Autism spectrum disorder among adults: The recognition of suspicious activity

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Table of Contents

Abstract

While it has been suggested that individuals with autism spectrum disorder (ASD) may be vulnerable to naïve criminal involvement due to particular features associated with the disorder, no empirical research has been conducted to assess such a possibility. Two features associated with ASD have been suggested as impairing their ability to detect individuals behaving suspiciously: theory of mind (ToM) deficits and restricted interests (RIs). If these features impair the ability to detect suspicious activity, individuals with ASD may have heightened vulnerability to a number of negative outcomes, one of which may be unwitting criminal involvement. It is proposed that ToM deficits may hinder one's ability to recognise suspicious behaviour, and the presence of an intense RI may further impair this ability.

To explore whether ToM deficits and RIs influence the ability to detect suspicious behaviour a two phase study was conducted with 182 individuals participating in the first phase, and 101 individuals with a full scale intelligence quotient (IQ) above 85 participating in the second phase. All participants had a diagnosis of ASD and were aged between 16 and 78 years. In Phase 1, participants completed tasks assessing ToM, RIs, and IQ. Between phases, 16 audio scenarios were created for each participant. Half of the scenarios were tailored to include references to each participant's unique RI, and half made no mention of their RI. Eight scenarios were designed to make listeners increasingly suspicious and culminated in criminal activity. The remaining scenarios served as controls and were similar, but not designed to arouse suspicion, and did not culminate in criminal behaviour. Participants were asked to press response buttons 'May be suspicious', 'Definitely suspicious', 'No longer suspicious'

and/or ‘Nothing was suspicious’ while listening to scenarios. Latency of each button press was recorded as a measure of ability to detect suspicious behaviour.

There was some evidence to support the first hypothesis regarding ToM and response latency. While correlations between ToM and latency were in the hypothesised direction, few results were statistically significant. When examining the first button pressed by each participant (whether ‘May be suspicious’ or ‘Definitely suspicious’) correlations between ToM and latency were stronger. Further, when examining ToM scores of individuals who pressed ‘Definitely suspicious’ as their first button, those who pressed the response button after the scenario ended had lower ToM scores in all scenarios than individuals who pressed the response button during the scenario. While these differences were not statistically significant, the sample sizes were relatively small and effect sizes ranged from small to large.

There was limited evidence to support the second hypothesis regarding RIs moderating any relationship between ToM and response latency. There were no differences in response latency between scenarios with and without references to each participant’s RI. Further, participants reported less difficulty attending to scenarios involving their RI. While there were a number of limitations to the current study, and limited statistical significance, this study is the first to provide empirical evidence that there may be some kind of relationship between ToM and the ability to detect suspicious behaviour.

Declaration

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

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Rebecca L. Flower

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Chapter 1: Introduction

Overview

Autism Spectrum Disorder (ASD) is a pervasive neurodevelopmental disorder characterised by impairments in two key areas: a) social interaction and communication, and b) the presence of restricted and stereotyped patterns of behaviour, interests, and activities (American Psychiatric Association [APA], 2013). Current estimates suggest that approximately one in 68 individuals worldwide have a diagnosis of ASD (Centers for Disease Control and Prevention, 2014), with approximately 115,400 individuals in Australia living with the disorder (Australian Bureau of Statistics, 2012). As a spectrum disorder, the presentation of individuals with ASD varies considerably, both in the content and severity of deficits presented (Wing, 1988). Debate regarding the role ASD plays in criminal behaviour has taken place over the past few decades, and continues within both the academic literature and media (e.g., Allen et al., 2007; Murrie, Warren, Kristiansson, & Dietz, 2002). While anecdotal reports suggest that the majority of individuals with ASD are law abiding (and may even be overly concerned with compliance to the law due to their rigidity; Howlin, 2004; Wing, 1997), a subset of individuals with the disorder do come into contact with the criminal justice system (Murrie et al., 2002; Wing, 1997). There is, however, a limited understanding of whether the disorder is in any way a contributing factor in offending behaviour (Gomez de la Cuesta, 2010): specifically, whether particular features of the disorder might heighten the vulnerability of this population to unwitting criminal involvement is unknown. The following paragraphs will provide a brief overview of the issues to be discussed in more detail throughout this thesis.

Individuals with ASD may commit crimes with malicious intent, as do individuals in the non-ASD population. This thesis, however, is not concerned with these intentional acts. Rather, this study seeks to investigate whether there are particular features found among those with the disorder that may impair the ability of individuals with ASD to recognise suspicious[1] behaviour. If indeed some persons with ASD, by nature of their disability, have difficulty recognising suspicious behaviour, these individuals may have a heightened vulnerability to a number of negative outcomes, one of which may be unwitting involvement in criminal activity.

The question is; what skills do we require to recognise suspicious behaviour, and is it plausible to suggest that some individuals with ASD may lack these skills? Several cases have been described of individuals with ASD where difficulties relating to an inability to attribute mental states to others seemed to relate to their naive involvement with the criminal justice system (e.g., Barry-Walsh & Mullen, 2004; Freckelton, 2011; Murrie et al., 2002). This deficit is referred to as impaired theory of mind (ToM), and is proposed to be a core deficit among individuals with ASD (e.g., Baron-Cohen, Leslie, & Frith, 1985; Frith, Morton, & Leslie, 1991). ToM is described as the ability to attribute mental states to others (Premack & Woodruff, 1978): that is, the ability to recognise that other people have knowledge, feelings and beliefs different from one's own, which influence their behaviour (Baron-Cohen et al., 1985). ToM deficits are thought to underlie the poor social and communicative skills associated with the disorder (i.e., diagnostic Criterion A for ASD [APA, 2013]; Baron-Cohen et al., 1985;

[1] According to the Oxford Advanced Learner's Dictionary (Deuter, Bradbery, & Turnbull, 2015), 'Suspicious' is defined as "feeling that somebody has done something wrong, illegal or dishonest, without having any proof", "making you feel that something is wrong, illegal or dishonest" or "not willing or able to trust somebody/something".

Frith et al., 1991), and are associated with difficulties interpreting social cues such as facial expressions (Murrie et al., 2002; Sucksmith, Allison, Baron-Cohen, Chakrabarti, & Hoekstra, 2013), non-literal language (e.g., sarcasm, lying; Happé, 1994a), and interpreting mental states such as intentions (Baron-Cohen, Leslie, & Frith, 1986; Phillips, Baron-Cohen, & Rutter, 1998). These difficulties also include those that might influence vulnerability to naïve involvement with the criminal justice system, such as trouble recognising the impact of one's own behaviour on oneself and others (e.g., due to difficulty recognising the emotions and mental states of others; examples of such cases can be found in Barry-Walsh & Mullen, 2004; Chen et al., 2003; Howlin, 2004; Katz & Zemishlany, 2006), social naiveté (e.g., where an individual might have a limited knowledge of appropriate social behaviour, and/or have difficulty interpreting the behaviour of others; examples of such cases can be found in Brewer & Young, 2015; Murrie et al., 2002), and vulnerability to manipulation (e.g., due to a desire for friends but limited knowledge of appropriate friendship behaviour, and/or a limited ability to interpret the intentions of other people; examples of such cases can be found in Brewer & Young, 2015; Murrie et al., 2002).

One case illustrating difficulty interpreting the intentions of other people was described by Howlin (2004). Howlin (2004) described the case of a man with ASD who worked at a jewellery store, who one night was asked by a newly employed security guard for the keys to the safe. He handed the guard the keys, the safe was subsequently burgled, and the individual was arrested as an accomplice to the crime. While the individual was later released, as a result of this incident he lost his job. The behaviour of this individual is consistent with what would be expected by an individual with impaired ToM, as it seems that he

failed to suspect that the new guard might have had an ulterior motive when he requested the keys (Howlin, 2004).

While deficits relating to ToM alone may be enough to influence the ability to recognise suspicious behaviour among persons with ASD, the presence of a circumscribed and restricted interest (RI) in addition to poor ToM may exacerbate vulnerability among this population (Howlin, 2004). A number of case studies of individuals with ASD who have committed criminal activity have identified that in addition to the individual presenting with the social and communicative difficulties associated with poor ToM, the crime was committed while in the pursuit of an obsessive or circumscribed interest (e.g., Barry-Walsh & Mullen, 2004; Brewer & Young, 2015; Chesterman & Rutter, 2003; Freckelton, 2011; Haskins & Silva, 2006; Kawakami et al., 2012). RIs, which are a type of the restricted, repetitive behaviours experienced by individuals with the disorder (i.e., diagnostic Criterion B for ASD), are interests which are considered unusual in their intensity or focus (APA, 2013), and are sometimes referred to as 'obsessions' (Baron-Cohen & Wheelwright, 1999). RIs are more intense than interests held by typically developing individuals (Anthony et al., 2013), and play a significant role in individuals' lives, consuming much of their time (Mercier, Mottron, & Belleville, 2000).

One example seemingly illustrating difficulties relating to both ToM and RIs included the description of a young man with ASD who was preoccupied with sex. The individual provided gifts and cash for women, allowed a number of people to use his home to conduct criminal activity, and was persuaded by others to engage in public sexual acts for their entertainment, as he believed that his actions would lead to having sexual relations with these people (despite never

discussing this with them; Murrie et al., 2002). This individual seemingly failed to realise that he was being exploited by others, and was instead focused on achieving his RI, sex (Murrie et al., 2002). In this case it is possible that both the social naiveté and obsessionality described by Murrie et al. (2002) contributed to the individual's apparent failure to recognise that he was being exploited.

If deficits in ToM affect an individual's ability to anticipate the consequences of their behaviour, recognise socially appropriate behaviour, or reflect on the intentions of others, it is plausible that such deficits might contribute to an individual becoming involved in inappropriate behaviour without intent. In order to be found guilty of criminal behaviour, an individual must have demonstrated intent to commit the crime in question, otherwise known as *mens rea.* Therefore, impaired ToM may be important to consider when determining an individual's culpability for a crime: that is whether there was a deliberate and intentional act of knowingly unlawful behaviour (Haskins & Silva, 2006). Further, I argue that if an individual is focussed on their RI, they may be less likely to evaluate social cues in the environment and/or the implications of their behaviour, but rather focus on the RI. Thus the ability to recognise suspicious or inappropriate behaviour may be further compromised by a combination of these features. While there is limited information about attentional biases among individuals with ASD in regards to the distraction from their RI (Luke, 2011), it has been suggested that individuals with obsessive compulsive disorder (OCD) have difficulty attending to important stimuli due to difficulty inhibiting unimportant stimuli such as their obsessive thoughts (e.g., Clayton, Richards, & Edwards, 1999; Mancini & Barcaccia, 2014). Therefore given the intensity of RIs (APA, 2013), it is plausible that persons with ASD may also have difficulties due

to the attention given to their obsessive interest at the expense of more important information.

In examining the behaviour of a number of individuals with ASD who have come into contact with the criminal justice system unwittingly, several researchers and professionals have suggested that due to deficits in ToM and the presence of RIs, persons with ASD may have difficulty recognising suspicious or malicious behaviour (e.g., Birmingham City Council, 2012; Brewer & Young, 2015; Howlin, 2004; Murrie et al., 2002). As a result, it has been suggested that individuals with ASD may be vulnerable to naïve criminal involvement, particularly with regard to being led unknowingly into criminal behaviour by other individuals. However, to date these claims have not been systematically investigated, and to my knowledge no experimental studies have been conducted in this area. The focus of this thesis was to investigate whether ToM deficits and the pursuit of RIs influence the ability of individuals with ASD to recognise suspicious behaviour in the criminal context. If one has difficulty recognising that the behaviour of others is suspicious or questionable, it might heighten vulnerability to a number of negative outcomes, one of which may be unwitting involvement in criminal activity. To my knowledge this study is the first to use experimental methods to assess whether ToM deficits and RIs play a role in the ability of adults with ASD to recognise suspicious activity.

