative in the sense that they describe where biases in reasoning do not occur. In this instance, there seems to be no significant difference between high and low - PDI scoring individuals reasoning about crime, when considering reaction time and accuracy scores. However, it is possible that the effect of a bias may present itself in other circumstances and conditions.

There was a significant drop in the number of individuals who completed the PDI compared to the number who went on to complete the GRAT. The loss of participants was down to an inefficient methodology. Individuals were asked to complete the PDI on one day and then were invited to complete the reasoning task several days later. Consequently, for a number of reasons, some students did not return to complete the GRAT. This could have been due to individuals' motivation, incorrect contact details, or time constraints.

Finally, the GRAT required individuals to respond to the presented statements without placing the statements into context. Some previous studies have adopted this design in order to seek ecological validity and represented realism (Galbraith *et al.*, 2008).



**Chapter Four: Study Two,  
Graduation Reasoning Assessment  
Task – Revised (GRAT-R)**

## **4.1 Overview of Chapter Four**

The results presented in chapter three, Study One suggested that there were no significant differences in reasoning between high and low scoring individuals with regard to reaction time and accuracy. However, a closer examination of the results revealed trends in reaction times and error rates that were consistent with previous studies (Garety, Hemsley, & Wessely, 1991; Linney *et al.*, 1998). The non significant results could have been due to a number of issues that arose from the methodology: the four part reference level (for more information please see Chapter Three Study One) dispersed the results; the lack of context surrounding the statements; the task length.

Study Two therefore addresses these issues by reverting back to a two part reference level assessing differences in reasoning between ‘the self’ and ‘other’ people (Galbraith, Manktelow and Morris, 2008), and providing context to the statements and decision making process

## **4.2 Literature Review**

There has been an increased amount of research providing evidence for Schizotypy being accompanied by biases in cognitive functioning similar to those experienced by individuals diagnosed with Schizophrenia (Claridge, 1988; Claridge and Beech, 1995; Van Os, Linscott, Myin-Germeys, Delespaul & Krabbendam, 2009). In particular, individuals show Theory of Mind functions that focus primarily on the self (Sass & Parnas, 2003; Taylor, 2010; Waters & Badcock, 2010). Individuals with Schizotypal tendencies acquire biases in the ability to infer the mental states (beliefs, thoughts and intentions) of others in order to predict and explain their behaviour (Blackwood *et al.*, 2001). These reasoning abnormalities are believed to contribute to the formation and maintenance of delusions and delusion like beliefs (Huq, Garety and Hemsley, 1988; Garety, 1991; Garety and Hemsley, 1994; Garety and Freeman, 1999) in individuals diagnosed with Schizophrenia, Schizotypal Personality Disorder and those at risk of delusions.

It has been proposed that an exaggerated focus on the self (Moller and Husby, 2000) can lead to a profound disorder of the self (Ipseity Disturbance) or a disrupted

sense of awareness. Sass and Parnas (2003) propose that prodromal Schizophrenia, a period that occurs one to two years before psychotic symptoms emerge, is characterised by hyper reflexivity. This causes individuals to become detached from aspects of 'the self', and therefore, these aspects are perceived as external to the self (Galbraith *et al.*, 2008). Additionally, some individuals appear to have less cognitive flexibility (Everette, Lavolie, Gagon & Goasselin, 2001) with an inability to adapt to new sensory information. Accordingly, individuals who scored high for Schizotypal tendencies may have responded differently to statements that captured a detached aspect of the self, particularly as individuals reasoned at different stages along the four part self referent level.

However, the length of the participation process in Study One could have affected an individual's concentration and participation towards the latter end of the test. Individuals may have rushed through the statements in order to complete the test more quickly, causing the results to fluctuate and any differences in response time that reflected the detached aspects of the self could have merged. In a small scale study, Garety *et al.*, (2007) collected self-reported measures of 'rushing' in combination with a variation on the traditional 'beads task' paradigm. Participants were asked '*how much were you in a rush to finish this study?*' and were asked to respond by indicating which point on a scale of 1 (not at all rushing) to 100 (extremely rushing) best represented their rate of rushing. They found that the extent to which an individual was rushing was a good predictor of a 'jump to conclusions' bias emerging. However, the rushing measure had not been previously demonstrated with a clinical population and the scale itself was derived from an invalidated single item response. In contrast to these findings, Woodward and Lambert (2007) directly enquired about the strategies that individuals employed when completing their reasoning task. They asked individuals whether they were aiming to finish the task 'as soon as possible' and found no evidence for such motivation. Conversely, Heit (1998) maintains that time pressure impacts significantly upon individuals' strategies when faced with a reasoning task. Whilst restricted by time, individuals have to make a calculation as to what information is essential or most important. As a result, some information is left out and therefore individuals consider less of the presented material. Usually these kinds of decisions are made using prior experience. In addition, limited time appears

to be the single most deleterious effect on occurrence of errors (Marken, 2003). In response, this study captured individuals' reflections of their thoughts, emotions and processes whilst completing the reasoning task in the form of an audio diary. Individuals were covertly prompted to assess whether they were rushing to complete.

Study One, Chapter Three, examined participants' reasoning abilities by requiring individuals to simply agree or disagree with a sequence of statements. Whilst this initially appeared to be a non-demanding task the sequence provided participants with quite an intense experience. Individuals were bombarded with randomised statements based on six sentences. Each time the action word was replaced by either a crime action or mundane action word. Participants had to carefully consider both the 'action' and the 'consequence'. For example, 'I should be punished for murder' or 'I should not be punished for murder'. The statements moved across a four part reference level of 'me', 'family', 'friend' and 'stranger'. Furthermore, the statements were isolated and not placed into any particular context, and therefore did not require participants to apply realistic reasoning skills that are reflective of everyday reasoning. A number of traditional moral reasoning tasks have provided individuals with context through the adoption of vignettes or scenarios (Kohlberg's Moral Dilemmas - Kohlberg, 1976) which provides a basis and platform from which decisions can be made. The Moral Judgement Interview (Colby and Kohlberg, 1987) is one of the most widely used measures of moral reasoning. As a prediction measure of moral reasoning, the Moral Judgement Interview uses moral dilemmas to elicit moral reasons and justifications from respondents. On this basis, a moral dilemma is a situation where there is a conflict between two moral issues (Palmer, 2003). Kohlberg used moral dilemmas as part of a qualitative assessment tool to capture individuals' 'justifications' as an informer of individuals' reasoning level. However, other studies have utilised moral dilemmas as part of a quantitative assessment tool.

The Defining Issues Test, like the Moral Judgement Interview and Sociomoral Reflection Measures, uses moral dilemmas but records a quantitative measure of moral reasoning. Similarly, the Sociomoral Reflection Objective Measure (Gibbs *et al.*, 1984) is an adaptation that is reflective of previous tests but again with a

quantitative measure. The quantitative measure has traditionally been achieved by adopting multiple choice style questions.

In light of the above literature and reflection on Study One, this study attempts to move towards a more ecologically valid design by placing the reasoning task into context. This is achieved through the use of vignettes/stories. The previously used four part reference level of 'me', 'family', 'friend' and 'stranger' utilised in Study One was replaced with a two part reference level, 'me' and 'other', consistent with previous studies (Galbraith *et al.*, 2008). This aspect of the reasoning task explored the exaggerated 'self focus' associated with high levels of Schizotypy and Schizotypal disorders.

The reasoning task in this study will adopt the same measures used in Study One: response accuracy and reaction time. These dependent variables will provide a way of measuring the presence and extent of a 'jump to conclusions' bias in individuals with high Schizotypal tendencies. This study will adopt an innovative qualitative data capture tool in the form of an audio diary. This method will replace the interviews used in Study One. The audio diaries create a more freeing environment for participants to reflect and record their feedback on the reasoning task, whilst providing an arena to covertly gain feedback on participants 'rushing' to complete.

#### 4.2 (a) Research Question and Hypothesis

It is expected that individuals with high Schizotypal tendencies will present a 'jump to conclusions' bias on the reasoning task, generating quicker reaction times and as a result making more errors.

### **4.3 Method**

#### 4.3 (a) Participants

56 participants (9 male and 47 female) were recruited to take part in this study from the undergraduate population, across the City North Campus, at Birmingham City University. Their ages ranged between 20 and 53 ( $M = 23.69$ ). Participants were recruited using opportunity sampling through a combination of posters, signup sheets, recruitment in lectures, and by word of mouth.

### 4.3 (b) Measures

#### *Peters Delusions Inventory (Peters et al., 1999)*

Similarly to Study One, participants were screened for Schizotypal traits using the Peters Delusions Inventory (PDI: Peters *et al.*, 1999) (see section 2.4a for more details).

#### *Reasoning Task: Graduation Reasoning Assessment Task Revised (GRAT-R)*

The GRAT-R was an adaptation of the Graduation Reasoning Assessment Task (GRAT) used in Study One. The GRAT was composed using Superlab programming software, used in a number of experimental cognitive psychology studies (Feeney, Coley, & Crisp, 2010; Torres, Keed, Marlow-O'Connor, Beewen, & Goldman, 2009). However, Superlab has been critiqued for its usability and limited design features (MacWhinney, St. James, Schunn, Li, & Schneider, 2001), and therefore, the GRAT-R utilised E Prime 2 software for the creation and implementation of the reasoning task. E Prime 2 provided a number of supplementary functions that were not provided by Superlab which proved advantageous in the programming of the GRAT-R and enabled the GRAT-R to overcome a number of problems that were encountered in Study One when using Superlab (see methodology chapter for in depth discussion around these issues). The GRAT-R, whilst being based on the GRAT, acquired an additional element that placed the reasoning task statements into context. This was achieved through the use of vignettes that derived from the dilemmas created by the focus groups in part one.

The vignettes set the scene by providing participants with a crime based dilemma. Participants were then presented with a set of statements whereby they were required to agree or disagree. Half of the statements referred to the 'self' and the other half to 'other' people, i.e. characters within the vignette. One of the vignettes was purposely based on a violent act/crime whilst the other vignette was based on a non-violent act/crime. This was in keeping with crime statistics that suggest that individuals diagnosed with Schizophrenia are four times more likely to commit a violent crime (Lindqvist & Allebeck, 1990; Link, Andrews, & Cullen, 1992) and have a self-reported elevated engagement in aggressive behaviour (Swanson, Holzer, Ganju, & Jono, 1990). Furthermore, the results of focus group from Study One

suggest that the man classification for differentiating crime was the level of violence displayed during the act.

*Example Scenario:*

*Jared was walking home from work late one night when he heard a scream from the road ahead. He ran down the road to find a lady lying on the floor calling for help. She told Jared that she had been attacked by a gang moments ago. As there were lots of people surrounding the lady by this point, Jared ran further down the road in the direction that the lady had said the gang had gone. Jared caught up with the gang who were running down the road. He shouted at them and managed to capture one of them by the hood. Losing his temper he threw the guy to the floor and punched him.*

*Example Statements:*

*To assault is wrong*

Figure 4.0: Example Scenario and statement

Eprime was programmed to record participants' reaction times and accuracy scores.

*Audio Diary*

The audio diary element was an adaptation to the interviews that were conducted in Study One. Audio diaries as a method of data capturing is novel and innovative. However, there are a number of advantages to using this method over a standard interview. Individuals completing an interview, particularly given the set up of this research study, often experience a delay between an event (the completion of the reasoning task) and the interviews. Therefore, participants in the interview are relying on memory. The audio diary set up allowed individuals to record a diary straight after completing the reasoning task so that their responses were immediate and not affected by time (Alaszewski, 1998). To some extent the demands placed upon individuals in the interview setting is reflective of System Two analytic

processing. As such, this method allows for an exploration of System One and System Two processing from a qualitative approach.

The audio diary method enabled several diary rooms to be set up and therefore a number of participants were able to record their feelings, emotions and experiences at the same time, but more importantly, diary entries were recorded immediately after completing the reasoning task. Consequently, this significantly reduced the amount of time that was needed to test participants. In addition, a number of participants commented, during the study, that they were more comfortable to record an audio diary than to take part in an interview. The audio diaries were based around the same four main questions as used in the interviews in Study One (see appendix A12 & A13).

Each of the questions were designed to specifically target elements that have been suggested to impact upon reasoning. For example, question one was created to capture individuals' emotional responses to the scenarios and the statements used during the reasoning task. A wealth of research has suggested that the lack of emotional detection and empathy tied into 'Theory of Mind' functions can have a significant impact upon reasoning accuracy (Brune, 2004).

Question two was specifically aimed at trying to capture the techniques that individuals may have adopted in order to complete the reasoning task. This question was an attempt to subtly capture individuals' comments with regards to 'rushing', 'time pressure' and completing the task 'as soon as possible' (Woodward & Lambert, 2007; Garety, Bebbington, Fowler, Freeman & Kuipers, 2007; Heit, 1998; Marken, 2003).

Question number three was designed to investigate whether individuals felt comfortable with simply answering 'agree' or 'disagree' in response to the statements in the reasoning task. This interest stems from Kohlberg's (1958) theory of moral development, where the focus is on how an individual justifies their reasoning, rather than their level of reasoning accuracy. Therefore, it seemed plausible to capture whether individuals wanted to justify their responses and whether there were any differences between groups.

Finally, question four follows on from question three, by asking participants to comment on their thoughts about crime and criminal behaviour. Again, individuals might demonstrate a need to justify their answers or simply be happy to give their opinion.

A pilot study of both the reasoning task and audio diary was conducted with ten participants. The results from these participants were not included in the final data sets. However, the study highlighted a few points that needed to be addressed before carrying out the larger scale study. It became clear that individuals required more than simply four questions to record the audio diaries. Naturally, there is no interaction with the researcher when recording audio diaries, unlike interviews, as the participants were sitting in a room on their own. Therefore, it was suggested that additional prompts/sub questions were added to questions 1, 2 and 4 in order to guide and to help participants to engage and further consider connected points to the main questions (See appendix A12 & A13).

#### 4.3 (c) Design

##### *Focus Groups*

Four focus group sessions were conducted with students from Birmingham City University, ensuring that the crime based scenarios and vignettes were meaningful and relevant to the target population sample. Each focus group had between 8 and 10 participants who were recruited on a voluntary opportunity basis. Four dilemmas were created from the material generated in the focus group sessions. These dilemmas were used to create the vignettes featured in the reasoning task in the experiment phase of this study.

##### *Main Experiment*

The experiment comprised a between subject factor of PDI (Peters Delusions Inventory) and a within subject factor of word type (i.e. Crime / Non-crime). The dependent variables were reaction time and accuracy.

A three-stage format similar to Study One was adopted for Study Two. First, participants were required to complete the Peters Delusions Inventory (Peters *et al.*,

1999) in order to measure individuals' Schizotypal tendencies. Then participants completed the reasoning task programmed using Eprime software. Finally, participants were required to complete an audio diary of their experience, thoughts and feelings whilst completing the reasoning task. The audio diary recordings were prompted by four main questions as cited below. It was ensured that individuals remained anonymous throughout the study by implementing experimental participation numbers.

#### 4.3 (d) Procedure

Participants were required to complete the PDI (Peters *et al.*, 1999), the Graduation Reasoning Assessment Task-Revised (GRAT-R) and an audio diary entry. The audio diary component was made optional to participants, as some students may have not been fully comfortable with completing a fairly innovative task. However, the combination of these measures allowed for a deep analysis of whether Schizotypal rating relates to reasoning speed and accuracy, and to what extent these measures differ between these groups. In all cases instructions were standardised using an experiment script (see appendix A11) to ensure that all participants had the same level of explanation and guidance in completing each section of the study. Individuals were asked initially to read a participant information sheet (see appendix A6) and were encouraged to ask any questions prior to participation. Participants were informed that a summary of the results would be available once all of the data had been collected, analysed and written up. This ensured that participants did not misinterpret or accumulate a wrong understanding about their individual score. At this stage participants were given their participant number and were instructed to use this number in place of their name. Individuals then completed a consent form (see appendix A7) and a background information sheet (see appendix A8) whilst being reminded of their right to withdraw at any point. Once all the forms were completed individuals were given instructions on how to complete the practical elements of the study. Half of the participants completed the PDI first and then the GRAT-R, and the other half the GRAT-R followed by the PDI. The counterbalancing process ensured that neither component affected the other. The PDI questionnaire was completed individually after receiving standardised verbal instructions from the researcher along

with the written instructions provided by the PDI. Once complete, participants posted the PDI questionnaire into a secured box. The reasoning task component was explained both verbally and visually using standardised instructions prior to individuals starting the task (see appendix A11). Scenarios within the task were counterbalanced, i.e. half of the participants completed the violent scenario first and the other half completed the non-violent scenario first, in order to account for practice and order effects.

The final stage of the research required participants to record an audio diary of their thoughts, reflections and feelings in relation to the GRAT-R. Participants completed the audio diaries on an individual basis. Multiple research laboratories were set up with four main questions on the walls (see appendix A12 & A13) which helped guide the individuals through the process of making their diary entry. Finally, participants were debriefed and reminded of the purpose and focus of the research whilst having the chance to ask any questions or to raise any concerns.

## **4.4 Results**

### 4.4 (a) Reasoning task results

#### *Self-reference level and PDI descriptive Statistics:*

The descriptive statistics for self-reference level reaction time and error scores can be viewed in Table 4.0 below.

*Table 4.0: Descriptive statistics for reference level.*

<b>Self-Reference Level</b>	<b>PDI group</b>	<b>Mean Reaction Time (s)</b>	<b>Reaction Time Standard deviation (s)</b>	<b>Mean Number of Errors</b>	<b>Error Score Standard deviation</b>
Me (self)	Low (n=28)	5.37	2.00	1.21	1.18
	High (n=28)	4.96	2.24	0.84	1.54
	Total (n=56)	5.16	2.10	1.03	1.37
Other	Low (n=28)	6.99	1.92	2.74	1.94
	High (n=28)	6.57	2.91	2.63	1.95
	Total (n=56)	6.78	2.44	2.68	1.92

The results from the Levenes' pre-test were non significant and therefore did not violate any assumptions for parametric testing (Levenes  $p \geq 0.05$ ).

A series of repeated measures two-way Analysis Of Variance (ANOVA) was conducted on the data set.

*Reaction time:*

No interaction between PDI and Reference Level was found ( $F_{1, 36} = 27.06, p > 0.05$ ).

There was a significant main effect of reference level (participants made significantly faster decisions about themselves compared to making decisions about others) ( $F_{1, 36} = 27.06, p < 0.05$ ).

*Error data:*

No interaction between PDI and Reference Level was found ( $F_{1, 36} = 41.83, p > 0.05$ ).

There was a significant main effect of reference level (participants made significantly fewer errors when making judgements about themselves compared to when making judgments about others)  $F_{1, 36} = 41.83, p < 0.05$ .

*Crime type:*

The descriptive statistics for crime type (violent and non-violent) reaction times can be viewed in table 4.1 below.

*Table 4.1: Descriptive statistics for crime type.*

<b>Crime type</b>	<b>PDI group</b>	<b>Mean Reaction Time (s)</b>	<b>Reaction Time Standard deviation (s)</b>	<b>Mean Number of Errors</b>	<b>Error Score Standard deviation</b>
Non-violent	Low (n=28)	5.74	2.19	1.35	1.13
	High (n=28)	4.95	1.87	2.01	1.55
	Total (n=56)	5.34	2.05	1.56	1.24
Violent	Low (n=28)	6.62	2.10	1.63	1.05
	High (n=28)	6.58	3.92	2.17	1.95
	Total (n=56)	6.59	3.10	2.68	1.96

*Reaction time:*

No interaction between PDI and Crime type was found ( $F_{1, 36} = 5.61, p > 0.05$ ). However, there was a significant main effect of crime type (participants made significantly faster decisions about non-violent crime compared to violent crime)  $F_{1, 36} = 5.61, p < 0.05$ , partial  $\eta^2 = 0.14$ . Non significant results were collected from the analysis of PDI and reasoning reaction time. However, a significant difference was found between reasoning times when comparing reasoning across the reference level of ‘me’ and ‘other’.

Further analysis demonstrated a large effect size according to Cohen D ( $d = 0.89$ ) and retrospective power = 1.0 (Cohen, 1992).

*Error data:*

No interaction between PDI and crime type was found ( $F_{1, 36} = 35.23, p > 0.05$ ).

There was a significant main effect of crime type (participants made significantly fewer errors when making judgements about non-violent crime compared to making judgments about violent crime)  $F_{1, 36} = 35.78, p < 0.05$ .

#### 4.4 (b) Audio Diary results

The audio diaries were completed by 42 participants (22 high scoring and 20 low scoring). The diaries that were collected were analysed using thematic analysis (Howitt, 2010; Braun & Clarke, 2006) in NVivo 8, and as a result a number of themes emerged. Each of these themes will be introduced and presented individually below.

There appeared to be a difference in answers between those individuals who scored high and low for Schizotypal tendencies when asked about their *emotions*. Eleven of the high scoring individuals tended to report either feeling no emotion or some kind of personal emotion with relations to taking part in the research. For example, one individual stated that they were a little anxious about taking part and completing the task.