The remainder of Chapter 1 will include an examination of evidence suggesting an association between ASD and criminal behaviour, followed by studies that have investigated the prevalence of ASD in offending populations, and the prevalence of offending among the ASD population. A discussion of ToM deficits and RIs will then be presented, specifically regarding how these

features might influence the ability to recognise suspicious behaviour. Given that limited research has been conducted with adults with a diagnosis of ASD, issues with regard to the measurement of ToM and RIs among this population will be discussed, and an overview of the measures used in the current study will be presented. Chapter 1 will conclude with a discussion of intelligence as a potential confounding factor, followed by the aims and hypotheses.

Autism Spectrum Disorder and the Criminal Justice System

The following section examines the evidence base regarding the involvement of individuals with ASD in the criminal justice system, to determine whether the claim that ASD is a risk factor for criminal behaviour can be substantiated with the evidence available to date.

Origin of the suggested link between autism spectrum disorder and offending. In Kanner's (1943) original description of autism there was some suggestion that individuals with ASD have a propensity toward violent behaviour. Asperger's disorder in particular has been associated with antisocial behaviour, and was originally termed autistischen psychopathen (autistic psychopath) when it was first identified by Hans Asperger in 1944. However, the relationship between ASD and criminal behaviour became the focus of much interest following the publication of case studies investigating individuals who allegedly had the disorder and had engaged in criminal behaviour (e.g., Baron-Cohen, 1988; Mawson, Grounds, & Tantam, 1985).

The first published suggestion of an association between ASD and offending behaviour was described in a case study of an individual diagnosed with Asperger's disorder who had a history of violent behaviour toward others (Mawson et al., 1985). As a result of this individual's behaviour, the authors

suggested that all individuals with the disorder may be prone to criminal behaviour (Mawson et al., 1985), a suggestion which has since been cited several times in support of this association. A second frequently cited case study described a young adult male diagnosed with Asperger's disorder who, among other violent incidents, physically abused his 71 year old girlfriend on a regular basis (Baron-Cohen, 1988). Here too the author suggested that the cognitive deficits associated with Asperger's disorder were likely a contributing factor in the young man's crime, and concurred that there may be a relationship between the disorder and criminal behaviour (Baron-Cohen, 1988). Although each study described the actions of only one individual, both of whom were diagnosed following their violent episodes by the authors of the studies, the suggestions of each of the authors greatly influenced future research regarding the involvement of individuals with ASD in criminal behaviour (Gomez de la Cuesta, 2010).

More recent publications have also proposed an association between ASD and offending. These examples include likening the characteristics of a convicted serial killer posthumously to those present in Asperger's disorder (i.e., Silva, Ferrari, & Leong, 2002), suggesting there are individuals with Asperger's disorder who may be prone to committing serial murder (i.e., Fitzgerald, 2010), and even going so far as to propose that serial killers be assessed for ASD (i.e., Allely, Minnis, Thompson, Wilson, & Gillberg, 2014). Media coverage suggesting that individuals who have committed crime have ASD has further served to highlight claims of an association between the disorder and criminal behaviour by implying a causal relationship between the two, despite a lack of empirical evidence to support such a claim (Allen et al., 2007; Lerner, Haque, Northrup, Lawer, & Bursztajn, 2012). In such media stories, the diagnosis of

ASD is sometimes alluded to, even though there may be limited evidence of a diagnosis. Further, co-morbid psychiatric conditions are rarely considered. A number of co-morbid conditions commonly experienced by individuals with ASD have been associated with an increased risk of engaging in criminal behaviour (e.g., attention deficit hyperactivity disorder; Lundström et al., 2014). Further, in many of the cases where individuals with ASD have been reported to have committed crime, these individuals have had a co-morbid psychiatric condition (Newman & Ghaziuddin, 2008). Hence these conditions may account for the behaviour rather than symptoms relating to ASD.

One example of such a media story includes the case of the murder of Stephanie Scott in rural New South Wales, with media outlets describing the suspect as ‘reclusive’, ‘odd’, ‘obsessive’ and similar to *Rain Man* (e.g., Colman, 2015; Olding, 2015). In other cases a diagnosis of ASD has been presented as fact even though it may be in question or speculative (Allen et al., 2007; Gunasekaran & Chaplin, 2012). While in some cases the individual may have been diagnosed with ASD, the sensationalised presentation of these rare crimes creates an inaccurate perception of the disorder (Browning & Caulfield, 2011), and suggests that the crime was caused by ASD (Gunasekaran & Chaplin, 2012).

Examples of such media headlines include “Autistic youth guilty of murdering Rosie May, 10” (Booth, 2004), “Boy with Asperger’s jailed for child rape” (2007), “Cold-hearted loner diagnosed as autistic” (Spencer & Harnden, 2007), “US campus killer ‘upset about Asperger’s’” (2012), and “Double Colchester killer in 'perfect storm' of paranoia and autism” (2016).

Prevalence of criminal behaviour in the population of individuals with autism spectrum disorder. In response to claims such as those outlined above that link ASD to an increased risk of engaging in criminal behaviour, a number of studies have attempted to determine the prevalence of offending among this population, by examining data obtained from both forensic (e.g., Kumagami & Matsuura, 2009; Scragg & Shah, 1994) and community settings (e.g., Allen et al., 2008; Woodbury-Smith, Clare, Holland, & Kearns, 2006). These studies have been conducted in order to ascertain whether individuals with ASD are more likely to commit crime than individuals in the typical population. The following paragraphs describe some of the studies that have attempted to assess the prevalence of individuals with ASD who offend, and have compared this to rates of offending in the typical population.

Autism spectrum disorder in offending populations. Studies investigating the prevalence of ASD among offending populations have typically been conducted in, or have analysed data from, highly specialised settings. These settings have included psychiatric hospitals (e.g., Hare, Gould, Mills, & Wing, 1999; Myers, 2004; Scragg & Shah, 1994), jails (e.g., Myers, 2004), and records from the forensic or judicial system (e.g., Kumagami & Matsuura, 2009; Siponmaa, Kristiansson, Jonson, Nyden, & Gillberg, 2001; Søndenaa et al., 2014). The first study to investigate prevalence of ASD among offending populations was conducted in a psychiatric hospital and reported that the involvement of offenders with ASD was 1.5% (95% CI [0.6, 3.3]); a rate considered disproportionate when compared with the estimated prevalence of ASD at the time (0.5%; Scragg & Shah, 1994). Although only six individuals were identified as having Asperger's disorder, four of whom had co-morbid

psychiatric conditions, it was suggested that ASD and violent behaviour might be connected (Scragg & Shah, 1994).

Estimates of ASD in offending populations from subsequent studies have varied considerably, ranging from 1.4% (Søndenaa et al., 2014) to 15% (Siponmaa et al., 2001). The validity of these findings in determining a relationship between ASD and criminal behaviour is questionable for a number of reasons. Firstly, the method of determining an ASD diagnosis varied greatly between studies. In some of the studies the individuals had received a diagnosis prior to participation (yet limited information regarding the validity of the diagnosis was provided; e.g., Kumagami & Matsuura, 2009; Søndenaa et al., 2014), while other authors diagnosed the participants during the study using only the information available, such as patient records and questionnaires completed by staff members (e.g., Hare et al., 1999; Siponmaa et al., 2001). These non-standard methods of diagnosing ASD raise questions regarding the validity of the diagnosis among participants. Secondly, the number of individuals in each study reported as having ASD was often small; ranging from $n = 6$ (Scragg & Shah, 1994) to $n = 48$ (Søndenaa et al., 2014). Therefore, there are issues in using the results from these small samples to make claims regarding the prevalence of criminal activity among the entire population of individuals with ASD. Thirdly, given the selective nature of each of the settings where the aforementioned studies were conducted (e.g., psychiatric hospitals, jails), the samples may not be representative of the population of individuals with ASD. Further, in some cases the diagnosis and role of co-morbid psychiatric disorders, which may have increased the risk of engaging in criminal behaviour (Newman & Ghaziuddin, 2008), were not taken into consideration (e.g., Scragg & Shah, 1994). Finally,

studies investigating ASD among offending populations have failed to consider that if individuals with ASD are overrepresented in the criminal justice system, it may be because individuals with the disorder may be more likely to be caught than individuals without ASD (Wing, 1997), they may quickly confess on being apprehended (Freckelton, 2011; Murrie et al., 2002), or it may be due to issues occurring during their interaction with the criminal justice system (e.g., they may unknowingly behave in a manner which serves to further incriminate themselves [Brewer & Young, 2015], or may confess to crimes for which they have not been accused [Helverschou et al., 2015]).

Offending among individuals with autism spectrum disorder. Another group of studies has been conducted that has assessed the frequency of offending among individuals with ASD and compared this to frequency of offending in the typical population (e.g., Allen et al., 2008; Cheely et al., 2012; Hippler, Viding, Klicpera, & Happé, 2010; Långström et al., 2009; Lundström et al., 2014; Mouridsen, Rich, Isager, & Nedergaard, 2008; Woodbury-Smith et al., 2006). The frequency of criminal behaviour reported for each group (i.e., Non-ASD and ASD groups) varies considerably between studies, with as many as 48% of participants with ASD reportedly having committed criminal behaviour (Woodbury-Smith et al., 2006). While each of the studies investigating offending among individuals with ASD found that those with the disorder were no more likely to engage in criminal behaviour than individuals without ASD, these studies had a number of methodological issues that render the results difficult to interpret. Firstly, comparison samples in some of the studies were unlikely to be representative of the general population. For example, although Woodbury-Smith et al. (2006) reported that participants with ASD were more likely than those

without ASD to engage in violent behaviour or cause criminal damage; while the ASD sample was recruited from a variety of locations, the sample without ASD comprised of 20 employees from a single company. These individuals were unlikely to be representative of the general population given they may have had a similar educational background and socioeconomic status, and the average IQ of this group was over one standard deviation above the population average. Secondly, the source of data regarding offending has varied considerably from study to study, from self-report (e.g., Woodbury-Smith et al., 2006) or informant report (e.g., Allen et al., 2008) to more comprehensive sources such as crime registers (e.g., Cheely et al., 2012; Hippler et al., 2010; Långström et al., 2009; Lundström et al., 2014; Mouridsen et al., 2008). Third, in studies involving self-reported behaviour, individuals without ASD are prone to social desirability bias, a phenomenon where individuals are more likely to respond in a manner that presents them in a favourable light (Nederhof, 1985). Individuals with ASD, however, are less likely to display this bias (Izuma, Matsumoto, Camerer, & Adolphs, 2011). Therefore, self-report offending data may be underrepresented among individuals without ASD, and self-report data may not provide an accurate representation of offending rates for comparison of these two groups. A further issue with studies comparing rates of offending between individuals with and without ASD is the operationalisation of criminal behaviour. While some of the studies included clear criteria for defining ‘crime’ (e.g., conviction data for any violent crime; Lundström et al., 2014), other studies have allowed for a broader interpretation of criminal behaviour (e.g., self-reported data of any behaviour which could lead to arrest, including behaviour such as ‘Taking non-prescription drugs’, or ‘Making an obscene phone call to a stranger’; Woodbury-Smith et al.,

2006). This broader definition of criminal behaviour may account for the high rates of crime reported in this study by participants with ASD (48%).

One of the largest and most comprehensive studies conducted investigating offending among the ASD population found that there was no increased risk of individuals with ASD engaging in violent crime (Lundström et al., 2014). This study was of a longitudinal nature, analysed data from a number of different national registers and included all individuals born in the greater Stockholm region over a ten year period, all of whom had received a diagnosis of ASD by a recognised professional (Lundström et al., 2014). The authors matched each individual with ASD to 10 typically developing individuals, taking into consideration factors such as year of birth, sex, and residential area to account for differences in socioeconomic status. Conviction data from the national crime register were compared across the ASD and matched controls for violent crime, which was defined as homicide, assault, robbery, arson, sexual offenses, illegal threats and intimidation. The authors found that there was no increased risk of individuals with ASD committing violent criminal behaviour (Lundström et al., 2014). Although there is a possibility that undiagnosed individuals were not captured in this study (King & Murphy, 2014), this is the most thorough study to date regarding the purported link between ASD and criminal behaviour.

Studies reporting that the proportion of individuals with ASD who offend is higher than expected given the prevalence of ASD (e.g., Kumagami & Matsuura, 2009; Scragg & Shah, 1994, Siponmaa et al., 2001) imply that individuals with the disorder are at an increased risk of offending compared to individuals without the disorder. However, to date there is no convincing

evidence to suggest that individuals with ASD are more likely to engage in criminal behaviour than their typically developing counterparts.

Features Associated with Autism Spectrum Disorder That May Influence the Ability to Detect Suspicious Behaviour

There is currently no evidence to suggest that individuals with ASD are more likely to commit criminal behaviour than typically developing individuals. However, a small number of individuals on the spectrum do come into contact with the criminal justice system (Browning & Caulfield, 2011; Gomez de la Cuesta, 2010). From the limited evidence available, which stems largely from case studies, it appears that in some cases when individuals with ASD have engaged in criminal activity they have done so naively. That is, without an understanding of where the situation might lead (e.g., Brewer & Young, 2015; Freckelton & List, 2009; Haskins & Silva, 2006; Murrie et al., 2002). The authors of several of these case studies have suggested that particular characteristics of the disorder seem relevant and may be linked to the offences committed. While a number of different factors associated with ASD may underpin the ability to recognise suspicious behaviour (e.g., co-morbid disorders), the focus on the present study was two features that have consistently been suggested as contributing to naive involvement in criminal behaviour: ToM deficits and RIs.

Theory of mind. ToM is described as the ability to attribute mental states to oneself and to others (Premack & Woodruff, 1978). Given that mental states are not objectively observable, ToM allows an individual to make a number of inferences about the mental states and behaviour of others based on verbal and non-verbal cues (Premack & Woodruff, 1978). The ToM hypothesis of autism suggests that individuals with the disorder are impaired in this ability, and this

impaired ToM is thought to explain the social and communicative difficulties experienced by those with the disorder (Baron-Cohen et al., 1985; Frith et al., 1991). While persons with ASD are thought to experience ToM deficits, the extent of these deficits is thought to vary markedly between individuals regardless of verbal and cognitive ability (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Happé, 1994a; Ozonoff, Rogers, & Pennington, 1991; Wing, 1988). An individual with impaired ToM may experience difficulties in the following areas, although the extent of such difficulties is likely to differ between individuals: interpreting interpersonal non-verbal social cues such as facial expressions and body language (Murrie et al., 2002; Sucksmith et al., 2013), tone of voice (Gomez de la Cuesta, 2010), non-literal language including jokes, lies, white lies, and sarcasm (Happé, 1994a), and interpreting mental states, including intention (Baron-Cohen et al., 1985). Individuals with poorly developed ToM may have difficulty recognising the impact of their behaviour on others (Frith et al., 1991), differentiating socially appropriate behaviour from that which is inappropriate (e.g., Van Roekel, Scholte, & Didden, 2010), and anticipating or predicting the behaviour of other people (Baron-Cohen et al., 1985). For example, during an interaction, an individual with poor ToM might experience difficulty knowing when to take turns in conversation, noticing when the other person would like to end the conversation, knowing if the other person is enjoying the interaction, or correctly interpreting emotional cues. The following paragraphs will illustrate how difficulties associated with poor ToM may impair one's ability to recognise suspicious behaviour.

Theory of mind and the recognition of suspicious behaviour.

Social naiveté. Given that poor ToM is thought to impair the ability to accurately interpret social cues (Baron-Cohen et al., 1985; Frith et al., 1991), ToM deficits may impair one's ability to detect when another individual is behaving in a manner inappropriate for a friend. Contrary to a widely held myth suggesting that individuals with ASD have a limited desire for friendship and prefer to be alone, many individuals with ASD do wish to make friends, but lack the requisite knowledge of how to form relationships appropriately (Bancroft, Batten, Lambert, & Madders, 2012; Murrie et al., 2002). While individuals without ASD may learn appropriate friendship behaviour through processes such as social learning (learning via the observation of others; Bandura, 1971), individuals with ASD struggle to understand appropriate social behaviour and how to develop and maintain relationships (APA, 2013). Due to social and communicative deficits, individuals with ASD may struggle to understand the concept of friendship and particular social rules (Cage, Bird, & Pellicano, 2016; Carrington, Templeton, & Papinczak, 2003), and many adults with ASD report difficulty making friends (Bancroft et al., 2012). ToM is thought to influence one's social understanding, with research finding that among typically developing children, those with poor ToM may be less likely to develop friendships (Fink, Begeer, Peterson, Slaughter, & de Rosnay, 2015). Further, Van Roekel et al. (2010) found that among children with ASD, those with more impaired ToM failed to accurately recognise bullying behaviour (instead mistaking it for non-bullying behaviour).

This social naiveté can mean that persons with ASD have difficulty determining whether individuals are likely to be genuine friends and, in turn, are

vulnerable to being mistreated (e.g., Howlin, 2004; Wirral Autistic Society, 2015) and/or manipulated into particular behaviour by others (e.g., Chesterman & Rutter, 2003). Indeed, the Wirral Autistic Society (2015) reported that individuals with ASD may fail to recognise that their 'friendship' is in reality an abusive relationship. Social naiveté as a result of impaired ToM has been suggested as being implicated in offending behaviour by a number of authors of case studies (e.g., Brewer & Young, 2015; Haskins & Silva, 2006), More recently, Helverschou et al. (2015) found that for 58% of cases (n = 28) of individuals identified as having ASD who had experienced a forensic examination after the commission of a crime over a 10 year period in Norway, social naiveté was deemed by the researchers as a contributing factor in the crime, with individuals manipulated by others or taken part in a minor crime that had been organised by others. Thus, it is possible that the social naiveté associated with poor ToM may render an individual less likely to recognise suspicious behaviour.

Interpreting intentions and predicting behaviour. ToM influences our ability to predict how other people may behave. Typically developing children as young as 13 months old are thought to be able to predict behaviour on the basis of social interaction using their developing ToM ability (Choi & Luo, 2013). Individuals with ToM deficits, however, may have difficulty predicting behaviour of others due to difficulties interpreting mental states such as intentions (Phillips et al., 1998). These intentions include deception. Indeed, both children and adults with ASD may have difficulty understanding and detecting deception (e.g., Mathersul, McDonald, & Rushby, 2013; Sodian & Frith, 1991). Individuals without ASD are considered poorly able to detect lies/deception, and it is something with which even skilled experts may have difficulty (e.g., judges,

investigators; Ekman & O'Sullivan, 1991). However, there are a number of cues that typically developing individuals may be able to detect that may be influenced by impaired ToM. For example, individuals who are lying tend to be less forthcoming with information (DePaulo et al., 2003). An individual with impaired ToM, however, may not consider the possibility that the individual has ulterior intentions, and thus may not think to probe an individual with questions about their behaviour. While lying, individuals may also appear uncertain (e.g., having difficulty explaining something, seeming insecure; DePaulo et al., 2003). Again, an individual with impaired ToM may not consider that this uncertainty may be due to deceptive intention, and given individuals with impaired ToM may have difficulties interpreting facial expressions (e.g., Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997), may not recognise the other person's uncertainty.

As a result of difficulties detecting intentions such as deception, individuals with ASD may be at risk of exploitation by others, which may include being led into criminal acts without their awareness (e.g., Debbaudt, 2002; Mouridsen et al., 2008; Wirral Autistic Society, 2015). Individuals with ASD may also be more compliant than those without the disorder, which may indicate a desire to avoid conflict (North, Russell, & Gudjonsson, 2008), and might suggest that they would be compliant to the requests of friends. A survey conducted by the Wirral Autistic Society (2015) found that up to 74% of individuals with ASD surveyed aged over 25 reported being manipulated or coerced into doing the wrong thing by individuals considered friends, and 54% of 12-16 year olds reported having items stolen by such individuals. If an individual has difficulty determining whether behaviour is socially appropriate, has

difficulty recognising the intentions of others, and has difficulty recognising deception and predicting behaviour, it is plausible that they may have difficulty recognising suspicious behaviour leading to criminal activity.

A number of cases have been reported where individuals with ASD have assisted another person/s in the commission of a criminal act seemingly unaware of their wrongdoing, in a manner consistent with how an individual with impaired ToM may behave. It seems that these individuals were unable to predict where the behaviour of others might lead, and in some cases did not suspect that they were being deceived. Consider the case described by Brewer and Young (2015) of an individual who was charged with illegal possession and storage of fire arms. Frederick, aged 18, had a desire to make friends and attended a party with his sister and her boyfriend. Frederick agreed to store the bag of someone he had met at a party, only to later discover once he was home that the bag contained weapons. An individual with an intact ToM may have addressed the situation differently, and recognised that the situation was suspicious. For example, firstly, one might have questioned why an individual who they had only just met would ask such a favour, rather than ask someone with whom they were more familiar. Secondly, one might wonder (and perhaps ask) why the individual required the bag to be stored, rather than keep the bag themselves. Lastly, one might enquire as to the contents of the bag before making a decision regarding such a favour. It is likely that an individual with intact ToM would have considered such questions, considered that perhaps the contents of the bag were not legal, and as such, may not have agreed to take the bag (particularly without any form of reimbursement or trade). However, Frederick agreed to take the bag, and when

interviewed by police, stated that at the time he had not considered the possibility that the bag would contain anything illegal (Brewer & Young, 2015).

Other similar cases have been described where individuals with ASD have become involved in criminal activity seemingly without recognition of wrongdoing at the time of offence. For example, a respondent in the Wirral Autism survey (2015) reported that his brother had become friends with his neighbours. These “friends” stored illicit substances at his brothers home to prevent themselves getting into trouble. Similarly, Howlin (2004) described a young man who had been an unwitting accomplice in a series of thefts, and who had been made to drive a vehicle filled with stolen goods following a robbery (while the other involved individuals fled the scene). Another case includes that of Jesse Snodgrass, a high school student with ASD who befriended a new student, who, unbeknown to him was an undercover police officer (Rubin Erdely, 2014). Jesse’s new “friend” persistently asked him to acquire marijuana, sending Jesse more than 60 text messages. In an apparent attempt to keep his new friend, Jesse sought and acquired a small amount of marijuana with the $20 he had been given by this friend. While Jesse had no prior criminal record, he was subsequently charged with distributing drugs and expelled from his school (Rubin Erdely, 2014). Given Jesse had no prior history of drug use or distribution, without the pressure he experienced from his new “friend”; it seems unlikely that Jesse would have otherwise committed the offence.