*P208: 'no great emotion, felt mundane'*

*P236: 'didn't really feel anything'*

*P244: 'I didn't really feel anything towards the characters in the scenario, although I did feel a little anxious about completing the study'*

On the other hand seven of the low scorers commented about how they felt about taking part in the research as well as how they related their answers to the scenario dilemma. For example one individual said:

*P217 'I felt some anxiety, a little nervousness, I think I felt this because some of the questions were moral questions that I should, it's for sure that stealing is wrong and you shouldn't be rewarded from it, and I wanted to make sure that I get these questions right'*

Another individual commented upon the fact that they wanted more information. They also suggested that they felt constricted by the response choices of either 'agree' or 'disagree' to the presented statements:

*P209: 'erm I felt like, like more needed to be explained, like rather agree and disagree like more explanation of the answers. I tried doing it by thinking about my own experiences, what I would do, how I felt'*

Nine individuals specifically commented on the characters in the scenarios, particularly given the actions that they had performed:

*P216: 'well the first one I wasn't sure what to think, yes he had committed a crime but at the same time he was trying to help someone else, so I was a bit confused as to what my stand point should be on that one, but eventually I thought hey he did something wrong'*

*P225: 'felt ok, my emotions, eh I just felt sorry for the old man when Cheryl took the money from him'*

Another theme that emerged whilst analysing the audio diaries was *justifications*. Sixteen high and thirteen low scorers commented on the desire to give more than a simple 'agree' or 'disagree' response.

High scorers commented:

*P232: 'I think the questions were closed where I myself has open answers to verbalise, I felt that with the assault sometimes there are reasons for assault whether to stop any serious actions or*

*actions that will be seen as worse than the original assault, I felt like I needed to express that'*

*P236: 'I believe that assaulting people in different contexts should have different outcomes so I wanted to explain that a bit more'*

Low scorers commented:

*P209: 'I just felt like I need the chance to explain it rather than a simple yes or no answer really'*

*P217: 'first question about Jarred assaulting the attacker, I think that not simply a yes or no answer a point like that your emotions can be running high perhaps blinded by anger and feel, eh you want to zap some vengeance. I don't think it's about a simple yes or no answer'*

This suggested that both high and low scorers felt the need to provide supplementary information and some form of communication, or at a bare minimum provide a justification for their decision.

Five of the high scorers showed signs of paranoid thinking, both in terms of the scenarios and the reasoning task itself. In response to the question 'was there anything that you wanted to verbally say whilst you were completing the task?' one individual made an interesting point with regards to contradicting themselves. They discussed how they were paranoid about giving an incorrect response to a statement:

*P245 'when I was on Jared's task erm I did want to shout out and say oh my goodness I've just contradicted myself because it asked erm there was a lady who got attacked by and gang and Jared ran over to her and she pointed to where the gang had gone and Jared ran after them caught one by the hood and punched to the ground so assaulted him and erm you know on the inside*

*I was thinking yea good, you know what goes around you know may come around an eye for an eye and all that stuff. You know, but when asked the question do you think what Jared did was good I had to you know disagree because I did even though I could see why he did what he did. I just felt like I was completely thrown, like I had contradicted myself'.*

This quote highlights something interesting about the way in which this individual reasoned about the given scenario. It appears that she had a double response to the situation, one that was a natural, raw and uncalculated, and another that demonstrated something of her morality through reasoning and thinking about the given dilemma. Despite scoring highly for Schizotypal traits, this individual was able to employ a strategy of going beyond her initial feelings to consider what would be a sensible answer.

The final theme that emerged from the audio diaries was *strategies* for completing the reasoning task. Here, individuals who scored high for Schizotypal traits seemed to give different answers to those who scored low for Schizotypal traits. Nine of the high scorers commented on using instinct. For example:

*P233: 'I used gut instinct; from the top of my head what I thought was right'*

*P237: 'I just knew, the actually act, it was wrong, it was wrong!'*

Twelve low scoring individuals commented on different ways of pondering over and absorbing the vast amount of information that was given to them. For example:

- P203: *'made sure that the answers were my opinions and not what other people would have thought, and I made sure that I had read the questions properly before answering them'*
- P204: *'the task questions, thinking about how they linked, reading them through and understanding it'*
- P209: *'erm, I was trying to think rationally and as clearly as possible... mainly focusing on what I would do in that situation'*
- P216: *'read the scenario, made sure I understood it, made my own opinion about it and thought about the crime itself, whether it was right or wrong'*
- P217: *'concentrating on reading the questions carefully so that I would answer it correctly....I read the question twice and answered accordingly'*

#### *Self reported 'rushing'*

In light of the supporting literature an analysis of the qualitative data was carried out to see if any of the participants, from either high or low grouping, mentioned anything with regards to 'rushing' or completing the task 'as soon as possible'. Neither of the groups made reference to 'rushing' to complete the task.

#### **4.5 Discussion**

The results of this study are grouped into sections comprising reaction times, error data, violent vs. non-violent and audio diaries. Together, these sections provide insight into the character and existence of biases exhibited by individuals who score highly for Schizotypal tendencies. The quantitative reaction time results presented a significant main effect of reference level. This effect showed that individuals were significantly quicker at making decisions about themselves compared to making decisions about other people. This could be a reflection of the fact that automatic/automated responses are generated from a first person perspective, whereas

when engaged in reasoning about another individual's situation then it takes longer to gather the information. It is also possible that individuals may gather more information, prior to making a decision, when reasoning about another individual compared to reasoning about their own situation. This could link to dual process accounts of processing (Evans, 2007), whereby System One processing is quick and automated, whilst System Two processing is slow. However, overall there was no significant interaction when considering PDI (Peters Delusions Inventory) scores. There were no significant differences between the reaction times of individuals who scored high and low Schizotypal tendencies.

In keeping with the reaction time results, the error score data presented a significant main effect of reference level. Participants made significantly fewer errors when making judgements about themselves compared to making judgements about other people. Similar to before, there were no significant interactions found between reference level and PDI scores, and no significant main effect of PDI.

The scenarios were divided into violent and non-violent crime types. The results presented a significant main effect of crime type. Participants reasoned more quickly about non-violent crime compared to violent crime scenarios. Again, there was no significant interaction between crime type and PDI, suggesting that individuals with high and low Schizotypal tendencies reasoned in the same way for both violent and non-violent crimes.

To summarise, individuals make quicker, more accurate decisions about themselves in comparison to reasoning about other individuals. Furthermore, participants made quicker decisions about non-violent crimes compared to violent crime scenarios.

Whilst the quantitative results suggest that there were no differences in the way that individuals with high and low Schizotypal tendencies reason, the audio diaries proposed that high and low scorers reasoned differently on a qualitative level. These differences can be captured by the themes of emotion, justifications, paranoid

thinking and strategies. Overall, individuals with Schizotypal tendencies showed less empathy towards other people and less emotional awareness whilst reasoning. Furthermore, both high and low scoring individuals reported that they wanted to provide more than a simple 'agree' or 'disagree' response. Individuals felt the need to provide some kind of justification or explanation of their chosen response. High Schizotypal scorers showed elements of paranoid thinking in their answers, questioning whether there was some kind of alternative motivation for the research study, or questioning whether cameras were watching them. The final theme that emerged from the audio diaries was the strategies that high and low scorers adopted whilst completing the reasoning task. High scorers reported using instinct, suggesting a quick automated response to the statements. Low scorers used strategies to absorb as much information as possible. This is evident in the average response times of high and low scorers: although these averages were not significantly different, it was clear that low scorers had slower response times which could be a result of individuals attempting to take in as much information as possible.

The non-significant results gathered by the reasoning task, when considering PDI and both crime type and reference level, suggest that a reasoning bias does not occur for individuals who score highly for Schizotypy traits when reasoning about crime based scenarios. To some extent, this is in keeping with crime statistics that suggest that people diagnosed with 'schizo' type disorders, including Schizophrenia, are not automatically criminal in nature (Prins, 2005). It is possible that biases and differences in reasoning might not necessarily apply to certain specific criminal acts.

There are a number of potential reasons why the inferential statistical tests found no significant differences when considering the impact that level of Schizotypy had on reasoning. It is possible that sub-clinical ideation groups represented by the high PDI scoring individuals do not present biases, errors and differences in reasoning to the same extent that individuals with 'schizo' type disorders do. It might be suggested, therefore, that Schizotypy does not affect reasoning skills when reasoning about crime based scenarios. However, this is inconsistent with the majority of previous research on general reasoning tasks (Le Pelley *et al.*, 2010; Galbraith *et al.*,

2010, 2008; Sellen, Oaksford & Gray, 2005), and in fact the direction of the mean scores contradicted the findings of previous studies indicating that high scorers made slightly faster decisions than low scorers.

It is likely that the reasoning task design had a number of limitations that did not capture the details and extent of the reasoning biases that are associated with Schizotypy. Study One and Study Two have confirmed that there are no significant differences when comparing the reaction times of high and low Schizotypy scoring individuals on these measures. It could be argued that high scoring individuals acquire no biases in terms of reaction time, and as a result, the results from this study have confirmed this notion. Previous studies have measured the amount of information required before making a decision (data gathering) rather than reaction time scores (Dudley & Over, 2003). Therefore, this study has highlighted and confirmed that the boundaries of such a bias do not present themselves when measuring reaction times. Individuals appear to present biases and difference in reasoning in terms of the amount of information an individual requires before coming to a conclusion. This has been confirmed in studies such as the beads task (Dudley and Over, 2003). Therefore, further research might explore whether the principles of the beads task apply to both crime based reasoning and more ecologically valid reasoning task designs.

The qualitative results presented evidence in the form of three main themes that highlighted a difference in reasoning between high and low scoring participants. There appeared to be a difference in the way that high and low scorers ‘talked about’ and ‘thought about’ their *emotions*. High scoring individuals reported very little about their emotional state or their empathy towards the characters in each of the given scenarios, while low scoring participants often provided great detail about their emotional experience. It is likely that there is a difference in emotions when reasoning about ‘the self’ compared to reasoning about ‘the other’, here lies a limitation of this study as it did not account for, or measure, emotional differences in reasoning about ‘the self’ and ‘the other’. As noted by Prins (2005) when discussing Schizophrenia, there is likely to be a degree of incongruity between thoughts and emotions. It is likely, therefore, that the lack of discussion by participants in the high

scoring group was related to, and representative of, the incongruity experienced by individuals with a clinical diagnosis. As such, these individuals may have experienced an exaggerated focus upon the self (Moller & Husby, 2000).

Another theme that emerged through the audio diaries with both high and low scoring participants was *justifications*. Both high and low scoring individuals suggested that they felt the need to justify or at least explain why they had made their decision. It would have been interesting to explore these answers further, and future research could adopt Kohlberg's theory to inform the analysis of the responses gathered. Interview data would provide a richer source for this kind of analysis.

Interestingly, two high scoring participants showed signs of paranoid beliefs and thinking during the audio diary. Despite the clear instructions and information sheets provided prior to taking part in the research, they expressed how they thought that there were possibly others aims of the research study. For example, one participant commented on the fact that they thought that someone might be watching them on a camera. Whilst these beliefs might be adopted by anyone taking part in a psychological experiment due to the nature of an experimental laboratory, it was interesting that the only people to report such beliefs were individuals who scored highly for Schizotypal tendencies and therefore are more susceptible to paranoid thinking and beliefs (Peters *et al.*, 2001).

A clear divide appeared between high and low scorers with regards to the strategies adopted whilst completing the tasks. High scoring individuals tended to respond to the statements on instinct, concentrating only on the logistics of completing the task. However, no participants in the high or low group commented upon rushing or completing the task as soon as possible. Low scoring participants commented on the methods that they used to ponder over and absorb the information presented to them in the task.

A statistically significant effect was found between reasoning about 'the self' and 'the other'. This suggests that there is a difference in reasoning about 'the self' and 'other', in terms of reaction times, and that the reasoning task was sensitive

enough to pick up this factor. Therefore, it seems that individuals find it easier to make decisions about themselves and therefore make quicker decisions. Decisions about 'the self' could be automated whereas decisions about 'the other' may require more processing and calculation. Further studies could explore the self-reference level further.

When considering the qualitative results, no-one suggested or commented about rushing or needing to complete the task 'as soon as possible'. This in some respects conflicts with Garety (2007), who suggests rushing to be a good indicator of a 'jump to conclusions' bias, although it is possible that a 'jump to conclusions' bias was not presented in this study by individuals who scored high for Schizotypal traits, in particular as the results showed no significant interaction between PDI and reaction times.

Overall, it seems that individuals find it easier to make a judgement about non-crime statements compared to crime based statements. Furthermore, individuals find it easier, and are more accurate, when making a judgment or decision about themselves rather than about other individuals. To conclude, it seems that reaction time scores do not necessarily differentiate in high and low scorers of the Peters Delusions Inventory (Peters *et al.*, 1999). Consequently, future research should consider different measurements of responses by individuals completing reasoning type tasks. Data gathering, defined as the amount of information required by an individual before making a decision, in relation to crime based reasoning tasks could be explored. Whilst this study confirmed that there is a difference between reasoning about crime and non-crime statements, future studies might explore the difference in severity of crime, such as violent and non-violent crimes.

# **Chapter Five: Study Three, Computerised Visual Reasoning Task**

## **5.1 Overview of Chapter Five**

In chapter three, Study One and chapter four Study Two, there were no significant differences detected between high and low Schizotypal scorers (according to the Peters Delusions Inventory: Peters *et al.*, 1999) in terms of reaction times when completing a crime based reasoning task. The results presented little evidence for the presence of a bias in delusional prone individuals. However, to some extent they highlight and mark where the boundaries of biases experienced by high scoring individuals lie. Despite this finding and interpretation it was still possible to see a trend in the data that supported previous predictions. High scoring individuals produced quicker reaction times on all self-reference levels and in each condition. Therefore, it seems that a reasoning bias does not fully present itself in individuals at risk of delusions when measuring reaction time on a reference level style reasoning tasks. However, when individuals are required to complete a data gathering type task a ‘jump to conclusions’ bias emerges (Peters, Thornton, Siksou & Linney, 2008). As a result, this study moves away from reaction times per se and towards a different measurement named here ‘data gathering’. This study is based on the robust findings of research into the effects of delusions on decision-making, reflecting on classic studies such as the beads task and applying the principles of such studies to a more ecologically valid design.

## **5.2 Literature Review**

Delusions occur in a number of medical and psychological conditions (Maher & Ross, 1984). Maher’s (1992) theory provides a clinically insightful explanation as to why individuals who experience delusions often come to the conclusion that they are being ‘spied upon’, and in particular by aliens. Maher (1992) maintains that the voices that individuals experiencing delusions hear usually provide some kind of affirmation, for example, that the proposed spying aliens have been sent by the CIA to spy on them (Peters and Garety, 2005). However, there are other plausible conclusions such as the voices being a manifestation of a mental disturbance that distorts conscious experience (Freedman *et al.*, 2004). Accordingly, not all delusions are based on distorted perceptions (Chapman & Chapman, 1988).

There is an increasing amount of evidence that demonstrates reasoning and attribution biases in individuals with delusion (Garety & Freeman, 1999), which

challenges Maher's (1992) theory. The 'jump to conclusions' bias has been widely reported among delusional type disorders (Garety & Freeman, 1999; Huq, Garety & Hemsley, 1988; Garety, Hemsley & Wessely, 1991) and in addition with participants diagnosed with Schizophrenia (Mortimer *et al.*, 1996; Menon, Pomarol-Clotet, McKenna, & McCarthy, 2006). Individuals with delusions or Schizophrenia acquire a 'jump to conclusions' reasoning style on probabilistic reasoning tasks, like the beads task, where participants require less information before making a decision, and are more likely to change their decision in light of disconfirmatory evidence (Peters & Garety, 2005).

A 'jump to conclusions' bias has since been reported, with various modifications of the basic paradigm, in both deluded individuals and those diagnosed with Schizophrenia (Garety & Freeman, 1999). Broome *et al.*, (2007) utilised a modified beads task to test individuals who had 'at risk mental states' and compared their scores with a sample of healthy individuals. Broome *et al.*, (2007) found that when task demands for a given assignment were high the 'at risk of delusions' group made judgements that were based on less information in comparison with the healthy group. They concluded that a 'jump to conclusions' bias was present in individuals who acquire an at risk mental state. They further suggested that this bias is linked to impaired working memory functions.

Merrin, Kinderman and Bentall (2007) compared a general population sample with two clinical samples: individuals suffering from persecutory delusions and individuals with major depressive disorder. Participants completed an inductive reasoning task whereby they were allowed to ask 20 questions before making a decision. Individuals suffering from persecutory delusions asked the least amount of questions and therefore based their decision on little information. However, the task could be criticised for using biased questions in line with a defensive model of paranoid attributions. Consequently, it could be argued that the results could be interpreted in a number of ways, in line with a number of theories of delusions. The deluded population sample was composed of individuals who experienced a range of delusional type disorders. Whilst this comparison group provided statistically significant results it would have been beneficial to subdivide the group into their

diagnosed disorders. Furthermore, there is an issue surrounding the validity and reliability of the diagnostic procedures when utilising a clinical population sample. Therefore, the addition of a psychometric measure may have aided the reliability of this study.

Similarly, Peters *et al.*, (2008) compared deluded and non-deluded individuals with individuals diagnosed with Schizophrenia. Participants completed three reasoning tasks: the Beads Task, Wason 2-4-6 Task and the Wason Selection Task. They found that individuals experiencing delusions showed tendencies towards a 'jump to conclusions' bias on data gathering tasks. However, due to small sample sizes the results suffered a lack of power. Incidentally, the group consisting of non-deluded individuals could have contained individuals who had historically experienced delusions or furthermore had escaped a clinical diagnosis. In addition, the reasoning tasks lacked realism and ecological validity.

As argued previously, the utilisation of clinical samples presents a number of limitations for experimental research studies in the way of diagnosis, comorbidity and administration of medication. As a result, recent studies have adopted methods of research that utilised a 'healthy' sample screened for sub-clinical Schizotypal tendencies. Ziegler *et al.*, (2008) performed the beads task and three additional non-probabilistic decision tasks on eighty-five university students. The participants were screened for Schizotypal tendencies using the Peters *et al.*, Delusions Inventory (Peters *et al.*, 1999). They confirmed that the 'jump to conclusions' bias reported by studies using the beads task can be generalised to decisions made in other similar reasoning tasks and contexts. However, their study is limited by its reliance on a sample populated by undergraduate psychology students. In addition, Ziegler *et al.*, (2008) utilised a reasoning task that lacked realism and ecological validity as it did not reflect the decisions that individuals would have made in an everyday life scenario. As with a substantial amount of the studies conducted in this area, the reasoning task utilised was not reflective of real life scenarios and everyday occurrences in a real life setting.

Menon, Pomarol-Clotet, McKenna & McCarthy (2006) conducted two studies

on individuals diagnosed with Schizophrenia. They compared 18 individuals diagnosed with Schizophrenia who had experienced delusions with a group of 15 individuals diagnosed with Schizophrenia but did not experience delusions. Participants completed a series of reasoning tasks designed to explore the influence of task difficulty and types of reasoning material. The three reasoning tasks comprised the traditional beads task, a modified 'realistic' version and an emotionally salient version. The realistic version of the beads tasks adopted the same principles but replaced coloured beads with gendered people. Therefore, individuals were told that one school was mainly male populated (60:40 ratio) and another school was mainly female populated (60:40 ratio). Participants had to guess which school the presented people were from.

The study produced non-significant findings thought to be as a result of the experimental methodology employed. In this study the items that were drawn were left visible throughout the task, rather than each item being hidden from view like in the original bead task methodology employed by Huq *et al.*, (1988). This is thought to have significant implications on memory load and task demands whilst completing the reasoning task. Additionally, the original study required participants to respond using response cards, whereas Menon *et al.*, (2006) required a verbal response.

In light of these findings a second study was conducted utilising two separate conditions for each of the three tasks. One of the conditions was a direct replication of Huq *et al.*, (1988) methodology, the second condition utilised similar methods to that employed in their first study which they called the 'memory aid' condition. Sixteen deluded and 15 non-deluded individuals diagnosed with Schizophrenia, and 16 controls completed the study. This time researchers found a significant difference between the performance of Schizophrenia patients and controls, furthermore, the magnitude of these differences was greater when a 60:40 ratio was employed. The methodology employed by Huq *et al.*, (1988) placed greater burden on memory and task demands enhancing the presentation of the cognitive deficits. This was confirmed through the non significant results reported in the presence of memory aids. However, there was no significant difference reported between deluded and non deluded Schizophrenia patients. A larger sample could have enhanced any minor

differences that could have been otherwise overlooked.

In light of the literature it seems that ‘data gathering’, considered as the amount of information gathered before making a decision, is considerably different in individuals diagnosed with a delusional type disorder or at risk of delusions compared with non delusional individuals. This study is an adaptation of previous research which aims to create a more ecologically valid test, and to consider whether the same biases occur when reasoning about a crime based scenario. Furthermore, this study was designed to measure possible difference between reasoning about violent and non violent crimes.

## **5.2 Research Question and Hypothesis**

This study aimed to explore whether individuals with high Schizotypal tendencies reason differently from a control group (low Schizotypal tendencies) on a visual based reasoning task. It was hypothesised that:

1. High scoring individuals would make decisions based on less information
2. High scoring individuals would be more likely to change their opinion when presented with disconfirmatory information.

## **5.3 Method**

### **5.3 (a) Participants**

Forty-five (11 male and 34 female) students from various undergraduate courses at Birmingham City University took part in this study. The age of the participants ranged between 19 and 44 ( $M = 24.33$ ,  $SD = 6.82$ ). Participants were informed (see appendix A6) that they were to complete a personality type questionnaire, a computer based reasoning task and an optional audio diary prior to taking part in the study. Details of each of these stages were described in a participant information sheet provided prior to consenting to take part.