While a number of possible interpretations could be drawn from the abovementioned case studies, one plausible explanation is that ToM deficits may hinder the ability of persons with ASD to recognise suspicious behaviour, problems with which may heighten vulnerability to exploitation.

Restricted interests. Alongside social and communicative difficulties, individuals with ASD engage in restricted, repetitive, behaviours (APA, 2013). One of the restricted, repetitive, behaviours commonly associated with the disorder and one that forms a part of diagnostic Criterion B for ASD is the presence of a restricted and circumscribed interest or set of interests (APA, 2013). Topics of interest range from those considered common among individuals without ASD such as video games, music, and sports statistics, to those more unique, including erotic phone conversations, deep-fat fryers, or post cards (Klin, Danovitch, Merz, & Volkmar, 2007; Mercier et al., 2000). In some cases the content or number of RIs may seem socially acceptable, however the interest is considered unusual due to the specificity, intensity or manner with which it is pursued (e.g., Anthony et al., 2013; Mercier et al., 2000). These interests can play an important role in individual's lives, and their conversations with others may often focus on lengthy descriptions of their RI, without recognition that the conversational partner is uninterested (Baron-Cohen & Wheelwright, 1999; Mercier et al., 2000). Individuals with ASD have reported RIs as a source of happiness, and something which assists in emotion regulation (Mercier et al., 2000; Winter-Messiers, 2007). However, this rigid and concentrated pursuit of the interest may lead to the individual becoming isolated, having few opportunities to meet others, and lead to disagreements with family members (Mercier et al., 2000).

By definition, RIs are so intense that they have been likened to an addiction requiring some level of control (e.g., Mercier et al., 2000) or eliciting a feeling akin to being in love (McIlwee Myers, 2006). The interest is often of such importance to individuals with ASD that they may spend many hours per day in

pursuit of or engaging in the interest, and as a result, limiting their social interaction (e.g., Brewer & Young, 2015). This interest can be so consuming that the pursuit may even be at the detriment of one's own needs such as eating (Taylor, 1990). Family members may find the intensity of the interest difficult to accept (Mercier et al., 2000), and parents of children with RIs report great difficulty removing the individual from their RI, behaviour that may result in confrontation (Mahoney, 2009; Winter-Messiers, 2007). For example, Brewer and Young (2015) describe one individual who reported that he would sit at his computer in pursuit of his interest for 6-7 hours per day. This individual reported becoming so focussed on the pursuit of his RI that he would forget everything else, and as a result of the intense pursuit had become socially isolated. Similarly, Mercier et al. (2000) describe an individual who reported that he found it difficult to stop pursuing his RI, to the point where he came to be in debt as a result of his continued pursuit.

Due to such intensity, it has been argued that RIs combined with poor ToM may heighten the vulnerability of individuals with ASD to naive involvement in criminal behaviour (e.g., Brewer & Young, 2015; National Autistic Society, 2005). While ToM deficits alone are likely to influence an individuals' understanding of socially appropriate behaviour and the intentions of others, having a RI might exacerbate these difficulties. While reports of single cases suggest that RIs may influence the decision making processes of individuals with ASD (e.g., Mercier et al., 2000), there is limited empirical evidence regarding whether individuals with ASD have a biased attentional processes due to their RI (Luke, 2011). There have been reports, however, that individuals with ASD may be easily distracted (e.g., Keehn, Nair, Lincoln, Townsend, & Müller,

2016). Further, research among individuals with OCD has found difficulties inhibiting obsessive thoughts (e.g., Clayton et al., 1999; Mancini & Barcaccia, 2014). Therefore, it is plausible that combined with impaired ToM, RIs may render an individual less likely to recognise suspicious behaviour.

Theory of mind, restricted interests, and the recognition of suspicious behaviour. Some individuals with ASD appear to have come into contact with the criminal justice system naively, by failing to recognise suspicious or illegal behaviour. In each case this failure seemed to relate to the individuals' poor ToM coupled with an intense RI. Examples of such cases are presented below.

Case 1. Murrie et al. (2002) cited the case of an individual referred to as CD who had a preoccupation with sex, who and moved out of the family home to increase his chances of having sex. CD also collected artificial vaginas. CD was unaware how to appropriately find a sexual partner, and believed that simply being around women would eventually result in sex taking place. To increase his chances of having sex, CD tried a number of different strategies, many of which resulted in his being exploited (Murrie et al., 2002). For example, in the hopes of receiving sex as repayment for his generosity, CD allowed women to use his residence to conduct illegal activity. For the same reason, CD also took a number of women shopping for lingerie, only to find that they would leave after the transaction had taken place. CD engaged in a relationship with a 15 year old male over a period of days, which lasted as long as CD was willing to provide gifts and money. On cessation of these gifts, the minor left, and took with him items from CDs home. On reporting this to police, CD was charged with sexual assault against a minor (Murrie et al., 2002), which occurred as a direct result of reporting the theft to police.

Case 2. Ashley was a young man with ASD with an intense interest in phone applications. He was persuaded by a "friend" to use his own debit card to purchase goods while the "telephone lines were down" (and hence communication to the banks was interrupted, allowing him to overdraw his account; Brewer & Young, 2015). Ashley had difficulty making friends, and agreed to go with this individual to use his own card to spend more money than was available in his account. To Ashley, this activity provided an opportunity to both impress his friend and, importantly, purchase more applications for his mobile phone. Ashley demonstrated both social naiveté and an inability to understand the intentions of his friend, as he failed to recognise that this individual had purposefully damaged the phone lines, and likely used Ashley's card so he would be the one who was implicated. Ashley failed to recognise the severity of the crime (believing he would eventually pay for the items himself when the lines were again working), and the risk that his friend would use his card for further illegal purchases (which he did; Brewer & Young, 2015).

Case 3. Ricci was a middle aged man who had an interest in surfing the internet, working on his family tree and collecting child pornography (Brewer & Young, 2015). Ricci had great difficulty making friends, so when individuals started sending him files containing photos he was excited that he was being included by others. Ricci was not interested in the content of the files (which contained child pornography), which was evident in the fact that most of the files were unopened when they were seized by police. He did, however, enjoy collecting the photos and being sent the photos by his new "friends". Ricci failed to realise that the content of the photos were illegal. Indeed, he failed to appreciate that the photos were real people, simply thinking of them as two

dimensional objects. As a result of both his interest in collecting files, and limited social understanding, Ricci failed to recognise the intent of the individuals sending him the photos, and failed to recognise that he was committing criminal activity. Ultimately Ricci was charged for both possession and accessing child pornography (Brewer & Young, 2015).

The above examples describe individuals who were naive perpetrators of crime, who seem to have committed crime without premeditation and were exploited by other people. These individuals exhibited signs of social naiveté, failed to recognise the intentions of others, and were focussed on their RI while failing to recognise suspicious behaviour.

While ToM deficits and RIs have been suggested as heightening the vulnerability of individuals with ASD to naive criminal involvement, as discussed, the available evidence largely stems from examinations of individual cases. While both ToM deficits and RIs have been suggested as underpinning the behaviour of individuals in these cases, neither ToM nor RIs were formally assessed in these studies. To my knowledge, there has been no empirical investigation into how these features might influence vulnerability among adults with ASD. The focus of the current study was to investigate one of the abilities that may influence the vulnerability to naïve criminal involvement: the ability to recognise suspicious behaviour. Therefore, the focus of this thesis was to assess whether impaired ToM or RIs influence the ability of individuals with ASD to detect suspicious behaviour.

The Current Study

Central to this project is the notion that features associated with ASD (namely, impaired ToM and RI intensity) may influence the ability to recognise

suspicious behaviour. To date, much remains to be understood regarding the presentation of ASD among adults, likely due to the paucity of research among this population (see Howlin & Taylor, 2015). As a result, relatively little is understood about the persistence of ToM deficits and RIs into adulthood and the presentation of these features among adults with ASD. The next paragraphs will discuss issues with the assessment of these variables among adults with ASD, and how ToM and RIs were assessed in the current study.

Measurement of theory of mind. While ToM deficits are suggested as underlying the social and communicative difficulties associated with ASD (Baron-Cohen et al., 1985; Frith et al., 1991), and several tools exist for the measurement of ToM, there is no standard operationalisation of the construct (Brewer, Young, & Barnett, 2016). Different tools have been designed to assess different abilities thought to be associated with ToM (e.g., the ability to interpret meaning from non-literal language [the Strange Stories task, Happé, 1994a]; or the ability to interpret how an individual is feeling from their eyes [The Reading the Mind in the Eyes task, Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001]). However, there has been debate over whether some of these tools are indeed assessments of ToM abilities (e.g., Johnston, Miles, & McKinlay, 2008). Further, while the severity of ToM deficits is thought to vary between individuals with ASD (Baron-Cohen et al., 1997; Happé, 1994a; Wing, 1988), the extent to which these deficits vary between adults with the disorder is unknown (Brewer et al., 2016). Possibly as a result of the different types of tools used among adult samples, the results regarding ToM deficits among adults with ASD compared to those without ASD have been mixed. While there is some evidence that, at the group level, adults with ASD perform worse than individuals without ASD on

ToM tasks (e.g., Brewer et al., 2016), in many cases at least a few individuals perform as well as those without ASD (Roeyers & Demurie, 2010), and in some cases no differences in ToM performance have been found between individuals with and without the disorder at group level (e.g., Begeer, Malle, Nieuwland, & Keysar, 2010). Therefore, despite much research suggesting that ToM is a core deficit of ASD, the pervasiveness and extent of this deficit among adults with ASD is unknown. Further, little is understood about any overlap in ToM deficits between individuals with and without ASD. Given the limited data available among adults with ASD regarding ToM ability, with some evidence to suggest that some individuals with ASD perform as well as non-ASD controls, it is entirely possible that significant ToM deficits only exist for *some* individuals with the disorder.

The first available tools for assessing ToM were designed for children, and are now referred to as 'first order' ToM tasks (e.g., the Sally-Anne task; Baron-Cohen et al., 1985). It became clear, however, that these types of tasks were commonly passed by older individuals with ASD, and those who had no intellectual disability (Happé, 1994a). As a result, a number of tools have since been designed for the assessment of ToM among older individuals with a higher intellectual ability (e.g., Happé, 1994a; Baron-Cohen et al., 2001). These tools treat ToM as a continuum, and individuals usually receive a score which is thought to be indicative of their ToM ability. There are some issues with the tools currently available for the assessment of ToM, which will be detailed in the following paragraphs.

Issues with theory of mind measures. Different types of tools have been developed for the assessment of ToM, including written vignettes, animated

computer tasks, and video tasks. The Strange Stories (developed by Happé, 1994a, and modified by Fletcher et al., 1995 and Kaland et al., 2002) was created to represent a realistic challenge for individuals with ASD. It comprises short written vignettes about social situations in which individuals say things they did not literally mean (e.g., white lie, double bluff), as one might experience in daily life. This task was designed to be appropriate for children, teens and adults. The Strange Stories requires participants to provide a written response as to why a character behaves in a certain way, which involves making a judgement about the intentions behind the character's behaviour. Responses are given a score between zero and two based on the demonstrated level of understanding, with higher scores indicative of better ToM. No time limit has, however, been employed for responses to the Strange Stories.