### 5.3 (b) Design

#### *Focus groups*

Twenty-two students from Birmingham City University took part in the focus group sessions. There were three separate focus group sessions which comprised between 6 and 8 participants who were recruited on an opportunity basis. The aim of these sessions was to arrive at a story/scenario which consisted of an individual who committed a criminal offence. One of these scenarios was to be based on a violent crime and the other a non-violent crime. The focus group sessions ensured the scenarios that were generated, and hence used in the reasoning task, were relevant, meaningful and realistic for the experiment sample.

There were two main stages to the structure of the focus group sessions. Firstly, standardised instructions were given both orally and visually to ensure students had the same amount of information despite which focus group they attended (see appendix A11). First, the groups had to generate a scenario, considering information such as names, location and criminal offence. Second, participants had to create a list of ten further statements which provided supplementary information to the story. The stories and additional statements were written on A1 display paper in order for the story to be clearly visible to the whole group and therefore enabling all individuals to contribute their ideas.

#### *The main study*

The main study consisted of an experimental design containing a within subject factor, violent and non violent scenarios, and a between participant factor, high and low scorers on the PDI. Accordingly, there were two independent variables: Scenario type (with two levels: violent and non-violent) and PDI rating (with two levels: high scorers and low scorers). The dependent variables were data gathering (which was a measure based on a scale to rate how much information an individual required before making a decision) and change of opinion (with two levels: one no change of opinion and two a change of opinion).

### 5.3 (c) Measures

#### *The Peters Delusions Inventory (Peters et al., 1999)*

The 24-item Peters Delusions Inventory, (Peters *et al.*, 1999) was used, like before, to measure individuals' Schizotypal tendencies. For further information please see Section 2.4(a).

#### *Computerised Visual Reasoning Task (CVRT)*

The CVRT was designed in response to the findings of Study Two, in keeping with the desire to incorporate aspects of traditional cognitive tests with moral reasoning tasks. Given the highlighted trends and the non significant differences found in reaction time results in Study One and Study Two, this task measured an individual's 'data gathering' based on how much information they required before making a decision or coming to a conclusion. Therefore, the task comprised individuals making a decision as to whether the character in two scenarios 'had done the right thing'. The reasoning task required individuals to gather data about a given scenario, collecting as much detail as they felt was necessary. This concept derived from traditional reasoning tasks, such as the beads tasks, except applied to manufactured but realistic life scenarios. The characters and scenarios for this task were generated during the focus group sessions.

Condition one, violent scenario, was based on a story about a character who attacked a 'youth' in the street. The attack was based on a number of assumptions. Following the short story about the sequence of events leading to the attack were subsequent statements that provided additional information and described a more complete picture of the events. Condition two, non-violent scenario, was based on a story about a character that lied in order to borrow money from a man with no intention to pay him back. The statements following the short story described vital information with regards to exposing the truth behind the character's need for the money.

In both scenarios, the reasoning task required participants to respond by pressing the 'D' key when they felt that they were happy to make a decision or the 'N' key to move onto the next statement. The 'D' key was to be pressed when individuals

felt that they had received enough information and therefore could make a decision as to whether the character in the given scenario ‘had done the right thing’. If the participant felt that they were unable to make a decision then they were required to press the ‘N’ key to move onto the next statement without making a decision. In either case, the participant would automatically move onto the next statement in order to measure participants’ change of opinion based on disconfirmatory information (Peters & Garety, 2005). Accordingly, participants were able to change their response after each statement was viewed.

### *Audio diaries*

The audio diaries provided an arena and space for participants to reflect on the completion of the audio reasoning task. The aim of this tool was to encourage participants to reflect upon their thoughts and emotions whilst completing the reasoning task. As previously implemented in Study Two, participants were required to stand in a room where a number of questions were displayed on the walls. These questions were designed to help guide and prompt individuals during their reflection process. The following questions and prompts were displayed to guide and help participants.

1. How did you feel whilst completing the reasoning task (computer task)?
  - What emotions did you experience?
  - Why might you have experienced those emotions?
  - How do you understand those emotions?
  - Where do emotions come from?
2. What were you thinking about or focusing on during the task?
  - Did you concentrate on a particular feature of the task?
  - Did you devise a strategy for completing the task?
3. Was there anything that you wanted to verbally say whilst you were completing the task?
4. What are your thoughts about crime and criminal behaviour in general?

- What causes crime?
- Where has crime emerged from?
- How should we categorise crime?
- Is it as easy as saying that certain behaviour traits are criminal?
- Where do we learn right from wrong?

### 5.3 (d) Procedure

Students were invited to take part in this study through a variety of methods. Initially, email invitations were sent out to all year groups across all courses. Course directors agreed to advertise the study along with contact details to find out more information. Participants were requested to reply with an expression of interest and a day and time was arranged. In addition to the initial advertisements, the study was promoted in various lectures whereby signup sheets were passed around. Finally, invitations were displayed and sent utilising the university intranet resources. On arrival to the experiment laboratory students were asked to read a participation information sheet (see appendix, A6) and were given the opportunity to ask any questions that they had relating to the study. Individuals were then given their participant identification number to write on the top of all sheets that they had completed, and to be used as the identification number on the CVRT. They were then asked to complete and sign a consent form (see appendix A7) and background information sheet (see appendix A8). Half of the participants completed the PDI questionnaire followed by the reasoning task, and the other half, the reasoning task followed by the PDI questionnaire. The order of the two components was counter balanced to control for any possible order effects.

#### *Computerised Visual Reasoning Task (CVRT)*

The reasoning task was created using Eprime technology, which allowed the CVRT to be clearly presented on a computer screen, along with precise measures of 'data gathering' and change of opinion. Instructions for the task were given both verbally and visually on screen (see appendix). The order in which participants completed the scenarios was counterbalanced to control for practice effects.

### *Audio Diary*

Finally, participants were asked to record an audio diary reflection of their thoughts, feedback and feelings about the study. The audio diaries were identified using the participant number and were recorded in a separate room where key questions were displayed on the walls in order to prompt and guide individual's reflections (see appendix A12 & A13). The audio diaries were analysed using Nvivo 8 software, adopting a thematic analysis approach to analyse the common themes that emerged from individuals diary accounts.

## **5.4 Results**

The results are presented from the reasoning task and followed by the audio diaries. Every precaution was made to ensure that the individuals responded to the reasoning task by pressing the correct keys. Standardised instructions were given both orally and visually, and Eprime programming software enabled the pressing of only certain keys to generate a response. This ensured that participants were pressing one of the response keys only.

### 5.4 (a) Reasoning Task (CVRT)

#### *Descriptive Statistics*

The reasoning task results were analysed using SPSS statistics 17.0, and are presented below. Descriptive statistics for the 'data gathering' scores can be viewed in Table 5.0 below:

Table 5.0: Data gathering descriptive statistics.

<b>Crime Type</b>	<b>PDI Group</b>	<b>Mean 'Data Gathering' (chunks of information)</b>	<b>'Data Gathering' Standard Deviation (SD)</b>	<b><i>P</i></b>	<b><i>F</i></b>
Violent	High (n=15)	2.14	2.25	0.69	0.16
	Low (n=15)	2.57	2.53		
Non violent	High (n=15)	1.79	1.42	0.04	6.96
	Low (n=15)	3.71	2.34		

Descriptive statistics suggested that high PDI scorers require less information compared to low PDI scorers for both violent and non violent crime scenarios, although this effect is represented to a greater extent in the non violent crime scenario.

*Inferential Statistics*

A two-way ANOVA demonstrated that there was not a significant interaction between PDI and Crime Type ( $F_{1,41} = 3.15, p > 0.05$ ).

Further analysis showed a low effect size ( $D = 0.18$ ) according to Cohen’s D (Cohen, 1992).

Non-violent Scenario and ‘data gathering’

Whilst a non-significant interaction was found overall, a significant effect was highlighted when analysing PDI on ‘data gathering’ with regards to reasoning about non violent scenarios ( $F_{1, 41} = 6.96, p < 0.05$ ). Further analysis revealed a large effect size ( $D= 1.02$ ) according to Cohen’s D (Cohen, 1992).

Change of decision data

The descriptive statistics for the change of decision data is presented in table 5.1.

*Table 5.1: Descriptive statistics for change of decision data (violent scenario)*

	Change of decision		
PDI	No	Yes	Total
High	4 (26.66%)	11 (73.33%)	15
Low	11 (73.33%)	4 (26.66%)	15
	<b>15</b>	<b>15</b>	<b>30</b>

A Yates continuity correction (Chi-square test) was conducted on the data. A non-significant difference was found between high and low PDI scorers and their change of decision when reasoning about a crime based scenario ( $X^2 = 4.12, df = 1, p > 0.05$ ).

*Table 5.1: Descriptive statistics for change of decision data (non-violent scenario)*

	Change of decision		
PDI	No	Yes	Total
High	7 (46.67%)	8 (53.33%)	15
Low	13 (86.67%)	2 (13.33%)	15
	<b>15</b>	<b>15</b>	<b>30</b>

A Yates continuity correction (Chi-square test) was conducted on the data. A non-significant difference was found between high and low PDI scorers and their change of decision when reasoning about a crime based scenario ( $X^2 = 4.12$ ,  $df = 1$ ,  $p > 0.05$ ).

#### 5.4 (b) Audio Diaries

Twenty-four individuals (11 high and 13 low) completed the audio diary element of this study. As shown in previous studies the qualitative aspect of this research has been insightful in terms of the descriptive differences in reasoning that seem to appear between high and low PDI scorers. Using thematic analysis, similar themes have emerged throughout the series of studies. One consistent theme has been ‘emotion’ and how high and low scoring individuals seem to acknowledge or disregard emotions. When asked what emotions were experienced whilst completing the reasoning task eleven high scoring individuals commented on the fact that no emotions or few emotions were experienced. In some cases individuals stated that they ‘didn’t feel anything’.

P304H

*the emotions I felt, well, I didn’t really feel anything because it was over the computer, the scenario wasn’t really in front of me for me to feel anything or say it was bad. If it was like, if it was like a video scenario then I might have felt more*

P337H *the emotions I experienced, weren't many, I think it was with the old woman, sorry the old man that I experienced more emotions with. I think generally because he is an old man, and he seems, well he is vulnerable and you don't like old people being taken advantage of and that was the main emotion. I think on the second one, sorry the first one, the man with his fiancée I think what you tend to do is try to think it's his fiancée then you might be overwhelmed with emotions and you do brash things without thinking.*

P316H *not really many emotions, I just found it quite weird, it's hard to explain, I think I was just concentrating on when and how to make a decision really. I think my head was still thinking about what I had to do.*

When low scoring individuals were asked the same question regarding emotions they expanded on how they felt about the character in the story, and in some cases suggested how the character in the story must have been feeling. Ten of the participants described how their feelings changed as they found out more about the characters and as the sequence of events unfolded.

P303L *erm, well for the first one involving Jared who ran after that man who he saw attacking the lady, well he didn't see attacking the lady, but responded to. Well at first I'd think to run after the man, I feel more for his safety, because he didn't really know what he was getting himself into or who he was running after. Even though his intension were good to help the lady, but then when he decided to, when he caught the man and beat him up I thought that was wrong because he was injuring someone else, although he had a good reason to. At the end, when I found out it was his fiancée I was sympathising with him, because I know that if I was the fiancée I would expect him to run after the man and like do whatever, that why in the end I got a bit stuck, it was wrong but right, he did it for love.*

P308L *hmm, it was alright, a bit annoyed at time when I read the scenarios, maybe because I was thinking why I felt like this about the questions were basically because I grew up sort of knowing that you don't cheat people or anything like that you are supposed to be honest, maybe because I grew up in a Christian home, the moral and values expected. You don't go on the street beating people up.*

P322L *erm, I thought it was confusing, I felt like I had made the same decision whatever the sentences that I saw, I can't say I had a strong emotional response but I could sympathise certainly*

Another emerging and continuing theme was based around the focus point during the completion of the reasoning task. Again, there appeared to be a qualitative difference between individuals who score high and low on the PDI questionnaire. Twelve high scoring individuals reported their focus to be on the logistics of the task. They concentrated on which buttons they needed to press, and in some cases viewed the task as a question and answer exercise.

P304H *I was focusing on the decision and the end if I was doing it right, that's the truth. I focused on the D and the N, I kinda, well I said if I didn't know then it was most likely a D.*

P337H *I tried to answer the questions really, from how the situation planned out. I think there was a strategy; like you don't want to be different you want to be the same as everybody else. You pick what you think other people might pick.*

P316H *I focused on when to make a decision, although I was a little confused about that. I didn't really have a strategy; it was just when I saw, when I thought that I could make a decision*

Low scoring individuals focused on the story line. The events, actions, relationships and characters within the story were deemed more crucial. Eight individuals described how the events that took place swayed or contributed to their overall decision.

P303L *I think I focused mainly on the actions that were taking place, erm, yea*

P308L *well, I was thinking basically, why would this guy start chasing and punching people out without being sure that this is the person, even if you run down the road and catch the person and you think this is the person you don't take matters into your own hands basically. You would call the police! In the end he was wrong anyway for beating this person up cos the person didn't do anything to this woman.*

P322L *I was thinking about the task as a whole. I was thinking that she shouldn't have robbed the money from the random old man no matter what the situation was, rather than the individual statement which is probably why my decision didn't change throughout*

The final theme that emerged during the audio diaries was related to the information that individuals wanted to verbally communicate whilst completing the task, but were not given the opportunity to at that stage. Again, a clear difference emerged between high and low scoring individuals. High scoring individuals, when asked 'were there any comments that you wanted to make whilst completing the task?', mainly answered 'no' followed by some kind of reference to the logistics of completing the task.

P316H *no, I was concentrating on when I was making a decision rather than the scenario itself.*

Low scoring individuals, on the whole, reported the need to justify or explain their answers or responses, and in some cases wanted to explain their own interpretation of the character in the story.

P303L *yea, the only thing I thought oh this is interesting, I just wanted to be able to express my thoughts like I have in question one, and justify my answers.*

P308L *first, I was thinking this boy is foolish and stupid. With the girl I just thought she is a thief.*

Overall, the audio diaries presented some interesting themes. High scoring individuals reported a lack of emotion through the reasoning task and focused on the logistics of completing the task, i.e. the practical instructions 'pressing the D key or the N key'. Furthermore, individuals reported having no desire to verbally communicate during the completion of the task. In contrast, the low scoring individuals reported feelings of empathy and anger and interestingly modify their emotions as the story unfolded. In this case individuals focused on the storyline paying particular attention to the events and details with regards to the characters in

the story. As a result, individuals felt the need to explain and justify their final decisions.

## **5.5 Discussion**

The quantitative results collected from the reasoning task suggest that there were no significant differences between high and low PDI scorers, when measuring the amount of information required before making a decision about a violent crime scenario. However, there was a significant difference when reasoning about a non-violent scenario. Despite the non significant results from the violent scenario, it is still possible to see a trend in the mean 'data gathering' scores that suggests that high scorers requested less information when reasoning about a violent crime. It seems that low scoring individuals required more information, when compared to high scoring individuals, before making a decision or coming to a conclusion. Overall, this finding is in keeping with previous studies that have suggested that individuals at risk of delusions, and therefore acquiring high Schizotypal traits, are more likely to make a hasty decision based on little information. The change of decision results also produced a non significant.

Whilst the quantitative results present some mixed findings, the qualitative results provided evidence of an on-going difference in reasoning between high and low scoring individuals. High scoring individuals tended to report being less bound by emotions and more focused on the logistics of the task at hand. An impaired working memory (Broome *et al.*, 2007), or at least biases in working memory functions, experienced by individuals with delusions could explain why high scoring individuals, on a qualitative level, tend to appear distant from their emotions and appear to concentrate purely on the task at hand, as they are limited by the amount of information that can be held and processed in working memory. This is consistent with the dual process account, whereby System Two processing is demanding on resources. This would subsequently explain why individuals with high scores tend to have biases when completing data gathering type reasoning tasks (Peters *et al.*, 2008). Furthermore, high scoring individuals reported focusing on the logistics of completing the task, rather than considering the details of each scenario such as the individual

characters' perspectives. This links back to the 'exaggerate self' bias reported by Sass and Parnas (2003). The final theme that emerged from the audio diaries was indicative of individuals' needs to communicate whilst completing the CVRT. Low scorers disclosed how they wanted, or felt the need, to justify their chosen responses. This in some respects relates to the qualitative research conducted by Kohlberg (1958, 1978). On the other hand, high scorers reported having no need to verbally communicate information and were generally happy to simply provide an answer.

Broome *et al.*, (2007) found that delusion prone individuals require less information before making a decision when task demands were high. The quantitative element of this study appears to confirm this trend, as high scorers required significantly less information in comparison to low scorers when reasoning about a non violent scenario. In addition, the qualitative element appears to complement Broome *et al.*'s (2007) theory by capturing the participant's description of events whilst completing the reasoning task.

There could be a number of explanations as to why these results occurred. The violent crime scenario could have created an automated reaction that is based on an initial gut response, in line with System One processing of the dual process account (Evans, 2007). As a result, both high and low scoring participants may have made a decision based on the same primary information presented towards the beginning of the task. It is also possible that the violent scenario contained a combination of facts that created a trigger for an automated response and hence both high and low scorers responded after similar amounts of information gathering. The non-violent scenario may have initiated ambiguous responses in individuals and hence amplified the differences in reasoning between high and low scorers. In this case low scoring individuals required more information about the scenario before they were happy to formulate a decision.

This study aimed to create an ecologically valid reasoning task that is reflective of real to life scenarios, but in doing so, the task only placed task demands on visual senses and their connected processes. Therefore, it could be argued that the task did not make adequate demands upon executive functioning, and consequently

the reasoning biases did not fully emerge. Furthermore, the visual presentation of the story allowed individuals to read the stories and additional statements at their own speed with no constraints on how long the visual material was presented for. As a result, the task did not place demands on executive functioning in terms of a time pressure and therefore the extent of the biases described by Broome *et al.*, (2007) may not have occurred. This could be explored in further studies by altering the modality of the presented material in the reasoning task, which may enhance the emergence of the biases acquired by high scoring individuals as this would create greater task demands on the participants.

# **Chapter Six: Study Four, Computerised Auditory Reasoning Task**

## **6.1 Overview of Chapter Six**

Chapter Five, Study Three, presented interesting findings with regards to exposing reasoning biases about violent and non-violent scenarios in high Schizotypal individuals. High scorers made decisions based on fewer pieces of information when reasoning about non-violent crimes and were less likely to change their decision based on disconfirmatory information. One possible explanation for the non-significant difference found when considering the amount of information required in a violent scenario is that Schizotypes are able to compensate for visual processing deficits (Koychev, El-Deredy, Haenschel & Deakin, 2010) whilst processing and reasoning about a violent crime scenario. In other words, the deficits that emerge as a result of receiving information through the visual senses, for example reading a scenario and additional statements on a computer screen, are negotiated and compensated for in Schizotypal individuals.

A number of research studies have highlighted where biases have occurred during audio sensory processes. For example, recent research has suggested that individuals with Schizotypal tendencies exhibit deficits on simple sensory judgement tasks such as pitch discrimination tests (Strous, Cowan, Ritter and Javitt, 1995). In addition, traditional reasoning tasks such as the Wisconsin Card Sorting Task (WCST, Lenzenweger & Korfine, 1994) have highlighted biases in cognitive flexibility demonstrated in individuals with Schizophrenia and Schizotypal disorders. More specifically, the WCST investigates biases in cognitive flexibility to auditory instructions (Lenzenweger & Korfine, 1994).

## **6.2 Literature Review**

Individuals with Schizophrenia display biases in auditory sensory “echoic” memory (Umbricht *et al.*, 2000), associated with deficits in extracting relevant information from sensory stimuli across all modalities (Javitt *et al.*, 2000). As such, individuals who experience deficits in extracting relevant information may produce biases on tasks that require the utilisation of represented extracted information. In other words, some individuals are overwhelmed with the mass of information available through their senses, and are unable to filter out the relevant or important information. These cognitive deficits are in line with the symptomatology of

Schizophrenia, as the DSM IV-TR states that Schizophrenia is usually accompanied by auditory delusions and /or thought disorder. Menon, Pomarol-Clotet, McKenna and McCarthy (2006) conducted two studies on individuals diagnosed with Schizophrenia. They compared 18 individuals diagnosed with Schizophrenia who had experienced delusions, with a group of 15 individuals diagnosed with Schizophrenia but who did not experience delusions. Participants completed a series of reasoning tasks designed to explore the influence of task difficulty and types of reasoning material. The three reasoning tasks comprised the traditional beads task, a modified 'realistic' version and an emotionally salient version. The realistic version of the beads tasks adopted the same principles as the traditional beads task but differed by replacing the coloured beads with gendered people. Therefore, rather than individuals being presented with jars of beads, individuals were told that there were two schools, one of which was mainly male populated (60:40 ratio) and another school which was mainly female populated (60:40 ratio). Participants had to guess which school the presented people were from.

The study produced non-significant findings thought to be as a result of the experimental methodology employed. In this study the items that were drawn were left visible throughout the task, rather than each item being hidden from view like in the original bead task methodology employed by Huq *et al.*, (1988). Therefore, individuals were able to see each of the beads that had been drawn from the jar and thus did not have to place demands or rely on their memory in order to make a calculation about which jar the beads were being drawn from. This is thought to have significant implications on memory load and task demands whilst completing the reasoning task. Additionally, the original study required participants to respond using response cards, whereas Menon *et al.*, (2006) required a verbal response.

In light of these findings a second study was conducted by Menon *et al.*, (2006) utilising two separate conditions for each of the three tasks. One of the conditions was a direct replication of Huq *et al's.*, (1988) methodology, and the second condition utilised similar methods to that employed in study one which they called the 'memory aid' condition. Sixteen delusional and 15 non-delusional individuals diagnosed with Schizophrenia, and 16 controls completed the study. This

time researchers found a significant difference between the performance of Schizophrenia patients and controls, furthermore, the magnitude of these differences were greater when a 60:40 ratio was employed. The methodology employed by Huq *et al.*, (1988) placed greater burden on memory and task demands enhancing the presentation of the cognitive deficits. This was confirmed through the non significant results reported in the presence of memory aids. However, there was no significant difference reported between delusional and non-delusional Schizophrenia patients.

The above suggests that task and memory demands enhance deficits and biases experienced by individuals who score high for Schizotypal tendencies or experience a Schizotypal disorder. It could be argued, therefore, that Study Three of this thesis captured a reduced effect of the reasoning biases due to the lack of task and memory demands placed on individuals completing the study.

Given that the positive features of Schizotypy largely involve distortions of visual and auditory perception along with the associated cognitive anomalies (Richardson & Gruzelier, 1994), similar to that presented in Schizophrenia, this study aims to in part explore auditory processing in individuals with Schizotypal tendencies. In addition, recent studies have reported reduced working memory performance in participants who displayed high level of positive Schizotypy (Schmidt-Hasen & Honey, 2009), and therefore an auditory reasoning task design will place greater demands on working memory functions. Garety *et al.*, (2007) found, on a test of probability estimation, that delusions predispose individuals to less data gathering despite individuals' probability estimates being correct. Furthermore, they suggest that a 'jump to conclusions' effect might occur as a product of a lack of influence of stored regularities on a current input (Hemsley, 1987, 2005). As such working memory demands or working memory features may become fragmented leading to previously viewed evidence being less available (Moritz and Woodward, 2005).

As noted by Delhommeau, Dubal, Collet, and Jouvent (2003) few studies have explored the perceptual, and in particular auditory, processing of individuals with Schizotypal tendencies. Yee, Deldin, and Miller (1992) used an Event-Related potentials augmenting/reducing paradigm to rule out simple sensory deficits in tone

perception; they found no differences between groups. However, some studies have reported differences in the strategies employed by controls and test groups (Miller, 1986), which suggests that differences may have occurred due to peripheral auditory abnormalities or difficulties in maintaining a template in echoic memory.

This study, therefore, is an attempt to assess whether Schizotypy rating relates to reasoning biases on an auditory presented crime based reasoning task. As a result, modality, along with an increase in memory load and demands, will be explored for its impact on crime based reasoning for individuals who score highly for Schizotypal traits. As explored previously, it is suggested that high Schizotypal individuals process emotions in different ways to control participants (Kerns, 2005). Previous research (Myin-Germeys, Nicolson, & Delespaul, 2001), suggests that emotional disturbances might contribute to psychotic symptoms associated with Schizophrenia and Schizotypy. As emotion was not the main focus of this study it was decided that a qualitative approach would best suit the exploration of the impact that emotions had on the reasoning task, in keeping with earlier studies presented in this thesis.

#### 6.2 (a) Research Question and Hypothesis

This study aimed to explore whether individuals with high Schizotypal tendencies reason differently from a control group (individuals scoring low for Schizotypal tendencies) on an aurally presented reasoning task. It was hypothesised that:

1. High scoring individuals would make decisions based on less information
2. High scoring individuals would be more likely to change their opinion when presented with disconfirmatory information.

### **6.3 Method**

#### 6.3 (a) Participants

Fifty-five participants from Birmingham City University took part in this study. All participants were undergraduate students from a range of faculties and

degree courses across the University. Participants were aged between 19 and 52 ( $M = 23.8$ ,  $SD 8.01$ ), ten were males and forty-five females. It was ensured during the recruitment stage that all participants were first language native English speakers. Thirty-six of the fifty-five participants volunteered to complete an audio diary entry reflecting upon their thoughts whilst completing the reasoning task.

### 6.3 (b) Design

The experimental design comprised a between subjects factor: PDI (determined by the scores on the Peters Delusions Inventory: Peters *et al.*, 1996) and a within participants factor of scenario type (non-violent vs. violent). There were two dependent variables: amount of information required before making a decision based on a 0-10 scale (data gathering) and change of decision based on the presentation of more information (change of decision).

### 6.3 (c) Measures

This study comprised three components and this is reflected in the methods used. Participants completed all three of the components but in varied randomised orders in order to ensure that the different components did not impact upon one another. The three components will be discussed in turn below.

#### *The Peters Delusions Inventory (Peters et al., 1999)*

The 24-item Peters Delusions Inventory, (Peters *et al.*, 1999) was used, like before, to measure individuals' Schizotypal tendencies. For further information please see Section 2.4(a).

#### *Computerised Auditory Reasoning Task (CART)*

This study was based around a reasoning task similar to that used in Chapter Five, Study Three, however, the renovated design presented information to participants in an auditory modality. The same vignettes and statements from Study Three were utilised in Study Four (see Appendix A15 & A16). In previous studies, individuals' reasoning abilities were assessed using materials that were visually presented in the form of a reasoning task. Using Eprime stimulus software, previous studies displayed visual information on a computer screen which then required a response from participants. However, given the evidence of cross modality bias

occurring in individuals with Schizophrenia, schizotypal disorders, as well as a small amount of evidence for differentiation in psychosis prone individuals (Rheed, Wakefield, Harris, Parry, Cella, Tsakanikos, 2007; Ferstl, Hanewinkel & Krag, 1994), this reasoning task presented information in auditory form. Using Eprime programming software as a presentation tool, participants were presented with two stories in an auditory format. Participants were therefore required to wear a head set in order to listen to the stories. Following each of the stories was a sequence of statements that contained additional information with regards to the scenario. Participants were simply required to indicate at which point they were happy to make a decision about whether the character in the story had done the right thing. Participants' responses were recorded on a ten-part scale.

### *Audio Diaries*

The audio diaries have been a feature that has been developed and utilised throughout Study Two and Study Three. The audio diaries provide an arena and space for participants to reflect on the completion of the audio reasoning task. The aim of this tool is to encourage participants to reflect upon their thoughts and emotions whilst completing the reasoning task. As previously implemented, participants were required to stand in a room where a number of questions were displayed on the walls. These questions were designed to help guide and prompt individuals during their reflection process. The following questions and prompts were displayed to guide and help participants.

1. How did you feel whilst completing the reasoning task (computer task)?
  - What emotions did you experience?
  - Why might you have experienced those emotions?
  - How do you understand those emotions?
  - Where do emotions come from?
  
2. What were you thinking about or focusing on during the task?

- Did you concentrate on a particular feature of the task?
  - Did you devise a strategy for completing the task?
3. Was there anything that you wanted to verbally say whilst you were completing the task?
4. What are your thoughts about crime and criminal behaviour in general?
- What causes crime?
  - Where has crime emerged from?
  - How should we categorise crime?
  - Is it as easy as saying that certain behaviour traits are criminal?
  - Where do we learn right from wrong?

### 6.3 (d) Procedure

Participants were recruited using an opportunity sample using adverts in lectures, invitations via email and the University intranet, and posters at various points around the university campus (see appendix A13). Participants were invited to come to the experiment laboratory where the study took place. On arrival at the laboratory, participants were required to read a participant information sheet (see appendix A6) and were given the opportunity to ask any questions. Participants then signed a consent form (see appendix A7) highlighting all the key issues with regards to the study. Each participant was then provided with a unique participant's number which they would use for identification on each of the experiment components. Participants' completed paper work was posted into a sealed box.

The order of the next proceedings was counterbalanced, with roughly half of the participants completing the PDI first and the other half completing the Computerised Auditory Reasoning Task (CART) first. This was to ensure that the PDI questionnaire had no adverse effects upon the completing of the CART.

### *Peters Delusions Inventory (PDI; Peters et al, 1996)*

Participants were instructed about the completion procedures of the PDI using the standardised instructions provided. Participants were given as much time as they required to complete the questionnaire. Individuals' participation numbers were printed at the top of the questionnaire ensuring that no personal information was attached. Once complete, the questionnaires were posted into a sealed box.

### *Computerised Auditory Reasoning Task (CART)*

The CART was presented and completed using E Prime technology. Participants were instructed to wear the provided head set and to press the space bar to commence instructions. The task instructions were presented in both an auditory and visual format, standardised by the programming software. Participants were required to enter their participation number in order to maintain confidentiality and anonymity. Half of the participants completed the violent scenario followed by the non violent reasoning scenario first, and the other half of the participants completed the non violent scenario followed by the violent scenario. Therefore, the scenario types were counterbalanced to control for rehearsal and practice effects.

### *Audio Diaries*

Finally, thirty-six participants volunteered to complete an audio diary entry, whereby they were required to give feedback on their thoughts, emotions and focus whilst carrying out the reasoning task. The questions and prompts (please see above section - Measures) were placed on the walls around the audio diary room to guide and prompt participants' thought processes. The audio diary entries were identified using the participant identification number given to participants at the beginning of the experiment. Once complete, participants were instructed to return to the main experiment laboratory for a debrief session.

## **6.4 Results**

In this section the results are presented from the reasoning task followed by the audio diaries.

#### 6.4 (a) Reasoning Task (Computerised Auditory Reasoning Task; CART)

##### *Descriptive statistics*

The reasoning task results were analysed using SPSS statistical analysis software 17.0, and are presented below. Descriptive statistics for the ‘data gathering’ scores can be viewed in Table 6.0 below:

*Table 6.0: Data gathering descriptive statistics.*

<b>Crime Type</b>	<b>PDI Group</b>	<b>Mean Data Gathering (chunks of information)</b>	<b>Data Gathering Standard Deviation (SD)</b>	<b><i>p</i></b>	<b><i>f</i></b>
Violent	High (n=19)	2.22	3.04	0.02	23.18
	Low (n=19)	6.78	3.95		
Non violent	High (n=19)	3.11	3.27	0.01	8.82
	Low (n=19)	6.06	2.65		

##### *Inferential statistics*

The results from the Levene’s pre-test were non significant and therefore did not violate any assumptions for parametric testing (Levene’s  $p \geq 0.05$ ).

A two-way Analysis of Variance (ANOVA) was performed on the results of the reasoning task, therefore considering the independent variables of PDI (high and low) and crime type (violent and non-violent), and the dependent variables data gathering and change of opinion. The two-way ANOVA revealed a non-significant interaction between PDI and scenario type ( $F_{2, 32} = 15.04, p > 0.05$ ).

Further analysis showed a large effect size according to Cohen’s D ( $d = 1.3$ ), and retrospective power = 0.99 (Cohen, 1992).

##### *Change of Decision Data*

The descriptive statistics for change of decision data can be view in table 6.1

*Table 6.1* Descriptive statistics for change of decision in the violent scenario

	Change of decision		
PDI	No	Yes	Total
High	7 (41%)	12 (59%)	19
Low	10 (59%)	9 (41%)	19
	<b>17</b>	<b>21</b>	<b>38</b>

A Yates continuity correction (Chi-square test) was performed on the change of decision data. There were no significant differences between high and low PDI scorers for change of decision data ( $p > 0.05$ ).

*Table 6.2* Descriptive statistics for change of decision in the non-violent scenario

	Change of decision		
PDI	No	Yes	Total
High	9 (50%)	10 (50%)	19
Low	9 (50%)	10 (50%)	19
	<b>18</b>	<b>20</b>	<b>38</b>

A Yates continuity correction (Chi-square test) was performed on the change of decision data. There were no significant differences between high and low PDI scorers for change of decision data ( $p > 0.05$ ).

#### 6.4 (b) Audio Diaries

Thirty-eight participants (15 high and 13 low) completed the audio diary section. The audio diary entries were analysed using thematic analysis (Howitt, 2010; Braun & Clarke, 2006). A number of themes emerged from the audio diaries and these themes are presented in the following section.

##### *Emotions*

A clear division emerged between how individuals responded to emotional engagement. Twelve of the high scoring individuals commented on there being no or little emotional response. One individual in particular suggested that they experienced no emotional response as the scenarios were not real.

P422H: I didn't really feel any emotions towards it because it was only a scenario and not real, if it had been real then maybe I would have felt differently.

P426H: 'erm, I didn't really feel any sort of emotion but hearing the story about the one with the girl, I think her name was Shelly or Cheryl, taking money off an old man erm but yet she wasn't sick and worse she was lying about the situation, at first it made me feel like well, that was silly, and well then you go more into the story and then you hear that she is being black mailed by a gang, eh, I felt as if she had to what she had to do even though the money would have been more useful for the old lady who was already sick.

On the contrary, eight of the low scoring individuals commented on some level of emotional response usually resorting from, or being affected by, the relationships between individuals. For example, one individual commented on how they would feel if Cheryl, the lady in one scenario, was their daughter. Furthermore, the emotional responses experienced were bound by morals.

P423L: 'the emotional feelings were more tied up in my morals'

P437L: 'frustrated and angry at times, and a bit confused as well.... Anger frustration, because I couldn't answer fully, if I could have explained myself then I wouldn't have been so frustrated. Erm, I don't understand those emotions they just come, when I'm angry I'm angry'.

### *Self-reflective*

Another theme that emerged was how individuals self-reflecting whilst completing the reasoning task. Both high and low scorers commented about placing themselves in the scenario or the scenario occurring to someone that they knew.

P422H: 'I just kept thinking about what I would personally do if I was in the situation'

P426H: 'Erm so I can understand that yes she was right in what she did cos it was to save her own self. Maybe she should not have lied about the situation, but then had she not lied about the situation she would not have got the money'.

P436L: 'because obviously if you saw your fiancée on the floor and she has got a broken arm fractured something then obviously you are gonna be really upset and your emotions take over'

### *Task completion*

High and low scorers appeared to go about completing the task with different approaches. Nine of the low scoring individuals commented about being concerned with making a 'good' 'moral' decision based on the complexities of the scenario. For example, one individual stated:

P423L: 'I was focusing, obviously, on trying to make a well rounded decision, erm I didn't really devise a strategy, I just felt like when my heart strings were pulled, when my morals were being infringed upon that seemed like a pretty good time to press the decision button'.

High scoring individuals, generally speaking, were focused on the requirements of completing the task. For example, which buttons they needed to press and how many section/scenarios they were about to be presented with:

P412H: 'I was erm consciously making sure that I pressed the correct key erm eh to make a decision. I erm wondered how long the task was'

### *Difficulties with the task*

Both high and low scorers comment upon some of the difficulties that they experiences whilst completing the reasoning task. These difficulties were 'moral' ones rather than the physical completion of the task. One high scoring individual suggested:

P426H: She could have done with the treatment, but the fact is you are comparing the old lady to someone who is very young. Because you wouldn't particularly find old people who are involved with gangs

Similarly a low scoring individual commented:

P437L: At times it was hard to make a decision cos you want to say one thing but you can kind of go both ways if that makes sense. I was trying to make a decision, a good one, I was thinking about morals, whether it was morally right or wrong to do something like that. Especially with the Cheryl case because she was in trouble but then she took the last bit of money that the old man had and then the person who was ill couldn't get any treatment, so was that morally right of her?

### *Feeling restricted*

The final theme that emerged for low scoring individuals, but not for high scoring individuals, was to do with 'feeling restricted'. Ten of the low scoring individuals commented about their need to explain the answers that they had given. Furthermore, they stated that not being able to explain their answers had made them feel restricted. One individual said:

P432L: There was so much I wanted to say whilst completing the task, too much, and you only realise what you want to say when you're not allowed to say anything. Ah but if I had another button where I write a bit more, explain a little bit, then I could tell you why I thought Cheryl was wrong, and Jared might be a bit more right in my eyes.

## **6.5 Discussion**

The results from this study proved interesting. A two-way analysis of variance (ANOVA) demonstrated that overall there was no interaction between PDI and crime type, however, the  $p$  and  $f$  values suggested significant differences between high and low scorers within each crime type (violent and non violent). Either individuals who

scored high for Schizotypal tendencies required fewer ‘chunks’ of information before making a decision (data gathering), compared to individuals who scored low for Schizotypal tendencies, or it is possible that low scorers gathered more information in comparison to high scorers. The descriptive statistics suggest that the violent crime scenario created a bigger gap between the mean ‘data gathering’ scores generated by the high and low scoring groups. Therefore, it could be argued that the violent crime scenario exacerbated the ‘jump to conclusions’ bias that frequently occurs in individuals at risk of delusions (Huq, Garety & Hemsley, 1988), or caused low scorers to gather further information before making a decision. Furthermore, the results suggest that the biases in reasoning that accompany Schizotypy, which have presented themselves on traditional non-specific reasoning tasks, also present themselves on crime based reasoning tasks.

There appear to be no significant differences between high and low scorers, both for the violent and non-violent crime scenarios, in terms of change of opinion. This suggests that there were no differences between delusion prone individuals and non delusion prone individuals in terms of making and adjusting their decision based on further information. It might be suggested, therefore, that this bias does not occur when reasoning about crime based scenarios in an auditory modality. However, in Study Three there was a significant difference between high and low scorers, in terms of changing their decision, for the violent crime scenario. This suggests that in the right conditions a bias may occur, however, this particular design did not capture such a bias.

The audio diaries captured some interesting thoughts and feedback from the participants who took part in the study. A number of the themes were consistent with the previous three studies in this thesis. There is a clear difference in the way that high and low scoring individuals process and utilise their emotions. Low scoring individuals appear to be far more aware of their emotional states as well as the possible emotional states of other individuals. This is consistent with deficits in Theory of Mind functions (Baron-Cohen, 1991) demonstrated in individuals with schizotypal disorders. Low scoring individuals, who acquire no deficit in Theory of Mind functions, are able to understand their own emotions, beliefs, intents and desires

as well as understanding and appreciating the mental states of other individuals. This was demonstrated by individuals commenting on how characters in the scenarios might be feeling or what they might be thinking. In contrast, high scoring individuals reported little about their own emotions and the possible emotional states of individuals in the scenario. Interestingly, both high and low scoring individuals reported placing themselves into the scenario to aid the decision making process. Arguably, this demonstrates elements of ‘self reference’ skills whilst reasoning.

There is commonality between the results gathered by Study Three and Study Four. Statistical tests on the results gathered from Study Three presented a significant difference for ‘data gathering’ scores between high and low PDI scorers. Low PDI scorers requested more information before they were happy to make a decision. Study Three placed demands on visual senses, as the information that was required to make a decision was presented visually on a computer screen. Study Four investigated the effects of a change in modality on the ‘jump to conclusions’ bias by placing demands on both auditory (listening to the story) senses and memory load, creating greater task demands. This was in line with previous research that suggests delusional and delusional prone individuals have impaired visual and auditory sensory abilities (Umbritch *et al.*, 2000; Javitt *et al.*, 2000). The increased task demands caused the low group to gather more data (Broome *et al.*, 2007; Garety and Freeman, 1999). Furthermore, when the scenario/story was read to participants they had less control over the speed at which information was delivered to their sensory receptors, when compared to individuals reading a story at their own pace, and hence created further demands on memory load, which was consistent with Schmidt-Hasen and Honey (2009) who found reduced working memory performance in participants who displayed high level of positive Schizotypy.

There appeared to be no differences with regards to performance on the reasoning task between the sexes. However, as Galbraith, Manktelow and Morris (2010) note, it is difficult to draw concrete conclusions from the data considering the relatively low number of males who took part. Previous research has found that females scored more highly than males on magical thinking and other positive Schizotypal features (Claridge & Hewitt, 1987). Therefore, future work should allow

for more reliable comparisons between the sexes.

The ethical clearance for this study limited the testable population sample to Birmingham City University students. Whilst it was ensured that students were recruited across degree courses and faculties, it would be advantageous to explore other 'non-clinical' population samples. Initially, this could be a University in another part of the United Kingdom, however, it would validate the results further if a non-university based sample could be recruited. Along with the expansion of 'non-clinical' population samples, it would be interesting to apply the same methodology to both clinical and forensic populations. These samples would validate the early pioneering studies which suggest that individuals with Schizotypal tendencies produce biases on crime based reasoning tasks, and a direct comparison could be made between individuals with a delusional based disorder and those who had already committed an offence. Furthermore, it would be interesting to see if the type of offence committed related to individual results on the crime based reasoning tasks. For that reason, adaptations of the reasoning tasks could be produced with an extended assortment of variations of crime based scenarios.

Considering the above, future research might investigate the effects and impact of threatening or emotional content on deluded patients' reasoning (Kemp *et al.*, 1997; Mujica-Parodi *et al.*, 2000; Young & Bentall, 1997). This issue has not been controlled for in previous studies, as they have utilised non-clinical samples; however, thought should be given to this issue in the event of testing a clinical sample.

Finally, further thought should be given to the measure of Schizotypal tendencies (PDI). This measure has proven to have high levels of reliability; however, it is specifically designed for completion by a non-clinical sample. Therefore, should further research be conducted on a clinical or forensic sample then an alternative or additional test may be required.

# **Chapter Seven, Study Five: ‘Dual Processing’ in Visual Modality**

## **7.1 Overview of Chapter Seven**

Chapter five, Study Three and chapter six, Study Four presented interesting findings with regards to exposing reasoning biases about violent and non-violent scenarios in high Schizotypal individuals. Study Three demonstrated that Schizotypy is accompanied by biases in reasoning about non-violent crime when the information is fed through the visual senses. However, the biases did not occur to the same extent when reasoning about violent crime scenarios. Study Four, demonstrated that information processed using auditory senses caused these biases to occur for both violent and non-violent scenarios, although, the violent crime scenarios produced the largest effects. The method employed for Study Three and Study Four made it difficult to ascertain whether the auditory presentation of information (modality) alone impacted upon processing or whether the auditory presentation of information placed greater demands on cognitive functions, such as memory and executive functioning, causing a dual processing effect. Consequently, Study Three and Study Four present confounded results due to the method and lack of control of potential influential variables. Study Five and Study Six collectively attempt to overcome this confound by exploring a dual process design to explore whether cognitive load elevates the biases experience in Schizotypy and crime based reasoning.