Animated computer tasks have also been developed for the assessment of ToM among adults. One widely used example is the Frith-Happé animations (Abell, Happé, & Frith, 2000). The Frith-Happé animations consist of a series of animations of two triangles which, in some cases, can be perceived as 'interacting' (Abell et al., 2000). This task does not rely on verbal intellectual ability as the Strange Stories does, and has a quick and objective scoring system making the task easy to administer (e.g., White, Coniston, Rogers, & Frith, 2011). However, the task has limited ecological validity given the dissimilar nature of interactions between animated triangles to interactions between humans (Roeyers & Demurie, 2010).

A number of tasks have been developed to more closely mirror social situations in everyday life. These include tasks that involve watching videos of social situations and making an interpretation regarding the mental state or

behaviour of protagonists (e.g., the Reading the Mind in Films Test [Golan, Baron-Cohen, Hill, & Golan, 2006], the Awkward Moments Test [Heavey, Phillips, Baron-Cohen, & Rutter, 2000], the Awareness of Social Inference Test [McDonald, Flanagan, & Rollins, 2002], the Empathy Accuracy task [Roeyers, Buysse, Ponnet, & Pichal, 2001]), and tasks involving interaction with another individual where inference of their mental state is required (e.g., Begeer et al., 2010). These tools have however, been criticised, as while response time may be recorded (e.g., Begeer et al., 2010; Heavey et al., 2000), the tools do not require responses to be provided within a particular time limit. Moreover, a participant may be able to use extra time to come to a solution using a strategy that does not require ToM (i.e., to *hack out* a solution; Frith, Happé, & Siddons, 1994). As delayed responses are not penalised, these tools may not capture the difficulty experienced by individuals who took longer to come to a solution. Therefore, scores on tools that are not timed may not be reflective of how individuals would perform in a real world social setting, where there may be less time to draw inferences from behaviour (Roeyers & Demurie, 2010).

While a number of different tools have been developed to assess ToM among adults with ASD, the sample sizes recruited to assess these tools have been small, with typically less than 40 adults with ASD (e.g., n = 28, Barnes, Lombardo, Wheelwright, & Baron-Cohen, 2009; n = 15, Baron-Cohen et al., 2001; n = 32, Begeer et al., 2010; n = 21, Channon, Crawford, Orlowska, Parikh, & Thoma, 2013; n = 18 [including children], Happé, 1994a; n = 16, Heavey et al., 2000; n = 21, Kaland et al., 2002; n = 40, Mathersul et al., 2013; n = 24, Roeyers et al., 2001). As a result of the small sample sizes of previous studies, there is a paucity of data regarding the ability of these existing tools to discriminate

between individuals with and without ASD. Further, while a number of these tools have been reported as suitable for the assessment of ToM among adults with ASD, the reliability and validity of the tools currently available has not been well established.

Assessment of theory of mind in the current study. The A-ToM (Brewer et al., 2016) was developed to address some of the criticisms that had been directed at the Strange Stories task (Fletcher et al., 1995; Happé, 1994; 1999; White, Hill, Happé, & Frith, 2009); to take the existing scenarios and present them in a video format that was more realistic of a social situation, and limit the opportunity of participants to hack out a solution by including a one minute time limit for each response. Further, psychometric analyses of the tool were undertaken with a comparatively large sample of adults with ASD. The A-ToM has a standardised method for administration, and has been reported as demonstrating acceptable reliability and validity (Brewer et al., 2016). Detailed psychometric properties are described in Chapter 2. Therefore, the A-ToM was deemed the test best suited for use in the current study.

Measurement of restricted interests. While limited information is understood regarding the restricted, repetitive behaviours that form diagnostic Criterion B for ASD (APA, 2013), this is particularly the case for criterion B3, regarding restricted interests (Leekam, Prior, & Uljarevic, 2011). While RIs persist into adulthood (Howlin, Goode, Hutton, & Rutter, 2004); the interest may change and/or decrease as one gets older (Esbensen, Seltzer, Lam, & Bodfish, 2009; Leekam et al., 2011). However, limited research has been conducted that has examined the presentation of RIs among adults with ASD. Further, while the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; APA, 2013)

provides examples of different levels of severity of restricted and repetitive behaviours, these are vague, and do not specifically refer to RIs. Thus little is understood about the intensity of these interests and the impact they have on behaviour among the population of adults with ASD.

Few tools have been developed to specifically assess RIs for research purposes. Of those that have been designed to assess RIs, the majority have been designed as a parent or informant measure to assess interests among children (e.g., Cambridge University Scale of Special Interests, Baron-Cohen & Wheelwright, 1999; Interests Scale, Bodfish, 2003; Yale Survey of Special Interests, South, Klin, & Ozonoff, 1999). To date, there is no standard tool specifically for the assessment of RIs among adults with ASD.

Few studies to date have assessed RIs among adults, and of these, only three have attempted to quantitatively assess RI intensity. The first of these studies was conducted by Woodbury-Smith et al. (2010), who created a semi-structured interview to assess both the content and intensity of RIs. Intensity of interests was operationalised as amount of time spent in pursuit of the interest. The authors, however, reported that this information was difficult for participants to provide, and as a result the information was not included in their data analyses. Caldwell-Harris and Jordan (2014) examined interests among adults with (self-reported) ASD using an online version of the Cambridge University Scale of Special Interests (Baron-Cohen & Wheelwright, 1999), a measure where participants were presented with a number of categories (e.g., machines, systems), and were asked to endorse any category in which an interest had ever been held. Caldwell-Harris and Jordan (2014) adapted the scale to include a measure of intensity, where participants were asked to rate the intensity of any

reported interest on a scale ranging from 1 (*Casual interest*) to 3 (*Intense interest*). While this information may have been useful for comparison of the intensity of interests reported by individuals with and without ASD, limited information about the intensity of RIs among adults with ASD was obtained. More recently, Barrett et al. (2015) adapted the Repetitive Behaviour Questionnaire-2 (Leekam et al., 2007) into the Adult Repetitive Behaviours Questionnaire-2. While four of the 20 questions enquired specifically about RIs, the responses provided limited information regarding either the content or intensity of interests (e.g., 'Do you have a fascination with specific objects?' with three response options ranging from 1 [*Never or rarely*] to 3 [*Marked or notable*]). Therefore, to date there does not appear to be a tool suitable for the quantitative assessment of RI intensity among adults.

Assessment of restricted interests in the current study. Given an appropriate tool that assessed the content of an interest and a measure of intensity that was appropriate for use among this sample could not be located, a questionnaire was created for the current study. The questionnaire was self-report (i.e., rather than parent/informant report), and participants were only asked to recall interests they either had currently, or had experienced within the last 12 months. In order to address difficulties described by Woodbury-Smith et al. (2010) regarding obtaining accurate information about the amount of time spent in pursuit of the interest, participants were asked to estimate how many hours per day they would engage in or pursue their current interest during a) weekdays (i.e., between Monday and Friday), and b) the weekend (i.e., Saturday and Sunday).

Measurement of the recognition of unfolding suspicious activity. In the present study a tool was designed to examine the ability of participants to

detect unfolding suspicious behaviour that was indicative of a criminal act. This tool involved creating a series of audio scenarios, each of which described one individual who was unknowingly exploited and who unwittingly became involved in the perpetration of criminal activity. In each scenario the protagonist was asked to perform particular behaviours by other people (who in some cases were friends, and in other cases were individuals they had just met), and the protagonist complied, unaware that they were facilitating criminal behaviour (e.g., assessing houses as suitable targets for burglary).

The scenarios were designed to become increasingly suspicious as they progressed. This was achieved by including at the beginning of each scenario subtle cues suggesting either slightly odd or inappropriate behaviour or a slightly unusual situation (e.g., an individual found a job advertisement while shopping, and following a phone call, had a job interview in another individual's garage), followed by more obviously suspicious behaviour (e.g., the individual was asked to visit homes and take note of whether a security system was installed, and whether there were obvious valuables in the home) and led to the criminal act being exposed by police officers questioning the protagonist regarding the offence (e.g., the individual was questioned by police regarding a number of thefts in the area after a home owner called the police during the "interview").

In order to assess whether RI intensity influenced response latency, in half of the scenarios each participant listened to included references to their unique RI. Given individuals with ASD report a wide variety of interests (e.g., Klin et al., 2007), a tool needed to be created that allowed for a range of interests to be embedded. Using an audio format allowed for information regarding each

participant's interest to be embedded while keeping the timing of the rest of the scenarios constant.

While listening to each scenario, participants were asked to indicate when they believed the situation may be suspicious, and then confirm when they were certain the situation was indeed suspicious. For the purpose of the study, 'suspicious' was defined as "Feeling that a person's behaviour or a situation is questionable, dishonest, wrong, and/or illegal". Time taken to report suspicious behaviour was considered as an indication of each participant's ability to detect suspicious behaviour.

Given ToM impairments are thought to influence the ability of individuals with ASD to recognise the intentions of others and deception (e.g., Baron-Cohen et al., 1986; Mathersul et al., 2013; Sodian & Frith, 1992), I posit that ToM may in some, possibly small way, be involved in one's ability to detect suspicious behaviour. It was anticipated that ToM deficits would be associated with the time taken to detect suspicious behaviour whereby those with more impaired ToM would take longer to respond. Given the many unknowns in the current study: the novel nature of the task, the limited information available regarding the extent of ToM deficits among adults with ASD, and the other possible factors that may be associated with the ability to detect suspicious activity, the strength of the proposed relationship between ToM and response latency was expected to be no more than moderate.

Further, little is understood about the presentation of RIs among adults, particularly in regards to intensity of the interest and whether this has any influence on their cognitive processing. For example, given the unusual intensity of RIs among the ASD population (APA, 2013), it is possible that RIs will be

more salient than the rest of the scenario and distract individuals from the storyline. Several references were made to each participant's unique RI throughout a number of the scenarios, in order to determine whether response latency differed when their RI was mentioned as compared to scenarios that did not involve references to their unique RI. It was anticipated that the intensity of an interest would moderate the relationship between ToM deficits and recognition latency, whereby those with more severe ToM impairments and more intense interests would take longer to detect unfolding suspicious activity. Given the novel nature of both the scenarios and the inclusion of the RI information, the strength of the predicted relationship was unknown.

The role of intellectual ability. Individuals with an intellectual disability have been found to be more vulnerable to social victimisation (e.g., Fisher, Baird, Currey, & Hodapp, 2016), and may comply with inappropriate requests of others (Wilson, Seaman, & Nettelbeck, 1996). Therefore, individuals with poor intellectual capacity may have difficulties recognising suspicious behaviour. Given the present study required participants to listen to a number of audio scenarios and make real time judgements about the occurrence of suspicious behaviour, the cognitive demands of this task were high. Thus performance would likely rely to some extent on verbal intellectual ability.

Not only does intelligence have the potential to influence time taken to detect suspicious behaviour, but also ToM performance. While researchers have suggested that ToM is a construct that is independent of intellectual ability (e.g., Baron-Cohen et al., 1985), several researchers have found a relationship between IQ and ToM, suggesting that performance on various ToM tasks relies to some degree on the intellectual ability of the participant (e.g., Baker, Peterson, Pulos, &

Kirkland, 2014; Begeer et al., 2010; Brewer et al., 2016; Golan et al., 2006; Happé, 1994b). As such, it was deemed important to examine the role of ToM impairment after removing any effect of IQ. For these reasons it was important that any influence of IQ was removed to ensure that participant's responses on either the ToM task or recognition task were not the result of their intellectual ability.

Aims and hypotheses. Central to this project is the notion that features associated with ASD (i.e., impaired ToM and RI intensity) might influence the ability of individuals with the disorder to recognise suspicious behaviour. Therefore, the aim of this study was to investigate whether these features do indeed influence this ability. It was hypothesised that:

1. After accounting for intelligence, there would be a relationship between ToM and the time taken to report suspicious behaviour, whereby individuals with more impaired ToM would take longer to detect suspicious activity.
2. After accounting for intelligence, RIs would moderate the relationship between ToM and the time taken to report suspicious behaviour, whereby individuals with more impaired ToM and more intense RIs would take longer to detect suspicious activity.

Chapter 2: Method

Phase 1

Participants. One hundred and eighty two participants; each with a diagnosis of autism spectrum disorder (ASD; 128 males, 54 females), aged 16 years or older (range 16-78 years, *M* = 28.7, *SD* = 13.2) were recruited for the present study. It is likely that the majority of participants recruited would have received a diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder, not otherwise specified from the revised fourth edition of the diagnostic and statistical manual for mental disorders (DSM-IV-TR; American Psychiatric Association [APA], 2000). However, consistent with the most recent edition (DSM-5; APA, 2013) all persons with a diagnosis of one of these disorders using DSM-IV-TR will be considered to meet DSM-5 diagnosis for Autism Spectrum Disorder. Thus the term 'ASD' will be used throughout the remainder of this thesis to refer to all of these diagnoses.

Participants were recruited from the Australian states of South Australia and Victoria, with the majority of participants (*n* = 171) residing in South Australia. One hundred and nine organisations were contacted for recruitment across the states of Victoria, South Australia, and New South Wales[2], including but not limited to, psychology practices, employment services, support groups and organisations specifically for individuals diagnosed with ASD and their families. A recruitment advertisement was also placed on the website for each state autism service (i.e., Autism South Australia [South Australia], Amaze [Victoria] and Autism Spectrum Australia [Aspect; New South Wales]). The majority of participants (*n* = 165) were recruited through a mail out by the autism

[2] No responses were received from individuals residing in the state of New South Wales regarding participation.

association for the state in which they resided (i.e., Autism South Australia [*n* = 161], Amaze [*n* = 4]). In order to receive the mail out in South Australia, participants needed to be registered for services with Autism South Australia.

All participants had a diagnosis of ASD. In South Australia it is a requirement that in order to receive support services, a diagnosis of ASD must be made by two independent accredited practitioners (i.e., a psychiatrist, speech pathologist, psychologist or paediatrician), by multi-disciplinary diagnostic teams at Autism South Australia, or the child assessment teams at three local hospitals. Of the 182 individuals who participated in Phase 1, 161 were registered with Autism South Australia. The remaining participants reported receiving a diagnosis from a professional recognised and accredited with Autism South Australia /Amaze (*n* = 8), or responded to an advertisement about the study via an organisation specifically for individuals diagnosed with ASD, and reported receiving their diagnosis from a psychologist (*n* = 8). One participant reported a family history of ASD and that they had received an informal diagnosis of ASD from a trained professional, but did not have a formal diagnosis of ASD at the time of data collection. This participant received a score above 32 on the Autism-Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001), a tool which is considered appropriate for determining whether individuals are likely to have ASD (Booth et al., 2013; Woodbury-Smith, Robinson, Wheelwright, & Baron-Cohen, 2005), and one that is often employed as a screening tool for ASD for the purposes of research inclusion (e.g., Brown-Lavoie, Viecili, & Weiss, 2014; Byers, Nichols, & Voyer, 2013). Given that removing the data collected from this participant did not affect the overall results of the study, their data were retained.

Measures.

Demographic information. Each participant was asked for demographic information including their age, sex, and first language. Participants were asked if they had been diagnosed with ASD (including ASD, autistic disorder, Asperger's disorder, or PDD-NOS), the type of professional who provided the diagnosis, and whether they were registered with their local autism provider for services.

Intelligence quotient. Each participant's intelligence quotient (IQ) was assessed using the Wechsler Abbreviated Scale of Intelligence, second edition (WASI-II; Wechsler, 2011). This task involved participants completing four subscales: Block Design, Vocabulary, Matrix Reasoning, and Similarities. The Vocabulary and Similarities subtests form the Verbal Comprehension Index (VCI), while the Block Design and Matrix Reasoning form the Perceptual Reasoning Index (PRI). Test-retest reliability for each of the subtests ranges between r =.83 - .94 (McCrimmon & Smith, 2012). Concurrent validity has been demonstrated by McCrimmon and Smith (2012) with correlations ranging between r = .71 - .92 between the WASI-II and the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999), the Wechsler Intelligence Scale for Children, fourth edition (WISC-IV; Wechsler, 2003), and the Wechsler Adult Intelligence Scale, fourth edition (WAIS-IV; Wechsler, 2008).

Theory of mind. Theory of mind (ToM) was assessed using the Adult - Theory of Mind (A-ToM; Brewer et al., 2016). The A-ToM was adapted from the widely used Strange Stories task (Happé, 1994a). The Strange Stories task consists of written vignettes of social situations, where participants are required to read the vignettes and provide a written response to questions asking about the motives behind an individual's behaviour. Rather than written vignettes, the A-

ToM task required participants to watch videos of social interactions, and provide a written response within a 60 second time limit. These changes were made in order to address criticisms of the Strange Stories task whereby researchers have argued that the mode of presentation may rely on verbal intellectual ability, and allow participants to work out a solution (e.g., Roeyers & Demurie, 2010).

During the A-ToM task, participants were required to watch 12 videos[3] of acted out social situations, which were adapted from written vignettes presented in the Strange Stories task (n = 8; Fletcher et al., 1995; Happé, 1994a; 1999; White, Hill, Happé, & Frith, 2009), or otherwise represented novel scenarios created by the authors (n = 4). Of the 12 videos, six were 'social' stories, which depicted different social behaviours (e.g., white lie, sarcasm) and required participants to determine the mental state or intent of the protagonist. The six remaining videos were 'physical' stories, which were used as control items and did not require participants to draw inferences about the mental states of protagonists. These were also adaptations of the Strange Stories task. The role of the physical stories was to provide a comparison to the responses from the social stories, so that if a deficit existed it could be determined whether the deficit was only in regards to ToM ability, or whether there were any deficits in comprehension. It was expected that individuals with ASD would differ in regards to the Social items but not Physical items. Videos ranged between 24 and 61 seconds in length. Following each video, a question was presented on screen (e.g., "Why does X say this?") and participants were asked to provide a written response. For two of the videos, participants were also asked to answer whether something said in the video was true, and to provide a yes/no response. Unlike the

[3] Participants were required to watch 25 videos in total for the purpose of another study; for the purpose of this study only 12 of the videos were used.

Strange Stories task where participants do not have a time limit, the A-ToM required participants to provide a response to each of the items within one minute of each video ending, in order to increase the likelihood of the score being reflective of ToM ability in the social environment (i.e., where there is limited time to respond). Responses for each item were scored 0, 1, or 2, where a higher score reflected better ToM ability. A score of two was awarded if the response indicated that the participant had understood the behaviour of the protagonist (i.e., understood the mental state or intent of the protagonist in the social stories, and in the physical stories had understood the logic of the protagonist's behaviour). A score of one was awarded if the response was more general (i.e., was correct, but lacking explanation, or the yes/no response was correct, but explanation was irrelevant/incorrect), and no points were awarded if the response was incorrect. Please refer to Table 1 for an example of one item from the social subscale and the corresponding scoring criteria, and Table 2 for one item from the physical subscale and the corresponding scoring criteria. See Tables A1 to A12 in Appendix A for all A-ToM items and the associated scoring criteria. Four versions of the A-ToM were created, where the 12 videos were presented in a different order per version. These four versions were presented an equal number of times across participants.

The A-ToM task was developed using a sample of adults with a diagnosis of ASD[4] much larger than has been reported in previous studies (n = 163). Previous studies using tools such as the Strange Stories and Frith-Happé animations have typically reported data for sample sizes below n = 30. As a result, psychometric analysis of the A-ToM was undertaken. Brewer et al. (2016)

[4] The sample included in this study formed a part of the validation data for the A-ToM task.

reported that the items split into two clear factors (i.e., physical, social), demonstrating content validity. Concurrent validity was demonstrated between the A-ToM and the Strange Stories with correlations between the A-ToM Social and Strange Stories Social subscales of r = .58, A-ToM Social with the Frith-Happé animations (White et al., 2011) 'Mental' and 'Feelings' subscales of r = .22 and r = .34, and A-ToM Physical and Strange Stories Physical subscales of r = .61. While there was some overlap in the Social subscale between individuals with and without ASD, at group level the A-ToM Social subscale differentiated between individuals with and without ASD who were matched for perceptual reasoning ability and the differences remained after controlling for verbal comprehension ability. Further, the A-ToM discriminated from other tools measuring different, but related constructs (i.e., social anxiety and empathy), which provided evidence of discriminant validity of the tool. Brewer et al. (2016) also reported test-retest reliability for the Social and Physical subscales as r = .82 and r = .64.

Table 1

Example Item from the A-ToM Social Subscale (Crying man) and the Corresponding Scoring Criteria

Social story	
Script	Scoring criteria
A man is seen sobbing on the couch. Sally and Drew are chatting across the room. Drew: "What's the matter with him?" Sally: "His wife just left him for a younger man." Drew: "Oh no, is he doing okay?" The man bursts into tears dramatically, as Sally and Drew are watching him. Sally: "Yeah, he's doing just fine." Fade to black Q: Is this true? Why did she say this?	2 points- reference to the woman's use of sarcasm/irony/not being serious/being funny/ridicule/derision, the man is clearly not fine. (Answer MUST reference sarcasm/irony/not being serious/being funny/ridicule/derision). Simply 'sarcasm' is sufficient for 2 points. 1 point- reference to the fact that the man is clearly not fine but without reference to sarcasm/irony/not being serious/being funny/ridicule/derision. e.g., 'Because he is not fine', 'He is obviously not ok' 0 points- reference to incorrect/irrelevant facts. e.g., 'The man is fine, 'She doesn't want to get involved', 'Maybe she thinks he is actually ok'

Table 2

Example Item from the A-ToM Physical Subscale (Light bulbs) and the Corresponding Scoring Criteria

Physical story	
Script	Scoring criteria
John is looking at light bulbs, a sales assistant approaches him. Assistant: "Excuse me sir, can I help you there?" John: "Yes, I've just bought a new lamp for my desk, and I need a new light bulb for it." Assistant: "Oh right, okay, well you can buy the Litebrite here, which comes in a single, or you can pay just a little bit more and get the Everbright, which comes in a pack of ten. John: Well I only need the one, but I think I will take the pack of ten. Thank you." Assistant: "Have a good day" Fade to black Q: Why does he buy the pack of 10?	2 points- reference to saving money (since multipacks are cheaper). May also, but needn't mention convenience of having more or future need for more than one bulb. e.g., 'Better value', 'Cheaper in bulk', 'Saves money that way' 1 point- reference to convenience of having more or future need for more than one bulb. No mention of saving money or better value. e.g., 'So he won't have to keep going out to the store', 'In case one blows', 'He will need more later' 0 points- reference to irrelevant or incorrect facts or references to characteristics of salesman. e.g., 'He likes that brand the best'. 'He needs a whole lot of bulbs', 'The salesman was charismatic', 'It was a good sales pitch', 'He was a con artist'

Restricted interests. Given few studies have assessed restricted interests (RIs) among an adult sample of individuals with ASD; a tool that measured both the topic and intensity of the interest could not be located. Therefore, a self-report questionnaire was created in an attempt to gather this information. In order to gain an understanding of the content and pursuit of each participant's interest/s, participants were asked a series of questions about interests they had currently, or had engaged in within the previous 12 months. Unlike other tools that provide categories of interests from which to select (e.g., the Cambridge University Obsessions Questionnaire, Baron-Cohen & Wheelwright, 1999; the Interests

Scale, Bodfish, 2003), the RI questionnaire required participants to describe the topic of their interest in an open-ended response. The additional questions enquired about how the interest was pursued (e.g., looking it up on the internet, collecting etc.), the participant's favourite thing about the interest, the amount of time spent in pursuit of, or engaging in the interest (i.e., approximate number of hours dedicated to the interest per day on weekdays and weekends), and how absorbed they became when pursuing the interest (e.g., 'When you are pursuing or engaging in this interest, to what extent do you forget to eat?'), with four response options ranging from *Never* to *Almost every day*. Two measures of intensity were created from these data: 1) number of hours spent weekly in pursuit of the RI (*Number of hours*), and 2) level of absorption (*Absorption*). The Absorption questions were each scored between 0-3 points (i.e., Never = 0, Occasionally = 1, Frequently = 2, Almost every day = 3), with a total possible score of 9. In both measures the higher the score, the more intense the interest was considered to be (i.e., the more time spent, the more absorbed during pursuit).