## **7.2 Introduction**

It is possible that the biases that accompany Schizotypy are compensated for when information is presented visually (Koychev, El-Deredy, Haenschel & Deakin, 2010) and therefore, the deficits that emerged as a result of receiving information through the visual senses, for example reading a scenario and additional statements on a computer screen, are negotiated for in Schizotypal individuals (Farmer, O'Donnell, Niznikiewicz, Voglmaier, McCarley & Shenton, 2000) and hence the biases do not significantly impact upon an individual's reasoning. In contrast, the auditory presentation of information, and its associated processing, may enhance the presentation and experience of these biases so that an individual's reasoning is significantly impacted upon. This theory is in keeping with Schizo-type disorders, such as Schizophrenia, which in their most common form are usually accompanied by symptoms such as auditory hallucinations. Recent research has reported that abnormalities in auditory perception could underpin or be a core feature of psychosis

(Johns & McGuire, 1999; Surquladze, Calvert, Brammer, Campbell, Bullmore, Giampietro & David, 2001) which could ultimately lead to biases in cognitive functioning including decision making and reasoning. It is possible that individuals who score high for Schizotypal traits are also susceptible to similar abnormalities in auditory perception which could underpin the biases found in Chapter Six, Study Four.

Previous studies cited in this thesis do not allow for the analysis and identification of whether the auditory presentation of information, and its associated abnormalities in perception, alone are the causal factors for biases which impact upon reasoning and decision making processes compared to whether the auditory presentation of information places greater demands on cognitive functions such as memory and executive functioning. Consequently, Study Three and Study Four presented confounded results due to the method and lack of control of potential influential variables. Therefore, Study Five and Study Six explored whether the enhancement of such biases were due to dual processing (Evans, 2007) effects and the restriction on necessary resources or whether there is a difference in processing through auditory rather than visual modality. Contemporary theories of cognitive processing (e.g. Evans, 2009; Stanovich, 1999; Sloman, 1996) suggest that the mind is a dual system, which occasionally functions in a complementary way. Sometimes the dualism creates competition, for example for resources, which can lead to biases and errors in processing, which could explain why the auditory crime based reasoning task found an increase in biases and errors in high Schizotypal individuals.

There are a number of 'dual task' theories (Evans, 2008; Sloman, 1996, 2002; Stanovich and West's, 2000, 2002, 2003), which all maintain the same underpinning assumption; that there are two core processing systems. System One approaches problem solving by calling upon prior knowledge and beliefs (De Neys, 2006), whereas System Two approaches reasoning by adhering to logical standards (De Neys, 2006). This requires access to a central working memory system of limited capacity. System One is rapid and automatic and System Two is slow and is heavily demanding of resources (De Neys, 2006; Stanovich & West, 2000).

Crime based reasoning therefore, would place demands on System One processing, although not necessarily exclusively, calling upon prior experiences,

beliefs, morals and background knowledge in order to make a decision with regards to the wrong doing of a particular given scenario. The change of modality from Study Three to Study Four could have placed greater demands on memory due to the nature of the presentation of information being verbally presented. Therefore participants were required to remember the presented information accurately in one attempt compared to the visual task where participants could read a given piece of information a number of times before making a decision. This theory and dilemma can be investigated more accurately using a dual task design. Previous research (De Neys, 2006) have utilised a dot matrix memory task to place demands on System Two processing which is explicit, sequential, controllable and makes high demands of working memory (Evans, 1996). In comparison to System One, System Two is slow, however, its speed facilitates flexibility and controllability. The complexity and difficulty of the memory task in De Neys (2006) study was controlled in order to create a measurable variable placing fewer or greater demands on resources.

#### 7.2 (b) Research Question and Hypothesis

Study Five aimed to explore the relationship between Schizotypy, and reasoning biases when completing visual ‘dual processing’ crime based reasoning task. It was hypothesised that a complex additional memory task, utilised in the dual processing paradigm (De Neys, 2006), would produce enhanced biases on a crime based reasoning task, whilst processing in a visual modality, compared to a simple additional memory task. A presentation of biases whilst completing the reasoning task would demonstrate that the biases are enhanced by competition between the dual systems as opposed to the modality of presented information. It was expected that high PDI scoring individuals, completing a complex additional memory task, would produce decisions based on fewer pieces of information and would be less likely to change their opinion when presented with disconfirmatory information.

### **7.3 Method**

#### 7.3 (a) Participants

74 participants from Birmingham City University took part in this study. The participants were undergraduate students from a range of Faculties and degree courses across the University. Participants were aged between 18 and 54 ( $M = 22.5$ ,  $SD = 6.69$ ), 23 were males and 51 females. It was ensured during the recruitment stage that

all participants were first language native English speakers. The top and bottom third of the overall sample, according to participant's PDI score, were compared for differences, which created a final sample of 49 participants. Out of the final sample, 37 volunteered to complete an audio diary entry reflecting upon their thoughts whilst completing the reasoning task.

### 7.3 (b) Design

A mixed experimental design was adopted for the study. The experiment designed enabled the exploration of three independent variables: PDI (determined by the scores on the Peters Delusions Inventory: Peters *et al.*, 1996); scenario type (non-violent vs. violent); and dual tasking (simple vs. difficult) explored using a dot matrix memory task. There were two dependent variables: amount of information required before making a decision based on a 0-8 scale (data gathering) and whether the decision was changed on hearing more information (change of decision).

### 7.3 (c) Measures

The study comprised of three main component measures. These measures are outlined below. Participants completed the PDI and reasoning task in randomised orders to ensure that the measures did not impact upon one another. The three components will be discussed in turn below.

#### *The Peters Delusions Inventory (Peters et al., 1999)*

The 24-item Peters Delusions Inventory, (Peters *et al.*, 1999) was used, like before, to measure individuals' Schizotypal tendencies. For further information please see Section 2.4(a).

#### *Dual Processing Visual Computerised Decision Task (DPVCDT)*

This study was based around the crime based reasoning task used in Chapter Five, Study Three, however, the renovated design presented information to participants in a visual modality accompanied by a dot matrix memory task (see appendix A16). Both of these tasks were presented and completed using E-Prime stimulus software. This design explores whether 'dual tasking' as opposed to a change in modality, and therefore greater demands on processing, enhances the effects of biases in individuals who score high for Schizotypy. This is supported by the

evidence of bias' occurring in individuals with Schizophrenia, schizo-type disorders, as well as a small amount of evidence for differentiation in psychosis prone individuals (Rheed, Wakefield, Harris, Parry, Cella, Tsakanikos, 2007: Ferstl, Hanewinkel & Krag, 1994).

Participants were presented with a dot matrix (simple or difficult) which they were required to remember whilst completing the second task. The second task consisted of a crime based scenario, either violent or non violent. Following the scenarios was a sequence of statements that contained additional information with regards to the scenario. Participants were simply required to indicate at which point they were happy to make a decision about whether the character in the story had done the right thing. Participant's responses were recorded on a ten-part scale. Once participants had completed the crime scenario, they were then requested to recall the dot matrix memory task. This process was repeated to account for violent vs. non violent and simple vs. difficult conditions.

#### *Audio Diaries*

The audio diaries have been a feature that has been developed and utilised throughout the studies featured in this thesis. The audio diaries have provided an arena and space for participants to reflect on the completion of the audio reasoning task. The aim of this tool is to encourage participants to reflect upon their thoughts and emotions whilst completing the reasoning task. As previously implemented, participants were required to stand in a room where a number of questions were displayed on the walls. These questions were designed to help guide and prompt individuals during their reflection process. The following questions and prompts were displayed to guide and help participants:

How did you feel whilst completing the reasoning task (computer task)?

- What emotions did you experience?
- Why might you have experienced those emotions?
- How do you understand those emotions?
- Where do emotions come from?

What were you thinking about or focusing on during the task?

- Did you concentrate on a particular feature of the task?
- Did you devise a strategy for completing the task?

Was there anything that you wanted to verbally say whilst you were completing the task?

What are your thoughts about crime and criminal behaviour in general?

- What causes crime?
- Where has crime emerged from?
- How should we categorise crime?
- Is it as easy as saying that certain behaviour traits are criminal?
- Where do we learn right from wrong?

### 7.3 (d) Procedure

Participants were recruited using an opportunity sample using adverts in lectures. Willing participants were invited to come to the experiment laboratory where the study took place. On arrival to the laboratory, participants were required to read a participant information sheet (See Appendix A6) and were given the opportunity to ask any questions. Participants then signed a consent form (See Appendix A7) highlighting all the key issues with regards to the study. Each participant was then provided with a unique participant number which they would use for identification on each of the experiment components. Participants completed paper work was posted into a sealed box.

The components of the experiment were counterbalanced, with roughly half of the participants completing the PDI first and the other half completing the dual task crime based reasoning test. This ensured that the PDI questionnaire had no adverse effects upon the completing of the crime based reasoning task

*Peters Delusions Inventory (PDI; Peters et al, 1996)*

Participants were instructed about the completion procedures of the PDI both verbally, using standardised instructions, and visually, using the instruction provided by the author. Participants were given as much time as they required to complete the questionnaire. Individual's participation numbers were printed at the top of the questionnaire ensuring that no personal information was attached. Once complete, the questionnaires were posted into a sealed box.

*Dual processing visual crime based reasoning task*

The dual processing visual crime based reasoning task was presented and completed using E Prime technology. Participants were instructed to follow instructions on screen which clearly described to participants the procedure of the task. Participants were required to enter their participation number in order to maintain confidentiality and anonymity. Similar to Study Three and Study Four, there were two crime based scenarios. One of the scenarios was violent in nature whilst the other scenario was non violent. Each participant completed a violent, non violent, easy memory load and hard memory load task. The order in which these combinations were presented was counterbalanced throughout in order to control for confounds.

Alongside completing the reasoning task, participants completed a dot matrix memory task as used by De Neys (2006). There were two categories of dot matrix tasks, one which was difficult and one which was easy (see figure 7.0). Participants were instructed to memorise the dot matrix before commencing with the reasoning task. Once they had completed the reasoning task they were then instructed to recall the dot matrix.

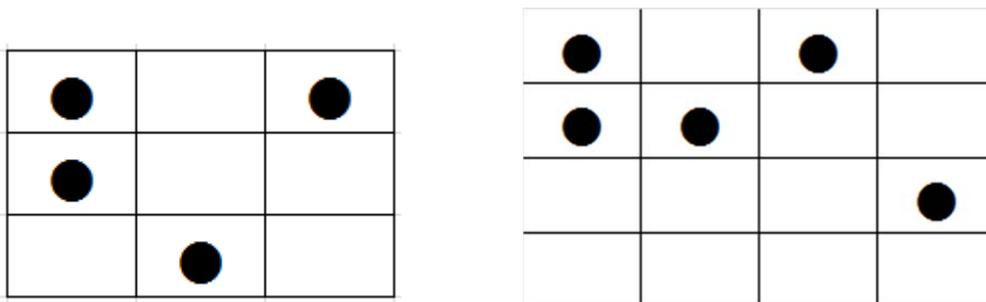


Figure 7.0: The easy and hard dot matrix designs

### *Audio Diaries*

Finally, thirty-seven of the participants volunteered to record an audio diary entry, this provided an element of feedback on the experiment. The audio diary provided participants with the opportunity to reflect upon their thoughts, emotions and focus whilst carrying out the reasoning task. Following the same procedure as Study Two, Three and Four, questions and prompts (please see above section - Measures) were placed on the walls around the audio diary room to guide and prompt participants thought processes. The audio diary entries were identified using the participant identification number given to participants at the beginning of the experiment. Once complete, participants were instructed to return to the main experiment laboratory for a debrief session.

## **7.4 Results**

This section presents the results from the reasoning task followed by the audio diaries.

### **7.4 (a) Reasoning Task (Visually presented Crime Based Dual Processing Task)**

#### *Descriptive statistics*

The reasoning task results were analysed using SPSS statistics analysis software 17.0, and are presented below. Descriptive statistics for the ‘data gathering’ scores can be viewed in table 7.0 below:

**Table 7.0: ‘Data gathering’ descriptive statistics**

<b>Crime Type</b>	<b>PDI Group</b>	<b>Mean data gathering</b>	<b>Data gathering standard deviation (DV)</b>	<b><i>p</i></b>	<b><i>f</i></b>
Violent (hard)	High (n = 25)	3.04	3.05	0.00	11.84
	Low (n=25)	4.72	4.03		
Violent (easy)	High (n=25)	2.68	2.69	0.00	18.31
	Low (n=25)	5.2	3.99		
Non Violent (hard)	High (n=25)	2.88	2.83	0.12	2.52
	Low (n=25)	4.32	3.53		
Non Violent (easy)	High (n=25)	3.48	3.16	0.09	2.99
	Low (n=25)	5.68	3.65		

*Inferential statistics: 'Data gathering'*

The data gathering results were analysed using a Split-Plot Analysis of Variance (SPANOVA) to assess the impact of one between subject independent variables (PDI: high and low) and two within subject independent variables (Scenario type: violent and non-violent; Memory load: high and low) on participants 'data gathering' scores.

Box's test of equality of covariance matrices was significant ( $p \leq 0.05$ ) and therefore the results below are reported using the Greenhouse-Geisser.

There was no significant interaction between memory and PDI ( $F= 2.69, p > 0.05, \eta^2 = 0.05$ ), PDI and Scenario type ( $F= 0.12, p > 0.05, \eta^2 = 0.00$ ), memory and scenario ( $F= 1.18, p > 0.05, \eta^2 = 0.02$ ), and memory, scenario and PDI ( $F= 0.00, p > 0.05, \eta^2 = 0.00$ ).

There was a significant difference in mean data gathering between high and low scorers ( $F= 6.79, p < 0.05$ ). There was also a significant main effect of memory (easy / hard:  $p < 0.05$ ) but there was no significant main effect of scenario type ( $p > 0.05$ ).

Whilst power calculations of the above analysis were made using SPSS they are not cited here as the results were so insignificant that it was not deemed necessary.

*Inferential statistics: Change of opinion*

*Table 7.1: Change of opinion descriptive data*

	<b>Yes</b>	<b>No</b>	<b>Total</b>
<b>High</b>	14 (53.85%)	11(45.83%)	<b>25</b>
<b>Low</b>	12 (46.15%)	13 (54.16%)	<b>25</b>
	<b>26</b>	<b>24</b>	<b>50</b>

The change of decision data was analysed using the non-parametric Chi-Square test. The test revealed no significant differences between the group combinations containing high/low ( $\chi^2 = 10.38, df = 7, p > 0.05$ ).

#### 7.4 (b) Audio Diaries

Thirty Seven participants completed the audio diary section. The audio diary entries were analysed using thematic analysis (Howitt, 2010; Braun & Clarke, 2006). A number of themes emerged from the audio diaries and these themes are presented in the following section.

##### *Emotional responses*

Emotion emerged as a theme when analysing participant's responses to the audio diary entries. High and low scorers reported differing levels of engagement with the emotions that might be involved in the decision making process. Twelve high scoring individuals suggested that they experienced little or no emotional response to the reasoning task.

P543H: well, I guess I found it difficult to feel anything really. Eh I'm not sure what I should have or how I felt I would have felt it.

P511H: Not really sure what this means, I didn't really think about feelings just got on with the task set.

Fifteen low scoring individuals reported emotional engagement with the characters or scenarios. This was usually accompanied by some kind of comparison to the characters in the scenarios.

P552L: I felt sad for the old man. He trusted Cheryl and then she took advantage of him. You know, there were more pressing issues that he could have used the money for.

P561L: I felt angry at the gang for attacking the lady, and I felt scared for Jarred because of the consequences of what he might do. I don't think Jarred should hurt the boy he caught, but they should not have hurt the lady. Ummm, if I was Jarred I would do the same, cos I would be angry.

### *Task completion*

There was a clear difference in the approach adopted by high and low scorers. Ten of the low scoring individuals reported concerns about making the right overall conclusion.

P567L: I wanted to make a good and well ‘just’ decision. When I say ‘just’ I mean what is right. I would like to see what is right happen as a consequence for the immoral acts performed in the scenarios. It makes me think of a programme that I saw. An old lady was robbed and she met the robber and she forgave him and said he should learn from his mistake but not go to prison and give something back to society.

High scoring individuals, generally speaking, were focused on what they needed to do in order to complete the task. Nine commented specifically on timing of answer and buttons to press in order to respond. However, the dual task paradigm appeared to create more pressure on high scoring participants.

P539H: I found it hard to concentrate on reading the scenario when I had to remember the grid. The bigger grid was even harder. I couldn’t focus.

### *Elaboration*

The final theme that emerged was the difference between high and low scoring individuals need to elaborate. Fifteen of the low scoring individuals reported that they felt the need to explain the answers that they had given and to provide a rationale or justification for why they have responded in that way.

P555L: I felt like shouting at the computer because I wanted to be able to tell you why.... Why I responded in that way. Somehow, not being able to say why made me want to say why even more so now. Some of my decisions were far from clear cut and they took a lot of weighing up the odds but I wanted to talk about that out loud.

## **7.4 Discussion**

The quantitative data presented no significant interactions, in any combination, between PDI, memory load and crime type. This could be interpreted, explained and accounted for in a number of ways. It is possible that the experiment design is not sensitive enough to capture any relationships between PDI, dual systems of processing and crime scenario type, despite adopting tools and methods that had been used previously in a number of studies which had generated significant results (Galbraith *et al.*, 2009; Evans, 2009; De Neys, 2006).

The results suggest that the biases that occurred in Study Three and Study Four were not a result of overloaded resources and increased demands placed on memory but rather the impact of modality (visually or auditory processed information). Nonetheless, it is impossible to be conclusive without testing the dual process paradigm within the auditory modality.

It is also possible that dual process theory does not adequately account for aspects of crime based real world reasoning and hence there is no relationship or interaction between the two separate systems when reasoning about crime based scenarios. It is also possible that the two systems of processing do not impact upon one another when individuals are engaged with crime based reasoning.

The quantitative analysis did highlight a significant difference in mean data gathering scores between high and low scorers, consistent with Study Three and Study Four that reported low scorers requiring more information before making a decision.

The audio diaries produced similar themes to previous studies around emotion, task completion and elaboration. Despite the quantitative results revealing no statistically significant differences between high and low Schizotypy scorers, the qualitative results suggest that different approaches and strategies were adopted by high and low scorers, along with differing levels of emotional interpretation and consideration. The differences in emotional consideration could relate to Evans and Over's (1996) proposal of two forms of rationality. They suggest that one form is personal in nature whilst the other form is impersonal. It is possible that low scoring participants interpret emotion in the scenarios at a personal level compared with high scores who processed emotion at an impersonal level. Evans and Over (1996) note

that this is particularly interesting when considering moral reasoning dilemmas that might depict acts of violence or criminal offences, which is in line with the design of the crime scenario types presented in this task.

Interestingly, the audio diaries highlighted that high scoring individuals reflected upon, and reported that, the memory load task distracted their attention and therefore they had difficulties remembering the dot matrix diagram whilst reading and processing the crime based reasoning task. To some extent this captures the competition for resources and conflict between System One and System Two processing (Manktelow, 2012; Evans, 2008) that is theorised and expected in the dual process paradigm.

Study Five produced little evidence to suggest that the biases relating to Schizotypy, modality and crime based reasoning are escalated or explained by dual processing on a quantitative level. However, the qualitative results captured elements of personal reports of conflict in processing by high PDI scorers. Therefore, it is necessary to explore whether the same findings occur when the information is delivered in an audio modality using the same dual task design.

**Chapter Eight, Study Six,  
'Dual processing' in auditory  
modality**

## **8.1 Overview of Chapter Eight**

Chapter Seven, Study Five, found no significant interaction between the independent variables PDI (high and low), scenario type (violent and non violent) and dual processing (high and low memory load) when reasoning in the visual modality according to the quantitative results. However, the trends in the data suggested that high scorers were still making decisions based on fewer pieces of information consistent with the findings from Study Three and Study Four.

The qualitative results from Study Five remained consistent with previous studies, however, they highlighted that high scoring individuals found the memory load task distracting and reported having difficulties remembering the dot matrix diagram whilst reading and processing the crime based reasoning task. Consequently, it was necessary to explore if a change of modality further enhances biases in a way that will reflect in the qualitative descriptions and more importantly become detectable in the quantitative results. Therefore, this study explores the dual task paradigm, as created in Chapter Seven, Study Five, but this time in an auditory modality.

## **8.2 Introduction**

The visual dual processing paradigm produced non significant interactions between PDI, memory load, and crime type. It is possible that the dual processing systems (System One and System Two) do not impact upon each other, or compete for resources, whilst individuals are engaged in crime based reasoning, in a visual modality, or the method of the experiment was not sensitive enough to detect relationships and differences between the independent variables.