The three questions regarding absorption during pursuit of the RI were included in an attempt to assess whether the RI interfered with every day activities, as described in the DSM-5 regarding the severity levels of restricted, repetitive behaviours (APA, 2013).

Procedure. Prior to the recruitment of participants, ethics approval was granted by the Flinders University Social and Behavioural Research Ethics Committee. Each participant completed the study in a location they nominated. This was either at the university campus in South Australia (n = 96), at their place of residence in South Australia or Victoria (n = 78), or at a quiet location such as

a public or university library (n = 8). In the cases where participants completed the study at their place of residence, a second individual (an undergraduate psychology student) attended the session as a chaperone. Sessions took place in various suburbs of Adelaide and towns in South Australia, which were located up to a distance of 90 kilometres from the Flinders University campus. The 11 sessions that took place in Victoria were conducted in various cities and towns across an approximate distance of 885 kilometres, including Melbourne and the surrounding cities/towns of Ballarat, Castlemaine, Geelong, Lakes Entrance and Wallan. While the locations varied between participants, efforts were made to ensure that each setting had as few distractions as possible (e.g., if the session was conducted in a library, a quiet location such as a separate room was sought and headphones were provided). A research assistant with an Honours degree in psychology who was trained in administering the measures assisted in the data collection process for Phase 1, and conducted 48 of the 182 sessions independently of the researcher (all of which were in South Australia).

Participants completed tasks in the following order: demographic questionnaire, A-ToM, WASI-II, and RIs questionnaire. Five extra tasks (the AQ; Baron-Cohen et al., 2001, the Interpersonal Reactivity Index; Davis, 1980, the Strange Stories task; Fletcher et al., 1995, the DASS-21; Lovibond & Lovibond, 1995, and the Frith-Happé animations; White et al., 2011) were also completed by participants during this session as a part of another study[5]. Research funding for the other study provided an opportunity to collect data for the current study from a sample larger in size than is the norm with experimental studies with adults with ASD. Each of the tasks was completed on paper, with the exception of

[5] Due to the similarity of the tasks, the A-ToM and Strange Stories were presented at the start and end of Phase 1 so that they were completed as far apart as possible. The order of these two tasks was counterbalanced.

the A-ToM and Frith-Happé animations which were presented on a Dell Latitude E6530 laptop with 15.6 inch high definition screen. In some cases (e.g., if participants completed this phase of the study in a library or reported that they had poor hearing), participants listened to the A-ToM videos with the assistance of headphones. Participants adjusted the volume of the videos to suit their hearing ability and preference. Session length ranged from 2.5 to 4 hours. The researcher was present throughout each session to conduct tasks and ensure that time limits were observed.

Inter-rater reliability. To assess inter-rater reliability for the scoring of the A-ToM, a research assistant who was familiar with the project independently scored approximately 35% of the responses. Inter-rater reliability was calculated as being between $k = .62$ and $k = .97$ (substantial to almost perfect agreement; Landis & Koch, 1977) for all but one of the A-ToM items. Scoring differences for this item were discussed, and agreement reached.

Phase 2

Participants. Participants were eligible to be contacted for participation in Phase 2 if a) English was reported as their first language in Phase 1, and b) their WASI-II full scale IQ score was at least 85[6,7]. One hundred and forty four of the 182 participants from Phase 1 were eligible to be contacted for participation in Phase 2[8]. Of these participants, 101 participated in the second phase of the project[9]. Participants in Phase 2 were aged between 16 and 62 years ($M = 28.4$,

[6] Due to the cognitive demands of the Crime Recognition task (described below), only participants with a full scale IQ score of above 85 were invited to participate in Phase 2.
[7] Despite discrepancies between VCI and PRI scores, a full scale IQ was calculated for the purpose of research inclusion.
[8] One participant was excluded due to English being a second language, three participants stated in Phase 1 that they did not wish to be contacted for Phase 2, and the remaining participants were excluded for achieving a WASI-II score below 85 in Phase 1.
[9] The remaining participants either did not wish to participate ($n = 21$), could not be contacted ($n = 21$), or did not report a RI at either Phase 1 or Phase 2 ($n = 1$).

SD = 12.3), and the majority were male (*n* = 71). Time between Phase 1 and 2 for each participant ranged from 56 and 922 days (*M* = 447, *SD* = 145).

Measures.

Restricted interests.

Between Phases 1 and 2. Prior to participation in Phase 2, all participants were asked to complete a shortened version of the RI questionnaire completed in Phase 1 to check whether the RI remained the same as previously reported. This version enquired only about the content, pursuit, and favourite thing about their interests. Participants were able to complete the questionnaire and send it to the researcher via email, answer the questions over the phone, or complete the questions via an online survey.

Phase 2. A number of questions regarding intensity of the interest were added to the RI questionnaire in response to qualitative feedback from participants during Phase 1. In addition to the questions asked about their RI in Phase 1 (including questions regarding the content and pursuit of their interest, number of hours spent per week, and how absorbed they became when pursuing the interest), in Phase 2 participants were asked about how they reacted and the level of anxiety felt when the pursuit of their interest was interrupted (e.g., "If you are interrupted while you are pursuing or engaging in the interest, and have to stop, do you find it difficult?", with response options ranging on a 3-point scale from *No* to *Yes, Every time*, or "If you are interrupted while you are pursuing or engaging in the interest, and have to stop, how do you feel?: I feel tense" with response options ranging on a 3-point scale from *Not at all* to *Very much so).* Participants were also asked about how important the interest was to them (e.g., "When I am pursuing or engaging in this interest I feel happy"), with response

options ranging on a 3-point scale from *Not at all* to *Very much so*. Two additional measures of intensity were created from these data: 1) response to interruption (*Interruption*), and 2) importance of the interest (*Importance*). Five of the items from the Interruption subscale (e.g., “I feel tense”), and all four items from the Importance subscale (e.g., “I feel happy”) were taken from the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The items included in the Importance subscale were chosen from those that are reverse coded in the STAI (i.e., are not associated with feelings of anxiety). Response options were amended from four options in the STAI to three. In both of the subscales responses were scored between 0-2 points (i.e., zero points for the lower end of the scale). The Interruption subscale included eight questions, with a total possible score of 16, and the Importance subscale included four questions, with a total possible score of 8.

These sets of questions each addressed an area that has been noted in previous studies; individuals with ASD may become distressed when interrupted during the pursuit of a RI (e.g., Rispoli, Camargo, Machalicek, Lang, & Sigafoos, 2014), and a number of positive aspects of RIs have been identified, including benefits to wellbeing (e.g., Mercier et al., 2000). Further, these additions were consistent with the explanation of the presentation of the three severity levels of restricted, repetitive behaviours in the DMS-5, which refer to the difficulty and distress individuals may experience changing focus (APA, 2013).

These sets of questions were treated as different measures of intensity (i.e., were not combined into a total sum), resulting in four measures of RI intensity: Number of hours, Absorption, Interruption, and Importance. These measures were treated separately as it is conceivable that an individual may lose

track of time while pursuing their interest (i.e., Absorption), yet be OK with an interruption when they are pursuing the interest (i.e., Interruption) as they may have learned to accept this will happen. The higher the score for each of these subscales, the higher the intensity of the RI (i.e., the more time they spend on the interest, the more absorbed they become in the interest, the worse they respond to interruption, and the more important the interest to them). See Appendix B for the RI questionnaire.

Recognition of suspicious activity. In order to assess the ability of each individual to recognise that a series of events may be suspicious (i.e., possibly leading towards the occurrence of a criminal act), a series of audio scenarios were created for a task, hereafter referred to as the Crime Recognition task. The scenarios were created using a Sennheiser e815S microphone with a Behringer UCA222 audio interface for recording, and a custom preamplifier. Adobe Audition 3.0 for Windows 7 was used to record and edit the audio scenarios. All audio scenarios were recorded by the researcher, and took place in an environment that had been treated with eggshell acoustic soundproofing foam to enhance the sound quality and prevent the requirement for post-recording 'noise' reduction techniques. As a result, techniques such as dynamics processing, equalisation, or audio signal processing were not required. Sixteen scenarios were created for each participant: eight involved a crime taking place, and eight did not involve criminal activity. Half of these scenarios were tailored to include multiple references to each participant's unique RI. The scenarios were individualised for each participant to increase the likelihood that they would become preoccupied by references to their interest. As a result, approximately 800 unique audio

scenarios were created. The following section will describe how these scenarios were created and presented to participants.

Crime scenarios. Of the 16 scenarios, four scenarios were created where an individual was described as becoming involved in a situation that was suspicious, and culminated in the individual unwittingly assisting a criminal act (hereafter referred to as *crime* scenarios). The crime scenarios were designed so that the situation of the protagonist became increasingly suspicious throughout the scenario. In each case, the protagonist was unaware of the criminal behaviour in which they were involved. The crimes implied in the scenarios were as follows: 1) the protagonist assisted individuals who were growing marijuana by living in the house where the plants were kept and keeping a look out for police officers, 2) the protagonist stored pornographic images of children on his computer as a favour for another individual, 3) the protagonist was in possession of a number of tablets (illicit drugs) planned for sale by her friend across a number of nightclubs, and 4) the protagonist was surveying houses for another individual, in order to determine whether or not the houses were suitable and desirable targets for burglary. Each crime scenario ranged between 480 and 580 words in length (before the RI information was added as described below), and consisted of five paragraphs, which were separated by a two second gap in the audio recording. Refer to Figure 1.1 for an example of a crime scenario template. See Appendix C for the template of each of the four crime scenarios.

No crime scenarios. A further four scenarios were created where the situation of the protagonist was similar to that described in the crime scenarios, with the exception of the suspicious behaviour and subsequent unwitting involvement in criminal activity (hereafter referred to as *no crime* scenarios).

That is, these scenarios were not designed to arouse suspicion. Each no crime scenario ranged between 480 and 580 words in length (before the RI information was added as described below), and consisted of five paragraphs, which were separated by a two second gap in the recording. Please refer to Figure 2.1 for an example of a no crime scenario template. See Appendix C for the template of each of the four no crime scenarios.