Many of the dual process studies use a task switching format (Arnell & Jolicoeur, 1999; Duncan *et al.*, 1997; Mondor, 1998; Shulman & Hsieh, 1995; Tremblay & Jones, 2000) to explore the impact of System One and System Two processing. De Neys (2006) utilised a dot memory task design to create a dual process design whereby participants were required to switch between a given task whether it be memory, reasoning, judgement and the dot memory task. This model was adopted in Study Five of this thesis and therefore has been modified and

developed for Study Six in an auditory modality, as there is a strong argument for developing a better understanding of cognitive processes in the auditory modality (Soto-Faraco and Spence, 2002). Previous research (Brünken & Leutner; 2001; 2002; Mayer & Moreno, 1998; Moreno & Mayer 2000; Mousavi, Low, & Sweller, 1995) has found differing outcomes of processes in auditory as opposed to visual modality. For example, Moreno and Mayer (1999) found a modality effect which impacted upon learning. Student's learning was aided when information was presented in an auditory modality (as speech) rather than a visual modality (as text), suggesting that a different level of processing occurred. Whilst this study focuses on acquisition as the outcome, it is possible that the presentation of information, either visually or orally, impacts upon decision making and associated cognitive processes. With a similar focus on learning, Sullins, Craig & Graesser (2010) assessed the influence of modality on deep-reasoning questions. They found that participants achieved better scores when the information was presented in written format and when the learning process involved the use of deep-reasoning questions.

Individuals with psychotic symptoms and Schizophrenia experience deficit in auditory sensory "echoic" memory (Umbritch *et al.*, 2000), which relate to problematic extraction of relevant information from sensory stimuli across all modalities (Javitt *et al.*, 2000). It could be argued that the results from Study Four suggest that individuals who score high for Schizotypy also experience biases in "echoic" memory.

Menon, Pomarol-Clotet, McKenna and McCarthy (2006) study produced non-significant findings, and has been critiqued for the methodology that was employed. The items were drawn and left visible enabling individuals to view each of the beads that had been drawn from the jar: this reduced the demands placed on memory processes. A dual process design would account for and control the demands placed upon memory processing during the task to explore more accurately any consequential impact.

This study aims to explore two key components that have featured in the latter studies in this thesis. First, whether the presentation modality of information, in other

words visual or audio, impact upon individuals processing and crime based reasoning. In addition, this study will explain whether an alternative explanation using a dual process paradigm to account for the differences found in audio crime based reasoning tasks. Each of these elements will be explored in the context of Schizotypy in order to assess whether there is a relationship between these elements.

### 8.2 (b) Research Question and Hypothesis

This study aimed to explore if individuals with high Schizotypal tendencies reason differently from a control group (individuals scoring low for Schizotypal tendencies) on an orally presented dual process crime based reasoning task. It was hypothesised that:

1. High scoring individuals would make decisions based on less information
2. High scoring individuals would be more likely to change their opinion when presented with disconfirmatory information.

These differences would become even greater when bigger demands were placed on memory.

## **8.3 Method**

### 8.3 (a) Participants

Sixty-One participants took part in the auditory Dual Processing study. The participants were recruited from Birmingham City University. The sample consisted of undergraduate students from a range of faculties and degree courses across the University. Participants were aged between 18 and 38 ( $M = 22.8$ ,  $SD 5.41$ ), 21 were males and 40 females. All participants were first language native English speakers. The top and bottom third of the overall sample, according to participants PDI score, was compared for differences, which created a final sample of 40 participants. Out of the final sample, 22 of the participants volunteered to complete an audio diary entry reflecting upon their thoughts whilst completing the reasoning task.

### 8.3 (b) Design

A mixed experimental design was adopted for the study. The experiment explored three independent variables: PDI (determined by the scores on the Peters Delusions Inventory: Peters *et al.*, 1996); scenario type (non-violent vs. violent); and a dot matrix task (simple vs. difficult). There were two dependent variables: amount of information required before making a decision based on a 0-8 scale (data gathering) and whether the decision was changed on hearing more information (change of decision).

### 8.3 (c) Measures

The study comprised three main component measures. These measures are outlined below. Participants completed the PDI and reasoning task in randomised orders to ensure that the measures did not impact upon one another. The three components will be discussed in turn below.

#### *The Peters Delusions Inventory (Peters et al., 1999)*

The 24-item Peters Delusions Inventory, (Peters *et al.*, 1999) was used, like before, to measure individuals' Schizotypal tendencies. For further information please see Section 2.4(a).

#### *Dual Processing Auditory Computerised Decision Task (DPACDT)*

This study was based around the crime based reasoning task in Chapter Seven, Study Five, however, the renovated design presented the Vignettes and statements to participants in an auditory modality accompanied by a visual dot matrix memory task (See appendix A16). The tasks were presented and results were recorded using E-Prime stimulus software. This design explores whether reasoning biases are further enhanced by 'dual tasking' or whether the modality of presented information impacts upon individuals decisions (Rheed, Wakefield, Harris, Parry, Cella, Tsakanikos, 2007; Ferstl, Hanewinkel & Krag, 1994).

Participants were presented with either a simple or difficult dot matrix memory test which they were required to remember whilst reading a crime based vignette accompanied by additional statements. Participants were required to indicate at which point they were happy to make a decision about whether the character in the

story had done the right thing. Participant's responses were recorded on a ten-part scale. Once participants had completed the crime scenario, they were then requested to recall the dot matrix memory task. This process was repeated to account for violent and non violent as well as simple and difficult conditions.

### *Audio Diaries*

The audio diaries have been a feature that has been developed and utilised throughout the studies featured in this thesis. The audio diaries have provided an arena and space for participants to reflect on the completion of the audio reasoning task. The aim of this tool is to encourage participants to reflect upon their thoughts and emotions whilst completing the reasoning task. As previously implemented, participants were required to stand in a room where a number of questions were displayed on the walls. These questions were designed to help guide and prompt individuals during their reflection process.

### 8.3 (d) Procedure

Participants were recruited on an opportunity basis using adverts in lectures. Willing participants were invited to come to the experiment laboratory where the study took place. On arrival to the laboratory, participants were required to read a participant information sheet (See Appendix A6) and were given the opportunity to ask any questions. Participants then signed a consent form (See appendix A7) highlighting all the key issues with regards to the study. Each participant was then provided with a unique participant number which they would use for identification on each of the experiment components. Participant's completed paper work was posted into a sealed box.

The components of the experiment were counterbalanced, with roughly half of the participants completing the PDI first and the other half completing the dual task crime based reasoning test. This ensured that the effect of the PDI questionnaire were minimised upon the completing of the crime based reasoning task

### *Peters Delusions Inventory (PDI; Peters et al, 1996)*

Participants were instructed about the completion procedures of the PDI both verbally, using standardised instructions, and visually, using the instruction provided

by the author. Participants were given as much time as they required to complete the questionnaire. Individual's participation numbers were printed at the top of the questionnaire ensuring that no personal information was attached. Once complete, the questionnaires were posted into a sealed box.

#### *Dual processing visual crime based reasoning task*

The dual processing visual crime based reasoning task was presented and completed using E-Prime technology. Participants were instructed to follow instructions on screen which clearly described to participants the procedure of the task. Participants were required to enter their participation number in order to maintain confidentiality and anonymity. The task included comprised of a number of variables which were counterbalanced throughout in order to control for confounds. Similar to Study Three and Study Four, there were two crime based scenarios. One of the scenarios was violent in nature whilst the other scenario was non violent. Each participant completed a violent, non violent, easy memory load and hard memory load task. The order in which these combinations were presented was counterbalanced throughout in order to control for confounds.

Alongside completing the reasoning task, participants completed a dot matrix memory task as used by De Neys (2006). There were two categories of dot matrix tasks, one which was difficult and one which was easy. Participants were instructed to memorise the dot matrix before commencing with the reasoning task. Once they had completed the reasoning task they were then instructed to recall the dot matrix.

#### *Audio Diaries*

Finally, 37 of the participants volunteered to record an audio diary entry, which provided an element of feedback on the experiment. The audio diary provided participants with the opportunity to reflect upon their thoughts, emotions and focus whilst carrying out the reasoning task. Following the same procedure as Study Two, Three and Four, questions and prompts (please see above section - Measures) were placed on the walls around the audio diary room to guide and prompt participants thought processes. The audio diary entries were identified using the participant

identification number given to participants at the beginning of the experiment. Once complete, participants were instructed to return to the main experiment laboratory for a debrief session.

## **8.4 Results**

This section presents the results from the reasoning task followed by the audio diaries.

### **8.4 (a) Reasoning Task (Visually presented Crime Based Dual Processing Task)**

#### *Descriptive statistics*

The reasoning task results were analysed using SPSS statistics analysis software 17.0, and are presented below. Descriptive statistics for the ‘data gathering’ scores can be viewed in table 7.0 below:

*Table 8.0: Data gathering descriptive statistics*

<b>Crime Type</b>	<b>PDI Group</b>	<b>Mean data gathering</b>	<b>Data gathering standard deviation (DV)</b>	<b>p</b>	<b>f</b>
Violent (hard)	Low (n=20)	6.50	3.08	0.00	10.37
	High (n=20)	2.08	1.99		
Violent (easy)	Low (n=20)	6.88	3.17	0.00	11.39
	High (n=20)	2.33	1.69		
Non Violent (hard)	Low (n=20)	6.21	2.96	0.48	0.52
	High (n=20)	2.55	2.46		
Non Violent (easy)	Low (n=20)	6.54	3.27	0.00	14.87
	High (n=20)	2.41	1.77		

#### *Inferential statistics: ‘Data gathering’*

The data gathering results were analysed using a Split-Plot Analysis of Variance (SPANOVA) to assess the impact of one between subject independent variables (PDI: high and low) and two within subject independent variables (Scenario type: violent and non-violent; Memory load: high and low) on participants ‘data gathering’ scores.

Box’s test of equality of covariance matrices was significant ( $p \leq 0.05$ ) and therefore the results below are reported using the Greenhouse-Geisser.

There was no significant interaction between memory and PDI ( $F= 0.48, p > 0.05, \eta^2 = 0.01$ ), PDI and Scenario type ( $F= 0.95, p > 0.05, \eta^2 = 0.02$ ), memory and scenario ( $F= 0.57, p = 0.81, \eta^2 = 0.00$ ), and memory, scenario and PDI ( $F= 0.04, p > 0.05, \eta^2 = 0.00$ ).

There was a significant difference in mean data gathering when comparing high and low PDI scorers ( $F = 70.7, p < 0.05$ ).

Whilst power calculations of the above analysis were made using SPSS they are not cited here as the results were so insignificant that it was not deemed necessary.

*Inferential statistics: Change of opinion*

Table 8.1: Change of opinion descriptive data.

	<b>Yes</b>	<b>No</b>	<b>Total</b>
High	12 (52.17%)	9 (47.37%)	<b>21</b>
Low	11 (47.83%)	10 (52.63%)	<b>21</b>
	<b>23</b>	<b>19</b>	<b>42</b>

The change of decision data was analysed using a Yates continuity correction (Chi-square test). The test revealed no significant differences between the group combinations containing violent/non-violent, high/low and hard/easy ( $\chi^2 = 8.53, df = 7, p > 0.05$ ).

8.4 (b) Audio Diaries

Twenty two of the forty participants completed the audio diary section. The audio diary entries were analysed using thematic analysis (Howitt, 2010; Braun & Clarke, 2006). A number of themes emerged from the audio diaries and these themes are presented in the following section.

*Emotional recognition*

High and low scorers reported differing responses to the reasoning task in terms of the emotive impact. Ten of the high scoring individuals made statements that suggested that they did not engage with the characters emotions in the scenarios, however, they would report things such as feeling happy or tired.

P612H: I can't remember feeling any emotion really. Eh erm I feel tired today.

In contrast to the above, nine of the low scoring individuals reported their emotions for the individual's characters in the scenarios. Some individuals would compare the characters with their own situation or experiences in order to make a decision about their actions.

P613L: I couldn't help but feel sorry for Cheryl eh I mean erm I know that she did a bad thing, she shouldn't of lied to him but there must be something really bad in her life to do that. She must be desperate for money.

P658L: I felt quite angry about the whole scenario. What's his name? I can't remember .... Jared, yea Jared was in an awful situation. I would hate to find her like that then catch hold of one of the gang. I can think of times that I have been face to face with the responsible one and it's awful.

#### *Logistics of completing the task*

High and low scorers reported differing methods and approaches to completing the task. Eight low scoring individuals were concerned about making a decision that reflected their moral beliefs. For example, one individual stated:

P622L: I wanted to know everything about the situation in order to make a decision which was fair and just. I felt that I needed to ask more questions about the characters and the happenings that led to the events.

In contrast seven high scoring individuals reported having questions about the logistics of completing the reasoning task. High scorers seemed to focus on which buttons they needed to press and when they needed to press them.

P637H: I got confused cos I wanted to recall the memory diagram half way through reading the scenario. I wanted to ask whether I should respond with same keys or different sets.

### *Law and Morality*

The final theme that emerged from the audio diaries related to the decision making process being based on the law or morality. In some cases it was suggested that these were two completely separate entities. Ten low scoring individuals were far more focused on moral decisions, that ties in with the emotive engagement, when making decisions. Nine high scoring individuals more frequently referred to practices and principles in the Law. One low scoring participant commented:

P658L: ...I can think of times that I have been face to face with the responsible one and its awful. You find yourself wrestling with how you feel and what you want to happen to that person but at some point eh eh you know, you have to to put on, be the bigger person.

One high scoring individual reported:

P638H: The gang really shouldn't of done that, but then Jarred by law would be in the wrong to hit him too. Well, you know, eh you can't deny that by law it would be wrong too.

### **8.4 Discussion**

Similar to Study Five, the quantitative analysis of the data gathering results found no significant relationships between PDI, dual processing and crime type, suggesting that these factors do not impact upon one another. However, there were significant differences highlighted between high and low PDI scorers with regards to their data gathering scores consistent with previous findings. In other words, high PDI scorers required fewer pieces of information before coming to a conclusion in comparison to low scorers who require more pieces of information before making a decision. However, the memory tasks did not interfere with this finding and caused no further elevated signs of reasoning biases. This suggests that the dual processing (Evans, 2003) account does not provide an explanation for why biases are elevated when presented in a visual modality.

It is possible that high PDI scorers require fewer pieces of information due to problems or abnormalities experienced with the processes and processing that are

involved in the extraction of relevant information from sensory stimuli across all modalities (Javitt *et al.*, 2000), however, the frequency or intensity of these abnormalities are heightened when information is presented orally.

Once again, similar themes emerged from the qualitative data, which have been discussed in previous studies in this thesis. However, this time there were a number of individuals who specifically discussed the decision making process in more detail than before, describing how they came to their conclusion. High scoring individuals discussed making their decisions based on the law. They used the law to inform their decision making process and to guide them to the correct response. Low scoring individuals made decisions and came to a conclusion based on their morals. It could be argued that our morals are in part influenced by the Laws which rule our country. However, some low scoring individual discussed that despite certain acts being against the law, they could fully empathise with why an individual might find themselves committing the act given the set of circumstances. This relates to Evans and Over (1996) who proposes two forms of rationality, one that is personal in nature and another form that is impersonal. The low scorers based their decisions on morality adopted a personalised approach, whereas the high scorers who made decision based on the law adopted an impersonal approach to rationality.

According to Kohlberg's (1958, 1978) theory, high scorers demonstrated evidence of reasoning at level one of moral development, according to which is right and wrong, whereas low scorers demonstrated evidence of reasoning at level 2 and even level 3.

# Chapter Nine: Discussion

## **9.1 Overview of Chapter Nine**

This thesis contributes a novel mixed-methods approach to the field of research, and has therefore explored how qualitative and quantitative methods of research can be used together to build a more informed and cohesive understanding of the bias associated with Schizotypy and crime based reasoning. In addition, this thesis provides further verification and validity testing of both the PDI and the adoption of non-clinical samples along with a novel validated crime-based reasoning scenario/paradigm.

A number of beneficial and important findings have occurred as a result of the combination and collection of the six studies that have been presented and discussed in this thesis. The relationship between Schizotypy and crime based reasoning is complex, however, a better understanding of the relationship and potential errors and biases in reasoning has been discovered as a result of this research. The qualitative data presented a number of themes that were consistent throughout the six studies. In addition, the qualitative element provided increased insight into reasoning ability that would not have been detected or demonstrated by the quantitative research alone. This chapter will provide a discussion around the themes, significant findings, and discuss possible explanations for the results collected from each of the experimental studies based on the literature to date. The final section will consider the direction of future research studies in terms of study populations and adaptations to the experimental designs pioneered within the studies contained in this thesis.

## **9.2 Trends in the Experimental studies**

A number of trends emerged throughout the quantitative data collected in this thesis and each of these trends will be discussed in detail below. In addition, a number of key themes emerged from the qualitative data which, in some cases, help provide further clarification about the quantitative trends as well as providing detailed descriptions of the biases experienced by certain individuals which the experimental data failed to detect.

*Self-reference levels*

The former studies in this thesis, Study One and Study Two, explored the relationship between self-referencing levels and crime based reasoning. Study One, Graduation Reasoning Assessment Task (GRAT: Wilkinson, Jones & Caulfield, 2011), explored an innovative four part reference level design and found no statistically significant differences between the reference levels: ‘me’, ‘family’, ‘friend’ and ‘stranger’, although a number of explanations may account for such a result. It could be argued, for example, that individuals make decisions in similar ways, despite their score for Schizotypal tendencies, in terms of their response time and accuracy. It is also possible that individuals reason in very similar ways about their friends and strangers, both of which feature at the end of the self-reference scale which is most removed from the self and therefore the four part self-reference task did not detect differences. However, when considering the qualitative data there were clear differences in terms of the techniques that high and low scorers implemented when reasoning. In particular, high scoring individuals reported differences in terms of how they reasoned along the self-reference levels. According to high scorers, the response changed depending upon how closely related they were to the individual placed in the scenario, demonstrating a clear link to ‘Theory of Mind’ functions (Baron-Cohen, 1999), as individuals showed signs of contemplating other individuals’ perspectives and perceptions.

The Graduation Reasoning Assessment Task – Revised (GRAT – R) in Study Two, was based on the GRAT featured in Study One but consisted of a two part self-reference scale, me and other, consistent with previous measures (Galbraith, Manktelow & Morris, 2009). The quantitative results presented a significant main effect of reference level, suggesting that individuals were significantly quicker at making decisions about themselves compared to making decisions about other people, regardless of PDI score. This finding can be explained using Theory of Mind (Baron-Cohen, 1991), whereby a first person perspective is adopted, when making a decision based on ‘me’, and therefore individuals generate an automated response. However, when an individual is engaged in reasoning about another person’s situation then it takes longer to gather the information and to apply the information about the self to another individual’s situation. It is also possible that individuals may digest more information, prior to making a decision, when reasoning about another individual

compared to reasoning about their own situation. There was, however, no significant interaction when considering PDI (Peters Delusions Inventory) scores.

In keeping with the reaction time results, the error score data presented a significant main effect of reference level. This suggests that participants made more accurate judgements when reasoning about themselves compared to reasoning about other people. However, once again, there were no significant interactions found between reference level and PDI scores, and no significant main effect of PDI.

Whilst the quantitative results suggested that there were no significant differences in terms of the way in which individuals with high and low Schizotypal tendencies reasoned along a self-reference scale, the qualitative results revealed some clear differences in the way high and low scorers interpreted the scenarios and reasoned about other individuals and criminal acts. One aspect that emerged as a theme throughout the studies contained in this thesis and is pivotal to reasoning overall is emotion. Individuals with high Schizotypal tendencies demonstrated less empathy towards other people and less emotional awareness whilst completing the reasoning tasks (Wilkinson, Caulfield & Jones, 2011). Low PDI scoring individuals demonstrated far more awareness of their own emotional states as well as interpreting the emotional states of other individuals, for example, the characters in the crime based scenarios. Again, this is consistent with and supported by the deficits experienced in individuals who suffer from biases in 'Theory of Mind' functions (Baron-Cohen, 1991), for example, Schizophrenia and Autistic spectrum disorders. Low scoring individuals, who acquire no deficit in Theory of Mind functions, were able to understand their own emotions, beliefs, intents and desires as well as understanding and appreciating the mental states of other individuals by applying the knowledge that they had about themselves to the situations that the other individual was in. Participants demonstrated this by commenting on how characters in the scenarios might be feeling or what they might be thinking.

An impaired working memory (Broome *et al.*, 2007), or at least biases in working memory functions, experienced by individuals with delusions and delusional like beliefs could explain why high scoring individuals, on a qualitative level, tended

to appear distant from their emotions and appear to concentrate purely on the task at hand, as they are limited by the amount of information that can be held and processed in working memory. This would subsequently explain why individuals with high scores tended to have biases when completing ‘data gathering-type’ reasoning tasks (Peters *et al.*, 2008), which was explored in the latter studies of this thesis.

Furthermore, high scoring individuals reported focusing on the logistics of completing the task, rather than considering the details of each scenario such as the individual characters’ perspectives. This links back to the ‘exaggerated self’ bias reported by Sass and Parnas (2003).

### *Strategies*

High and low PDI scorers differed, throughout the studies contained in this thesis, in terms of the strategies that they employed in order to make a decision. Consistently, low scoring individuals reported digesting as much information as possible and therefore employing strategies that ensure that they read the whole statement, with some individuals even suggesting that they read through the statements a number of times, prior to making a final decision. On the contrary, in some cases, high scoring individuals worked out the minimum amount of information that was needed in each case to make a decision, for example, they highlighted key words from the statements that shaped the scenario i.e. ‘murder’, ‘should not be’, and ‘punished’ and an instinctive decision was made based on the three selected key elements. These self described strategies provide further support for the ‘jump to conclusions’ bias demonstrated in individuals who experience delusions (Huq, Garety and Hemsley, 1988) along with a potential explanation of why this bias occurs. It is possible that the evidenced process demonstrated in low scorers is part of heuristic processing (Evans, 1984) whereby individuals select the representations that are relevant to a particular problem space, or this could be an example of strategy heuristic processing (Tversky & Kahneman, 1974) whereby individuals create shortcuts to get to the final stage.

The qualitative element of this thesis has provided essential information, along with a platform and an innovative approach to gaining a more complete understanding of the processes that occur when individual approach given problems and situations. This approach could be adopted when researching clinical and forensic samples, such

as those with delusional based disorders, to accompany experimental designs and therefore provide a more complete explanation, understanding of the biases and errors, and a better insight into the experiences of delusional patients that occur when making decisions.

### *Violent vs. non violent crime*

The latter reasoning tasks explored the differences in reasoning between violent and non violent scenarios. A significant main effect of crime type (violent and non-violent) was found in Study Two where participants reasoned more quickly about non violent crime scenarios compared to the violent crime scenarios. This did not interact with PDI, however, it highlighted that individuals made quicker decisions about non violent crime compared to violent crimes. It is possible that individuals take longer to process violent crimes due to the impact that such a crime might have on another human being, which would suggest System Two processes (Evans, 2007) drawing upon experience and memory, and therefore non violent crimes might provoke automated responses calling upon System One processing (Evans, 2007).

### *Justifications and morality*

The crime based reasoning tasks did not allow participants to explain why they had made a specific decision about a scenario which created interesting qualitative feedback from the interviews and audio diaries. Despite, the clear differences in both the strategies applied by high and low PDI scorers and the level of emotional engagement whilst reasoning, both reported the need to explain their answers and therefore, to go beyond a simple 'agree' or 'disagree' response. Low scorers specifically reported that they felt the need to provide some kind of 'justification' for why they made a specific conclusion. This was common throughout all of the studies. Future research might consider Kohlberg's (1958, 1978) style analysis to see whether high and low PDI scorers differ in the level of moral reasoning. Interestingly, the qualitative data from Study Six found a much deeper level of reflecting with regards to participant's reports and self-analysis of completing the reasoning task. It became clear that high scoring individuals made decisions based on the law, and in particular whether the law stated it was right or wrong to commit a certain act. Low scoring

individuals were much more reliant on their morals and whether they were doing the right thing according to the individuals in that given scenario.

#### *Reaction times vs. Data gathering*

Overall, the quantitative results collected from Study One and Study Two suggest that reaction times do not appear differentiated in individuals who score high for Schizotypal tendencies and hence the latter studies in this thesis turned to data gathering measures. Study Three (Computerised Visual Reasoning Task), therefore, provided a turning point in terms of study design and quantitative analysis. Whilst the preceding studies provided a mixed picture, it can be concluded that the biases in reasoning associated with Schizotypy are not reaction time based but rather based on data gathering techniques. This finding was concurrent with previous studies that have suggested that individuals at risk of delusions, and therefore acquiring high Schizotypal traits, are more likely to make a hasty decision based on little information (Galbraith *et al.*, 2008; Dudley and Over, 2003).

Reaction time data has proved to be both problematic and potentially unrelated to Schizotypy and decision making. However, high and low scorers adopted differing data gathering techniques which have been consistently confirmed throughout the audio diaries, the evidence for which might provide a platform to consider future interventions for individuals impacted by jumping to conclusions biases.

#### *Change of Decision data*

The series of experiments cited in this thesis have produced mixed findings with regards to the change of decisions data, that is consistent with previous literature that has also reported mixed and contradictory findings (Dudley and Over, 2003; Mortiz and Woodward, 2005; Peters & Garety, 2005). This aspect of delusion ideation should be explored further, particularly with more ecologically valid designs which explore real to life decision making. It is likely that context may play a major role with regards to the impact of disconfirmatory information (Peters & Garety, 2005).

#### *Dual processing vs. Modality*

Study Three and Study Four produced particularly interesting findings with regards to both reasoning biases and influential factors surrounding the intensity of those biases. It was concluded from Study Four that Schizotypy and crime based reasoning was impacted by either modality, visual or orally presented information (Delhommeau, Dubal, Collet, and Jouvent, 2003), or the increase load on memory resources which naturally occur when remembering information that has been received through the auditory senses. However, the methodological design adopted for this study made it impossible to identify whether the causal factor was modality or indeed competition for working memory resources. Therefore, Study Five and Study Six provided a solution to address this problem by adopting a dual task design (Evans, 2003; 2008). This allowed for an investigation of whether an increase in memory load enhances the crime based reasoning biases identified by Study Three and Study Four. The outcome of these additional studies suggest that it is not increased load on memory and resources that enhances the biases and therefore it can be deduced that there are key differences when reasoning using verbally presented information compared to visually presented information. The results reported in Study Four demonstrated that individuals with Schizotypal tendencies required fewer 'pieces' of information before making a decision, compared to individuals who scored low for Schizotypal tendencies. There was a significant difference in both non-violent and violent crime scenarios with regards to individual's 'data gathering' scores. However, the violent crime scenario created a bigger gap between the mean 'data gathering' scores generated by the high and low scoring groups. Therefore, it could be suggested that the violent crime scenario exacerbated the 'jump to conclusions' bias that frequently occurs in individuals at risk of delusions (Huq, Garety & Hemsley, 1988). Furthermore, the results suggested that the biases in reasoning that accompany Schizotypy, have presented themselves on traditional non-specific reasoning tasks, also present themselves on crime based reasoning tasks given the right conditions.

The studies contained in this thesis have demonstrated the importance of a mixed methods approach to research, particularly in the reasoning research field. Quantitative tests capture differences in reasoning and therefore allow statistical analysis and interpretation (Howitt & Cramer, 2008) but are not able to offer insight into, or explanation of, the thought processes behind such differences. The qualitative

elements of this research have therefore not only been both novel and exciting, but have played an integral role in shaping and informing the direction of the research in this thesis. The interviews and audio diary entries have captured descriptions of reasoning biases in the words of the individuals experiencing such biases, which have provided key information about the extent, impact and implementation of biased crime based reasoning. Without the qualitative element of this research, the research would be able to say nothing of how individuals think and feel about the decisions they made. This depth of understanding has been crucial to the development of this body of work.

### **9.3 Concluding thoughts and future research**

The research contained in this thesis has contributed to the current understanding of Schizotypy with a particular focus on crime based reasoning. In addition, the nature of the experimental studies has bridged a gap between Schizotypy and criminality, resulting in a new reasoning test. The reasoning test has been devised, tested and validated across both auditory and visual modalities.

Further support has been gathered for the use of non-clinical samples, which avoids issues around co-morbidity. In addition, non-clinical samples allow for reasoning tests to be created and developed prior to exposing to clinical participants. The aim of this thesis was to produce a crime based reasoning test, and consequently, a final format has now been achieved and therefore it is arguably more appropriate to consider recruiting other population samples, and therefore, bridging the gap between clinical, forensic and cognitive psychology.

The studies cited in this thesis have provided an ideal framework and tool for further experimental work. There are a number of directions that future studies could go on to explore. When reflecting on the six studies contained in this thesis along with their findings it seems that the most natural progression would be to explore reference levels, both 2 part and 4 part, with data gathering scores as opposed to reaction times, which were collection in Study One and Study Two. This would combine aspects of the original experiments with latter developments and findings.

Whilst the studies contained in this thesis appeared to demonstrate no clear or obvious differences with regards to performance on the reasoning tasks between the sexes, Galbraith, Manktelow and Morris (2010) note that it is difficult to draw concrete conclusions from experimental data considering the relatively low number of males who typically take part in psychological research. Previous research, that recruited an even balance of the sexes, found that females typically scored highly on magical thinking and other positive Schizotypal features (Claridge & Hewitt, 1987) compared to the sample of males. Therefore, future work could focus on recruiting an evenly balanced sample of males and females to allow for comparisons to be made between the sexes. This would provide the basis to compare the scores of males and females for Schizotypal tendencies, according to the PDI, as well as considering any differences in performance on a crime based reasoning task.

In addition to the above, there is scope to expand the range of crimes considered in the crime based reasoning tasks, for example, theft, fraud and sexual assault. It is possible that the type of crime committed might impact upon the reasoning outcome and the amount of information required when make a decision. An application of this idea might come into play when considering a case of homicide or murder. The first being generic in nature whilst the second being quite specific and with motivation or intent, according to the legal definitions (Prins, 2005). In addition to the above, an exploration of the effects and impact of threatening or emotional content on individuals with Schizotypal tendencies (Kemp *et al.*, 1997; Mujica-Parodi *et al.*, 2000; Young & Bentall, 1997) could be explored. This is one element that has not been manipulated within the studies contained in this thesis. However, some research has been conducted as a starting point on a non clinical sample (Kemp *et al.*, 1997; Mujica-Parodi *et al.*, 2000; Young & Bentall, 1997).

Following on from the work achieved in this thesis, it would be beneficial to investigate other population samples, both clinical and forensic. A clinical population composed of individuals with delusional based disorders such as Schizophrenia (psychotic based) or Schizotypal Personality (personality based) would enable a direct comparison to be made between 'healthy' individuals and those experiencing clinical delusional symptoms. The experimental process would consequently be more

complex and therefore would require careful consideration and planning.

In addition to investigating a clinical sample, it would also be beneficial to test a forensic sample. This process would be less complex and could be replicated more easily. A study based on a forensic sample could investigate whether ‘criminality’ has an impact upon reasoning in terms of accuracy and amount of information required. More specifically, certain types of criminals may reason in very differing ways. All of which could add to a more complete picture with regards to reasoning biases. It would also be interesting to investigate whether there is any kind of relationship between Schizotypy scores and offending behaviour.

A more complex, yet still informative, study might consider individuals who have been diagnosed with a clinical disorder, such as Schizophrenia or Schizotypal Personality, and have also engaged in criminal activity or behaviour. This design would require a very detailed and comprehensive review in order to ensure that factors such as comorbidity have been accounted and controlled for.

The research contained in this thesis has contributed to a better understanding of the configuration and boundaries of biases and deficits associated with Schizotypy and crime based reasoning. The implications of such findings, along with further clinical research, could contribute to the underpinnings of effective treatment programmes for mentally ill offenders.

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### **F20.0 Paranoid Schizophrenia**

Paranoid Schizophrenia is dominated by relatively stable, often paranoid delusions, usually accompanied by hallucinations, particularly of the auditory variety, and perceptual disturbances. Disturbances of affect, volition and speech, and catatonic symptoms, are either absent or relatively inconspicuous.

#### **Paraphrenic Schizophrenia**

*Excludes: involuntal paranoid state ( F22.8 )  
paranoia ( F22.0 )*

### **F20.1 Hebephrenic Schizophrenia**

A form of Schizophrenia in which affective changes are prominent, delusions and hallucinations fleeting and fragmentary, behaviour irresponsible and unpredictable, and mannerisms common. The mood is shallow and inappropriate, thought is disorganized, and speech is incoherent. There is a tendency to social isolation. Usually the prognosis is poor because of the rapid development of "negative" symptoms, particularly flattening of affect and loss of volition. Hebephrenia should normally be diagnosed only in adolescents or young adults.

#### **Disorganized Schizophrenia Hebephrenia**

### **F20.2 Catatonic Schizophrenia**

Catatonic Schizophrenia is dominated by prominent psychomotor disturbances that may alternate between extremes such as hyperkinesia and stupor, or automatic obedience and negativism. Constrained attitudes and postures may be maintained for long periods. Episodes of violent excitement may be a striking feature of the condition. The catatonic phenomena may be combined with a dream-like (oneiroid) state with vivid scenic hallucinations.

Catatonic stupor  
Schizophrenic:  
· catalepsy  
· catatonia  
· flexibilitas cerea

### **F20.3 Undifferentiated Schizophrenia**

Psychotic conditions meeting the general diagnostic criteria for Schizophrenia but not conforming to any of the subtypes in F20.0-F20.2, or exhibiting the features of

more than one of them without a clear predominance of a particular set of diagnostic characteristics.

### **Atypical Schizophrenia**

*Excludes:* acute Schizophrenia-like psychotic disorder ( F23.2 )  
chronic undifferentiated Schizophrenia ( F20.5 )  
post-schizophrenic depression ( F20.4 )

### **F20.4 Post-schizophrenic depression**

A depressive episode, which may be prolonged, arising in the aftermath of a Schizophrenic illness. Some Schizophrenic symptoms, either "positive" or "negative", must still be present but they no longer dominate the clinical picture. These depressive states are associated with an increased risk of suicide. If the patient no longer has any Schizophrenic symptoms, a depressive episode should be diagnosed (F32.-). If Schizophrenic symptoms are still florid and prominent, the diagnosis should remain that of the appropriate Schizophrenic subtype (F20.0-F20.3).

### **F20.5 Residual Schizophrenia**

A chronic stage in the development of a Schizophrenic illness in which there has been a clear progression from an early stage to a later stage characterized by long-term, though not necessarily irreversible, "negative" symptoms, e.g. psychomotor slowing; underactivity; blunting of affect; passivity and lack of initiative; poverty of quantity or content of speech; poor nonverbal communication by facial expression, eye contact, voice modulation and posture; poor self-care and social performance.

Chronic undifferentiated Schizophrenia  
Restzustand (Schizophrenic)  
Schizophrenic residual state

### **F20.6 Simple Schizophrenia**

A disorder in which there is an insidious but progressive development of oddities of conduct, inability to meet the demands of society, and decline in total performance. The characteristic negative features of residual Schizophrenia (e.g. blunting of affect and loss of volition) develop without being preceded by any overt psychotic symptoms.

### **F20.8 Other Schizophrenia**

Cenesthopathic Schizophrenia

Schizophreniform:

- disorder NOS
- psychosis NOS

*Excludes:* brief schizophreniform disorders ( F23.2 )

**F20.9 Schizophrenia, unspecified**

**Introductions**

*Who am I?*

My name is Dean. I'm a full-time postgraduate student at Birmingham City University, and I'm doing some research looking at the way different people make decisions about crime.

*Why am I here?*

I am conducting this study as part of my doctoral research at Birmingham City University. I am hoping to find out about the ways in which different people think about crime.

*Who has reviewed the study?*

The study has been reviewed by Birmingham City University Ethics Committee.

*What will happen today?*

If you do decide to take part in my research, I would very much like you to contribute to a focus group discussion centred on the topics of crime, criminal behaviour and offending. I estimate the focus group session to last approximately one hour and no longer than an hour and a half.

*What will happen after we have spoken?*

I will write up the discussion from the focus group session and in some cases your answers will be used to inform a series of studies that will form a thesis that will be read by my supervisor and examiners. After I have finished my research a copy of it will also be put in the university library so that others can read it. The findings may further be published in journals read by other people in my field of research.

### *Anonymity and Consent*

Information that is collected about you during the course of the research will be kept strictly anonymous. Any information about you will have your name removed so that you cannot be recognised from it.

If it is alright with you, I may use quotes from some of the answers you give me but your name will not be used and it will not be identifiable as you.

### *Do you have to take part?*

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are free to withdraw at any time and without giving a reason.

Contact for further information.

If you have any questions or require any further information, please write to me at the following address:

Dean Wilkinson

School of Social Sciences

Birmingham City University

Perry Barr

Birmingham

B42 2SU

Thank-you for taking the time to read this Participant Information Form and for considering taking part in the study. This Participant Information Form is for you to keep.

If you do wish to take part in the study, please sign the consent form. You will be given a copy of the signed consent form to keep.

Thank you for your time.

## Appendix A3

Research Identification Number:

Name of Researcher:

### CONSENT FORM – Focus group

Project: An investigation of how individuals think about crime.	(tick as appropriate)
I confirm that this study has been satisfactorily explained to me. I have had the opportunity to think about the information, ask questions, and these questions have been adequately answered.	<input type="checkbox"/>
I understand that I do not have to take part and that I am free to withdraw at any time, without giving a reason.	<input type="checkbox"/>
I know that I can refuse to answer any or all of the questions and that I can stop the session at any point.	<input type="checkbox"/>
I agree that my results may be used in reports (your name will still be kept secret).	<input type="checkbox"/>
I understand that everything I say will be confidential.	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>
I agree to the focus group being audio-recorded and for direct quotes to be used if need be. (your name will still be kept secret).	<input type="checkbox"/>

IF YOU ARE ABLE TO GIVE WRITTEN CONSENT PLEASE COMPLETE THIS SECTION:

Name:.....

Signature: ..... Date:.....

Name of researcher:.....

Signature: ..... Date:.....



## Focus Group Moderator's Guide

**Aim:** To create an environment whereby recruited participants can generate a list of words that represent and label different crimes. The generated 'words' will be specific and relevant to not only the individuals within the group but also the target population that they represent. Participants therefore will be required to talk about crime, different types of crimes and the level of seriousness attached to different types of crimes. At the end of the focus group there will be a generated list of words that are representative of the language that would be used by the target sample to describe different acts of criminality.

**Sample:** The sample population will consist of volunteer university students from the social sciences undergraduate programmes at Birmingham City University and the University of Gloucester. Each focus group will consist of 10 participants, as suggested by Morgan (1998), in order to sustain manageability and control.

**Equipment:** pens, paper (lists/brainstorms), A4 card pack (voting seriousness), board (to write seriousness likert-scale on & to park thoughts), sticky-labels (name badges), timer (to time each section), my contact details, help contact details (for individuals who may become stressed or distressed) and spare written consent forms.

## Conducting the Focus Group

### I. BACKGROUND / INTRODUCTIONS

*Moderator will:*

- Introduce yourself and thank participants for agreeing to come.

*1 ● Thank you for volunteering your time and coming this morning/afternoon. I am {NAME} – and I am {a research student based in the Centre for criminal justice policy and research}. I'll be moderating our discussion today. It is important that you understand and know that you can withdraw from this research at any stage without penalty. It is also important that you have signed the written consent for before we continue any further. If you have not signed the written consent form can you indicate that now?*

- Explain group guidelines and tell how long the focus group will last.

- *I (we) estimate this discussion group to last no longer than one hour and a half. During this time I (we) will be asking you to contribute in a number of ways to our research topic that primarily focuses on crime.*

- *I am here just to facilitate the session today and therefore you should feel free to express your thoughts and feelings on this chosen topic without any expectations from me. I (We) am interested in hearing your thoughts and points of view even if it is different from that which others express in the group. However, if at any point you feel distressed by anything we have/are discussing, you are free to leave at any time and without penalty. If applicable I will provide information of agencies who will be able to help, although I am unable to offer personal comment and advice.*

- *I'm going to make every effort to keep the discussion focused and within our time frame. If too much time is being spent on one question or topic, I may park the conversation so that we can move on and cover all of the stages and also to ensure that all participants have a chance to give their input. If we have sufficient time, we will revisit parked thoughts in the order they were parked. If thoughts/conversations are parked I will write them in a list format on the board.*

- Address confidentiality

- *We will be audio-recording the discussion because we don't want to miss any comments. But, we will only be using first names today and there will be no names attached to the comments on the final report. Therefore, you are assured of complete confidentiality. As the discussion will be recorded it is best if one person speaks at a time.*

**Participant introduction:**

- *On that note, please introduce yourselves to one another – first names are fine. (Write names on Labels)*

## II. DISCUSSION TOPICS

### Explain Process:

There will be three stages/activities in which I will be asking you to participate in today. One of these activities will require you to work alone for a short period of time. This is to give you a chance to reflect. The further two activities will require the whole group to participate in a discussion.

- **Activity I**

*Our topic of discussion today is focused on criminal activity. I (we) am going to ask you to first of all take a few moments to list or brain storm as many different types of criminal activities or crimes that you can think of by yourselves. It is important that you make the list easy to read, as I (we) will be collecting them in at the end of this session. There are no limits to what kinds of crimes can or should be included in your lists or brainstorm. Please do not worry about spellings as you will not be marked, judged or penalised for incorrect spellings.*

- **Activity II**

*Now that you have completed your individual list's I would like you to discuss with the rest of the group the types of crimes that you have included. It is quite possible that some people will have included some crimes that other people have left out – feel free to add these to you list's if you wish but please use a different colour pen and make note of the fact that a different colour pen has been used to represent those crimes that you had not thought about. If you have fewer crimes on you list or brainstorm than other members of the group then please note that this does not reflect badly on you and will not be interpreted as a personal reflection of your knowledge. So lets go around the room and begin to share our thoughts and reflections.*

**Moderator note:** *it might be useful to write down each crime mentioned on a piece of card in order to make use when participants get to the rating stage III.*

- **Activity III**

*In a moment I am going to ask you as a group to make a collective decision about the seriousness of each of the crimes that have been listed / mentioned during the first two stages of this focus group. I would like you to rate each crime along the scale 'not at all serious' 'less serious' 'serious' & 'very serious'. You might want to think about:*

- *How do you define each category rating?*
- *What makes each crime relative to each category rating?*

Put 4 sheets of flip-chart paper with each of the headings on in four locations around the room. Show each crime on the cards and take a vote – put majority vote on one of the flip – chart sheets.

### **III. CLOSING**

- Offer an opportunity for any short final comments participants would like to make.
- *Thank you very much for your input today. We are just about out of time. Are there any last comments that anyone would like to make? The information you provided will inform further research projects but it is important to note that your identity will remain confidential at all times.*
- *If you should wish to contact me in relation to this research or would be interested in taking part in further aspects of my research then please take a copy of my contact details.*

# Participant Information

## Introductions

### Who am I?

My name is Dean. I'm a full-time postgraduate student at Birmingham City University, and I'm doing some research looking at the way different people make decisions about crime.

### Why am I here?

I am conducting this study as part of my doctoral research at Birmingham City University. I am hoping to find out about the ways in which different people think about crime.

### Who has reviewed the study?

The study has been reviewed by Birmingham City University Ethics Committee.

### What will happen today?

If you do decide to take part, I would very much like you to complete a personality test and a simple reasoning test.

Following the reasoning test I might ask you some short questions about the way in which you completed the test.

If you find any of the questions disagreeable, in any way, then please do not feel that you have to answer them. You will be free to stop at any point or take a break.

I am interested in what you have to say and hope that you will enjoy taking part in this research.

### What will happen after we have spoken?

I will write up the results of the tests and in some cases use the answers to questions as part of a thesis that will be read by my supervisor and examiners. After I have finished my research a copy of it will also be put in the university library so that others can read it. The findings may further be published in journals read by other people in my field of research.

### Anonymity and Consent

Information that is collected about you during the course of the research will be kept strictly anonymous. Any information about you will have your name removed so that you cannot be recognised from it.

If it is alright with you, I may use quotes from some of the answers you give me but your name will not be used and it will not be identifiable as you.

Do you have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are free to withdraw at any time and without giving a reason.

Contact for further information.

If you have any questions or require any further information, please write to me at the following address:

Dean Wilkinson

School of Social Sciences

Birmingham City University

Perry Barr

Birmingham

B42 2SU

Thank-you for taking the time to read this Participant Information Form and for considering taking part in the study. This Participant Information Form is for you to keep.

If you do wish to take part in the study, please sign the consent form. You will be given a copy of the signed consent form to keep.

Thank you for your time.

# CONSENT FORM

Research Identification Number:

Name of Researcher:

Student Identification Number:

Project: An investigation of how individuals reason about crime.	(tick as appropriate)
I confirm that this study has been satisfactorily explained to me. I have had the opportunity to think about the information, ask questions, and these questions have been adequately answered.	<input type="checkbox"/>
I understand that I do not have to take part and that I am free to withdraw at any time, without giving a reason.	<input type="checkbox"/>
I know that I can refuse to answer any or all of the questions and that I can stop the session at any point.	<input type="checkbox"/>
I agree that my results may be used in reports (your name will still be kept secret).	<input type="checkbox"/>
I understand that everything I say will be confidential.	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>

I agree to the interview being audio-recorded and for direct quotes to be used if need be. (your name will still be kept secret).

IF YOU ARE ABLE TO GIVE WRITTEN CONSENT PLEASE COMPLETE THIS SECTION:

Name:.....

Signature: ..... Date:.....

Name of researcher:.....

Signature: ..... Date:.....

## Appendix A8 Background information sheet

Researcher Identification Number .....

Date of Birth .../.../...

Are you: Male  Female  (Please tick)

From which of the following ethnic/racial groups do you feel that you or your family originate?

White	
Black or Black British - Caribbean	
Black or Black British - African	
Other Black background	
Asian or Asian British - Indian	
Asian or Asian British - Pakistani	
Asian or Asian British - Bangladeshi	
Chinese	
Other Asian background	
Mixed - White and Black Caribbean	
Mixed - White and Black African	
Mixed - White and Asian	
Other Mixed background	
Other Ethnic background	
Do not wish to provide information	

What is your Nationality?

Do you have a religious preference?

Have you been convicted of a criminal offence or received a caution?

(Please tick) **Yes**  **No**

Are there currently outstanding charges against you?

(Please tick) **Yes**  **No**

## Appendix A9

# Girlfriend tells of fatal knife attack on bus

The girlfriend of a man stabbed to death after looking at a fellow passenger who was throwing chips on the top deck of a London bus told an Old Bailey jury yesterday of the 33-second fight that robbed her "calm and private" partner of his life.

Kerry Barker, 38, a legal secretary from Muswell Hill, north London, said she and Richard Whelan, 27, had been sitting on the top deck of the No 43 bus after a night when they noticed a man at the back of the bus laughing and throwing chips.

He had already caused one young woman to leave the bus, after throwing three chips at her, and a "tipsy" Ms Barker predicted: "He's going to throw them at me next." He then did.

When Mr Whelan turned to look at Anthony Joseph, 22, an unemployed man who had been freed from remand that afternoon, Mr Joseph stood up and came towards him.

"Richard stood up and I turned around and they were fighting. It took me by surprise," recalled Ms Barker. "I remember the man physically being on top of Richard and when I went over I saw Richard was looking quite weak and hitting him back. The man was covering Richard and as such Richard was trying to fight back.

"I remember trying to pull the man off Richard. I was ringing the bell. I was screaming: 'Leave him alone.'"

Towards the end of the fight, she saw that Mr Joseph "had a knife in his right hand". "The man then just got up and started walking off the bus. Richard then told me he had been stabbed ... My first reaction was we had to get some help and I helped to get him to the bottom of the bus." Mr Whelan, her boyfriend of two years, was pronounced dead in hospital an hour and 17 minutes after the attack. CCTV footage revealed that the fracas, from the 6ft-tall defendant moving from the back of the bus to the stabbing, took just 33 seconds.

The court heard that Mr Whelan, a hospitality agent, from Kentish Town, north London, received six or seven stab wounds, including a wound to the heart, which proved fatal. CCTV stills show him sitting down and trying to fend off Mr Joseph as the attacker held a knife. The stills also showed Mr Joseph biting Mr Whelan's fingers as he tried to fend him off. The attack, at 10pm on Friday July 29, 2005, came less than eight hours after Mr Joseph, from Islington, north London, was released from Forest Bank prison, Manchester, where he had been on remand for five weeks accused of an offence against a family. The case was dropped and it was "an angry man who returned ... that day", said Jonathan Turner QC, prosecuting.

When back at Euston station, just after 6.30pm, Mr Joseph made three calls to the father. Mr Turner said CCTV footage and forensic evidence meant there was no dispute Mr Joseph was the killer, nor was it self-defence. Mr Joseph denies murder. The defence seek to argue that he was suffering from such an "abnormality of mind" that he was guilty of manslaughter on the grounds of diminished responsibility.

The crown dispute this, said Mr Turner, since Mr Joseph, who carried a knife down the front of his trousers even when relaxing at home, made no mention of his mental illness until two days after his arrest when a doctor, who examined him, said he was "feigning mental illness".

Mr Turner said: "He knew what he was doing and while what he was doing was cruel, brutal and fatal it was nevertheless deliberate and rational."

The hearing continues.

# Experiment One:

# Experiment script

## Materials

*-Room/classroom*

*-Mac Book with super Lab*

*-Consent forms*

*-Information forms*

*-PDI test printed and copied*

*-Pens*

*-Number system for participants/stickers?*

*- support and help line cards*

## 1. Introduction

Thank you for agreeing to take part in this research. In order to take part in this experiment you will be required to complete three separate tasks. Each of the tasks will be explained fully prior to you completing them. You will also be given the opportunity to ask any questions relating to the individual tasks before proceeding to carry out what is required of you. I would like to remind you that you have right to withdraw from the study at any point and your identity will remain anomalous.

In order to keep your identity anomalous I will assign you with a participant number. This number will correspond with each of the tasks that you complete today. So please ensure that your participant number is clearly written at the top of each piece of paper and entered as your 'participant name' when completing the computer based part of this research.

## **2. Participant Information form**

In order to ensure that you have been fully informed about the procedures and background to research it is necessary for you to have read and understood the 'participant information' form. *(Hand out copy/copies of form)*

## **3. Consent form**

After reading the participant information form and deciding that you definitely want to take part in this research it is necessary for you to complete, sign and date a consent form. The consent form states that you are willing to take part in the research and that you fully understand your rights within the experiment environment. Further more, you are giving permission for your results to be used in the write up of the research. *(Hand out copy/copies of consent form)*

## **4. PDI**

- **Ensure that the correct participant number is placed at the top of the PDI questionnaire**

The first task that I am going to ask you to complete is a simple personality questionnaire. It is important that you understand that different people will score differently on this test depending on their personality traits and therefore there are no wrong or right answers. One score is not better than another it is simply different. I encourage you to answer as honestly as you can by focusing on your own experiences.

The test requires an initial 'yes' or 'no' response to each question. However, in the cases where your initial response is a 'yes' you will be required to give a further rating based on a 1-5 scale. The scores will relate to 'distress', 'how often you think about It', 'and whether you believe it is true'.

Are there any questions so far? *(Hand out copy/copies of PDI)*

## **5. The Reasoning Task**

- **Ensure that the correct participant number is entered into the participant name column**

The reasoning task will be completed on an Apple Mac. You will be required to respond to a statement by pressing the corresponding keys on the computers keyboard. You will be given a set of instructions on screen that will guide you through the process of completing this task.

Are there any questions at this stage?

## **6. Interview**

The final stage of the study is in the form of a short interview. I am going to ask you a few questions that relate firstly, to the tasks that you have completed today and secondly, to the general area of research. For ease I will be recording the interview and therefore I need you to confirm that you have given me permission to audio record the session? (*Check consent form*).

# **Interview**

- Reasoning behind choices
- Emotions
- Experiences
- Stress (E. Ron de Kloet *et al.*, 1999)
- Thought processes

The interview sessions are to provide a follow up to the experiment data and serve to investigate the qualitative reasoning and rationale behind the responses that were given to questions within the experiment stage. The interviews will provide an arena to explore the 'justifications' (Kohlberg) and reasons behind the given response.

The interview will focus on individual's feelings and emotional responses to crimes and criminal activity. The interviews therefore, are less concerned with a True/False or Wrong/Right response and more concerned with the processes that lead an individual to making a certain decision. It is thought therefore that emotions, experiences, individual's opinions, reasons, and thought processes influence the way that one derives at an answer.

# Interview Questions...

- Ensure that the correct participant number is recorded onto the interview tape

*The final stage of this research study is an interview. The interview space is designed to provide space for you to reflect on the reasoning task that you completed previously and therefore to be able to voice opinions and thoughts more freely with regards to the topic in question. Therefore the interview should only be short and will consist of only a few questions. However, please feel free to give thoughts and opinions outside of the area that the questions focuses on if you wish to do so.*

-PRESS record

*'This is interview number (enter number) with participant (enter number). For the benefit of the tape recorder can you reiterate that you have agreed to this interview being recorded? Thank you'*

*(1) How were you feeling whilst completing the reasoning task?*

- *What were you thinking about/focusing on during the task?*
- *Was there anything that you wanted to say whilst completing it?*

*(2) What are your thoughts about crime and criminal behaviour in general?*

*Have a read of this short article*

*(3) What kind of feelings and thoughts does this article provoke?*

*(3.a) How might you understand those feelings? /why might you have reacted in that way?*

# Debrief

## Help line & contact support cards

*Once again, thank you for taking part in this research study. As you are aware this experiment was looking at how individuals with different character traits reason about crime, criminality & criminal activity. Your results will therefore contribute to the over all finding of this research. A summary of the results will be available to you and if some reason you do find these results distressing then there are a number of help lines that you can contact.*

### [Birmingham and Solihull Mental Health Trust](#)

Tel: 0121 678 2000 (Switchboard)

Information about the NHS Trust and mental health issues

### [Rethink](#)

Phone: 0845 456 0455

Email: [info@rethink.org](mailto:info@rethink.org)

### [The Samaritans](#)

Telephone: 08457 90 90 90 24 hours, 7 days a week

Email: [jo@samaritans.org](mailto:jo@samaritans.org)

# A11 **Experiment script:** **(study two / three)**

## **Materials**

*-Room/classroom*

*-computer lab with Eprime*

*-Consent forms*

*-Information forms*

*-PDI test printed and copied*

*-Pens*

*-Number system for participants/stickers?*

*- support and help line cards*

## **7. Introduction**

Thank you for agreeing to take part in this research. In order to take part in this experiment you will be required to complete three separate tasks. Each of the tasks will be explained fully prior to you completing them. You will also be given the opportunity to ask any questions relating to the individual tasks before proceeding to carry out what is required of you. I would like to remind you that you have right to withdraw from the study at any point and your identity will remain anonymous.

In order to keep your identity anonymous I will assign you with a participant number. This number will correspond with each of the tasks that you complete today. So please ensure that

your participant number is clearly written at the top of each piece of paper and entered as your 'participant name' when completing the computer based part of this research.

## **8. Participant Information form**

In order to ensure that you have been fully informed about the procedures and background to research it is necessary for you to have read and understood the 'participant information' form. *(Hand out copy/copies of form)*

## **9. Consent form**

After reading the participant information form and deciding that you definitely want to take part in this research it is necessary for you to complete, sign and date a consent form. The consent form states that you are willing to take part in the research and that you fully understand your rights within the experiment environment. Further more, you are giving permission for your results to be used in the write up of the research. *(Hand out copy/copies of consent form)*

## **10. PDI**

- **Ensure that the correct participant number is placed at the top of the PDI questionnaire**

The first task that I am going to ask you to complete is a simple personality questionnaire. It is important that you understand that different people will score differently on this test depending on their personality traits and therefore there are no wrong or right answers. One score is not better than another it is simply different. I encourage you to answer as honestly as you can by focusing on your own experiences.

The test requires an initial 'yes' or 'no' response to each question. However, in the cases where your initial response is a 'yes' you will be required to give a further rating based on a 1-5 scale. The scores will relate to 'distress', 'how often you think about It', 'and whether you believe it is true'.

Are there any questions so far? *(Hand out copy/copies of PDI)*

## **11. The Reasoning Task**

- **Ensure that the correct participant number is entered into the participant name column**

The reasoning task will be completed on a personal computer in the psychology computer lab. You will be required to respond to a statement by pressing the corresponding keys on the computers keyboard. You will be given a set of instructions on screen that will guide you through the process of completing this task.

Are there any questions at this stage?

## **12. Audio Diary**

The final stage of the study will be in the form of a short audio diary. You will be required to reflect upon the task that you have just done by answering a few questions that will be written up on the walls.

*Aims:*

- Reasoning behind choices
- Emotions
- Experiences
- Stress (E. Ron de Kloet *et al.*, 1999)
- Thought processes

The qualitative feedback provides a follow up to the experiment data and serves to investigate the qualitative reasoning and rationale behind the responses that were given to questions within the experiment stage. The audio diaries will provide an arena to explore the 'justifications' (Kohlberg) and reasons behind the given response.

The audio diaries will focus on individual's feelings and emotional responses to crimes and criminal activity. The audio diaries therefore, are less concerned with a True/False or Wrong/Right response and more concerned with the processes that lead an individual to

making a certain decision. It is thought therefore that emotions, experiences, individual's opinions, reasons, and thought processes influence the way that one derives at an answer.

# Debrief

## Help line & contact support cards

*Once again, thank you for taking part in this research study. As you are aware this experiment was looking at how individuals with different character traits reason about crime, criminality & criminal activity. Your results will therefore contribute to the over all finding of this research. A summary of the results will be available to you and if some reason you do find these results distressing then there are a number of help lines that you can contact.*

### [Birmingham and Solihull Mental Health Trust](#)

Tel: 0121 678 2000 (Switchboard)

Information about the NHS Trust and mental health issues

### [Rethink](#)

Phone: 0845 456 0455

Email: [info@rethink.org](mailto:info@rethink.org)

### [The Samaritans](#)

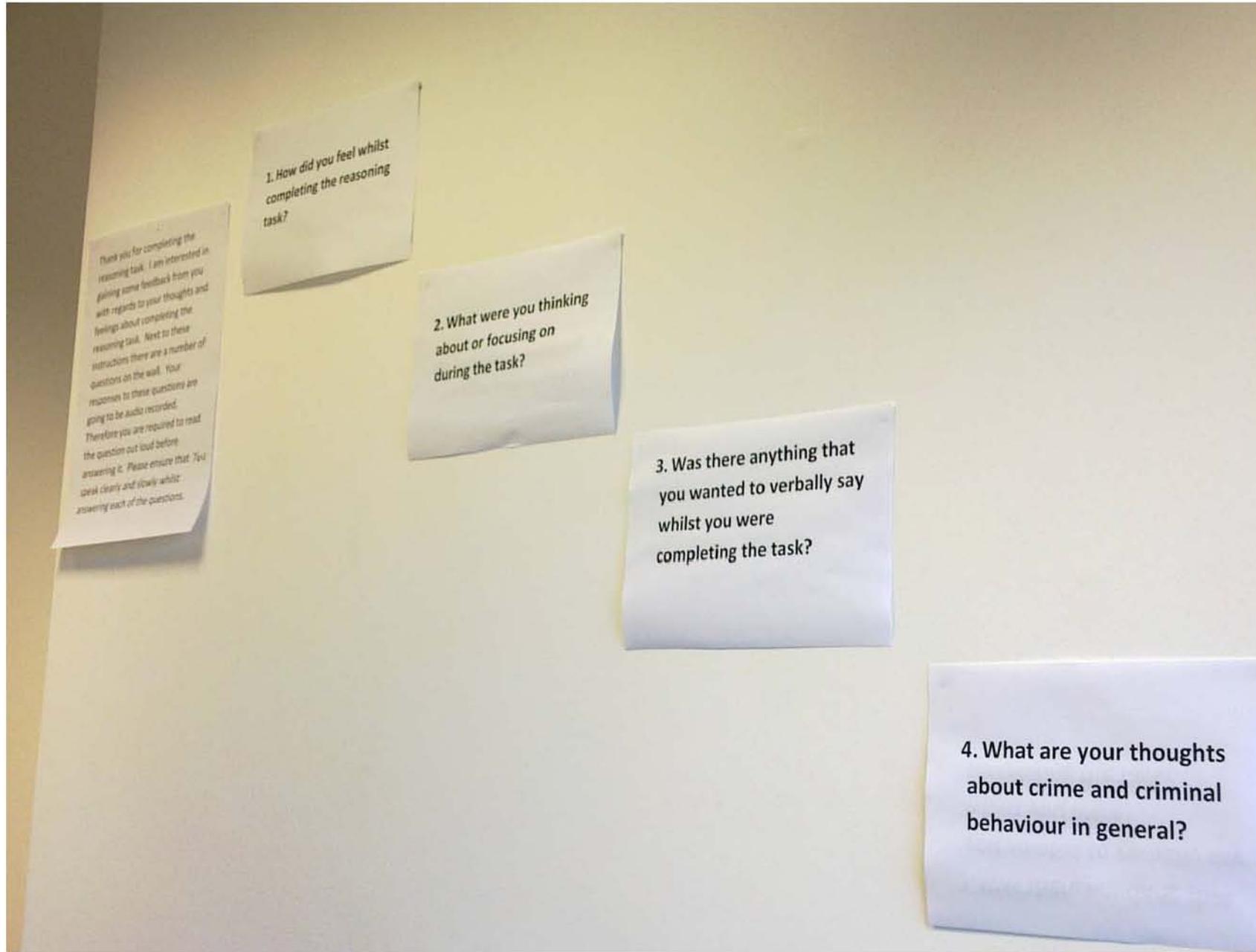
Telephone: 08457 90 90 90 24 hours, 7 days a week

Email: [jo@samaritans.org](mailto:jo@samaritans.org)

Thank you for completing the reasoning task. I am interested in gaining some feedback from you with regards to your thoughts and feelings about completing the reasoning task. Next to these instructions there are a number of questions on the wall. Your responses to these questions are going to be audio recorded. Therefore you are required to read the question out loud before answering it. Please ensure that you speak clearly and slowly whilst answering each of the questions.

**1. How did you feel whilst completing the reasoning task?**

**2. WI  
abo  
duri**



# Research Study!

**Would you like to take part in a research study about how your personality may influence the way you think about crime?**

Please contact Dean:  
dean.wilkinson@bcu.ac.uk  
0121 331 6368  
Sign up sheet D3.15

A15

## Violent Scenario

Jared was walking home from work late one night when he heard a scream from the road ahead. He ran down the road to find a lady lying on the floor calling for help. She told Jared that she had been attacked by a gang. As there were lots of people surrounding the lady by this point, Jared ran further down the road in the direction that the lady had said the gang had gone. Jared caught up with a group of lads who were running down the road. He shouted at them and managed to capture one of them by the hood. Losing his temper he threw the guy to the floor and punched him.

Did Jared do the right thing?

The young man that Jared attacked ended up in hospital

The lad that Jared had assaulted had nothing to do with the attack on the lady

The lady had been causing trouble in the neighbourhood

One of the gang members was an ex-boyfriend of the lady

The police were monitoring the gang and all confrontations should have been reported to the police

Jared had previously confronted neighbours about noise levels and they had threatened to hurt his fiancé

The attack towards the lady had left her with a broken arm, sprained wrist and black eye

The lady Jared had found in the street was his fiancé

That was the final statement, did Jared do the right thing?

A16

### Non Violent Scenario

Cheryl was in serious trouble and so planned to leave town. She was in a hurry and in need of money. She went to a retired old man, who was known to help people in town, and asked the old man to lend her one thousand pounds. She promised to pay the old man back later. Although the old man didn't know Cheryl very well, he lent her the money. So Cheryl left town with a thousand pounds.

Did Cheryl do the right thing?

Cheryl was secretly leaving town

Cheryl told the old man that she was very sick

Cheryl told the old man that she needed a very expensive operation

Cheryl wasn't really sick and had no intention of paying the money back to the old man

Cheryl had taken the old man's last thousand pounds

Shortly after Cheryl had taken the money from the old man a lady who really had an illness asked the old man for money

The ill lady didn't receive treatment as a result of Cheryl taking the old man's last thousand pounds

Cheryl was being blackmailed by a local gang

That was the final statement, did Cheryl do the right thing?

A17 Easy dot matrix memory task