Incorporating interest data into the scenarios. Each of the crime and no crime scenarios were adapted to include one of each participant's unique RIs. In the case where a participant reported more than one RI, the following rule was applied when selecting which RI to incorporate into the audio scenarios:

1. If any reported RI prior to Phase 2 matched one of the RIs in Phase 1, this RI was chosen[10] (n = 57).
2. If none of the reported RIs prior to Phase 2 matched RIs reported in Phase 1 (i.e., all RIs prior to Phase 2 were 'new'), the first RI listed prior to Phase 2 was chosen[11,12] (n = 24).
3. If the participant stated they did not have a RI prior to Phase 2, the first RI listed in Phase 1 was chosen (n = 12).
4. If the participant reported they did not have a RI in Phase 1, the first reported RI prior to Phase 2 was chosen (n = 8).

[10] In one case 'Washing clothes' was reported in both phases, however due to the limited nature of how the RI was pursued the first reported RI prior to Phase 2 was chosen.

[11] In two cases the reported RIs in Phase 1 were too difficult to incorporate into scenarios due to being vague (e.g., 'iPad programming'; 'took six months to explore it'), and the first reported RI prior to Phase 2 was too specific to allow integration into the four vignettes (e.g., 'Going to friends 400 acre block in [name of town]'). In these cases the second reported RIs prior to Phase 2 were chosen.

[12] In one case the first reported RI prior to Phase 2 was difficult to incorporate due to the way the interest was pursued (i.e., the RI was 'Want to learn how to ski', however the individual was not pursuing this RI by way of research or training), therefore the second reported RI prior to Phase 2 (ice skating) was chosen.

The inclusion of the RI information in the scenarios was as consistent as possible. The first mention of each participant's RI occurred in approximately the same position across the different scenarios; after the introduction of the protagonist, and prior to the events becoming suspicious. The RI was then mentioned throughout, in the same pattern across scenarios (i.e., three times in the first, second, and fourth paragraphs, and twice in the third and fifth paragraphs) so that the RI was referred to 13 times in each of the eight scenarios. The RI was referred to several times throughout each scenario so as to increase the likelihood the participant might be distracted due to the mention of their RI, and possibly engage in thoughts about their interest. Information specific to each participant's RI that was incorporated into the scenarios consisted of both a) the information each participant had provided (i.e., the content of the interest, how the participant preferred to engage in or pursue the interest, and their favourite thing about the interest), and b) further information specific to the interest, which had not been provided by the participant but had been sought out by the researcher (e.g., another possible way to engage in or pursue the interest, a type of product related to the interest, an upcoming event concerning the interest, or a fact about the interest).

The additional information regarding each RI (i.e., type b) was added in an attempt to increase the likelihood that the participant might engage in thinking about their interest while listening to the scenario. The pattern of type a and type b information was consistent across scenarios (in the order: a, a, a, a, a, b, a, b, a, b, b, a, b). Research was undertaken for each of the RIs to ensure the terminology included in the scenarios was appropriate within the area of the interest (e.g., if a particular game referred to challenges as 'quests', the term 'quests' was used).

The included information was also as specific as possible given the information provided regarding the RI (e.g., for the RI 'Doctor Who' [television show], rather than referring to the 'time machine', the name of the time machine in the show, the 'TARDIS' was used, or for the RI 'Lego: Harry Potter sets', particular pieces of Lego that were commercially available at the time such as 'Hagrid's Hut Set' were referenced). Places or events regarding the RI that were referenced in type b information were factual (e.g., for the RI 'Model trains', the Miniature Wonderland in Hamburg was referenced [the largest model train set in the world]; for the RI 'Mermaiding'[13], the Philippine Mermaid Swimming Academy was mentioned [a Mermaiding academy in the Philippines]). The information regarding each participant's RI that was included in the scenarios was consistent across scenario type (i.e., crime and no crime), so that the only content that differed across scenario type was in regards to the suspicious/non-suspicious activity.

In order to keep the length of each scenario consistent across participants (even though unique information was included in each), templates were created for each scenario, which did not include the sentences that contained the information regarding the RI. Once the information unique to each participant's RI had been researched and information relevant had been incorporated in the audio scripts, the information regarding each participant's RI was then recorded to a specified time (which was consistent across participants). These sections of audio track containing the RI references were then incorporated into the scenario templates at specified time points[14]. As a result, even though each scenario was

[13] Mermaiding is an activity that involves wearing (and possibly swimming in) a tail shaped like that of a mermaid.

[14] Care was taken to ensure the transitions between the audio referring to the RI and the rest of the scenarios were as seamless as possible. In addition, the amplitude of the unique information

tailored to include unique information per participant, the suspicious/non-suspicious activity occurred at the same time, and scenarios were the same length for each participant. The four completed crime and four completed no crime scenarios ranged in length from 3.37 minutes to 4.04 minutes. See Figure 1.2 for an example of how RI data was incorporated into a crime scenario template, and Figure 2.2 for an example of how RI data was incorporated into a no crime scenario template.

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was altered using Adobe Audition to match the amplitude of the scenario template. Pilot participants were also asked for feedback regarding the transitions.

Cherie is a young woman in her 20s who is studying social work at university. Cherie really enjoys (**RI data**). She spends many hours each day (**engaging in RI**), as she just loves (**favourite data**). Cherie currently lives on her own, but is finding it hard to pay rent while working on a casual basis. Therefore, she is looking to rent a room in a share house. While at university one day Cherie saw an advertisement for a very cheap room, and called the number to arrange a meeting and walk through the house.

A few days later, Cherie arrived at the house she had enquired about, and met the two other tenants. She found out that they were also students at her university. She was impressed when she found out that the other tenants liked (**engaging in RI**) too. Cherie was really passionate about (**RI**) and thought she would enjoy living with others with similar interests to herself. She wondered (***something about the others engaging in RI***). Cherie had a good discussion with the students, and thought it sounded like a good house for her, particularly given the cheap rent and free internet.

The students mentioned that they were looking for someone who was home most of the time. That suited Cherie as some of her subjects were to be completed online, meaning she could study at home. She also liked to (**engage in RI)** often, which she usually did at home. She liked (***looking up/doing something to do with RI*)**. They also mentioned that they were completing a report for the landlord regarding how many police cars drove past. They asked Cherie to keep a diary in the front room of the house, and write down if she saw any police cars in their street. She was happy to do this and agreed to move in to the house.

Cherie moved in the following week. Her house mates weren't home a lot, which suited her as she could study in silence most of the time. She did enjoy discussing (**RI**) with them occasionally, in particular (***something about RI*)**. They did have some disagreements about (***something more specific about RI)*** though. They seemed to come home, spend a little time in their room, and then leave. Often they would be holding some kind of tool Cherie didn't recognise, or large containers. She would often hear them using a lot of water. She also noticed that they usually left the lights on in their room, as she could see the bright light coming from underneath their doors even when they weren't home. When she questioned them about the power bill, they told her they would pay it all, and not to worry.

One day while Cherie was **(engaging in RI)** the police knocked on the front door. It took her a few minutes to get to the door; she was so involved in **(*specific way of engaging in RI*)** that she missed the first few knocks. She had just found out something new, and found it really interesting. When she answered the door, two police officers asked Cherie if she was growing anything in the house and if they could look inside. Confused, she informed them that she was not growing anything and let the officers in. On opening the other tenants' rooms, the police officers saw tables of plants growing under lights. They were green with long spiky looking leaves, and had buds growing on them. There was also a fridge in one of the rooms that was filled with what looked like green herbs.

Figure 1.1. Example of a crime scenario template, where the protagonist moves into a new house and assists individuals who are growing marijuana by living in the house where the plants are kept, and keeping a look out for police officers. Bold font indicates where information specific to the RI was incorporated (i.e., type a information). Bold italic font indicates where further information specific to the interest, which had not been provided by the participant was incorporated (i.e., type b information).

Cherie is a young woman in her 20s who is studying social work at university. Cherie really enjoys **musical theatre.** She spends many hours each day **either looking it up on the internet or listening to it,** as she just loves **how it relaxes her.** Cherie currently lives on her own, but is finding it hard to pay rent while working on a casual basis. Therefore, she is looking to rent a room in a share house. While at university one day Cherie saw an advertisement for a very cheap room, and called the number to arrange a meeting and walk through the house.

A few days later, Cherie arrived at the house she had enquired about, and met the two other tenants. She found out that they were also students at her university. She was impressed when she found out that the other tenants liked **listening to musical theatre** too. Cherie was really passionate about **musical theatre** and thought she would enjoy living with others with similar interests to herself. She wondered ***if they had seen promotional video for The Lion King, which was touring soon*.** Perhaps she could learn something more from them. Cherie had a good discussion with the students, and thought it sounded like a good house for her, particularly given the cheap rent and free internet.

The students mentioned that they were looking for someone who was home most of the time. That suited Cherie as some of her subjects were to be completed online, meaning she could study at home. She also liked to **look up and listen to musical theatre** often, which she usually did at home. She liked ***looking up the shows currently touring, reading about the performers and listening to the songs*.** They also mentioned that they were completing a report for the landlord regarding how many police cars drove past. They asked Cherie to keep a diary in the front room of the house, and write down if she saw any police cars in their street. She was happy to do this and agreed to move in to the house.

Cherie moved in the following week. Her house mates weren't home a lot, which suited her as she could study in silence most of the time. She did enjoy discussing **musical theatre** with them occasionally, in particular ***their favourite musicals***. They did have some disagreements about ***the best songs*** though. They seemed to come home, spend a little time in their room, and then leave. Often they would be holding some kind of tool Cherie didn't recognise, or large containers. She would often hear them using a lot of water. She also noticed that they usually left the lights on in their room, as she could see the bright light coming from underneath their doors even when they weren't home. When she questioned them about the power bill, they told her they would pay it all, and not to worry.

One day while Cherie was **looking up musical theatre** the police knocked on the front door. It took her a few minutes to get to the door; she was so involved in ***reading about the current cast of Cats*** that she missed the first few knocks. She had just found out something new, and found it really interesting. When she answered the door, two police officers asked Cherie if she was growing anything and if they could look inside. Confused, she informed them that she was not growing anything and let the officers in. On opening the other tenants' rooms, the police officers saw tables of plants growing under lights. They were green with long spiky looking leaves, and had buds growing on them. There was also a fridge in one of the rooms that was filled with what looked like green herbs.

Figure 1.2. Example of a crime scenario where the protagonist assists individuals who are growing marijuana by living in the house where the plants are kept, and keeping a look out for police officers, which has had RI information incorporated for a participant with an interest in musical theatre. Bold font indicates where information specific to the RI was incorporated (i.e., type a information). Bold italic font indicates where further information specific to the interest, which had not been provided by the participant was incorporated (i.e., type b information).

Oscar is a young man in his 20s who is studying medicine at university. Oscar really enjoys (**RI**). He spends many hours each day (**engaging in RI**), as he just loves (**favourite data**). Oscar currently lives with his parents, but is hoping to move into a share house with some other students. While studying in the library one day Oscar saw an advertisement for a cheap room on a notice board. He called the number to arrange a meeting and walk through the house.

A few days later Oscar arrived at the house he had enquired about, and met the two other tenants. He found out that they were also students at his university. He was impressed when he found out that the other tenants liked (**engaging in RI**) too. Oscar was really passionate about (**RI**) and thought he would enjoy living with others with similar interests to himself. He wondered (***something about the others engaging in RI*)**. Oscar had a good discussion with the students, and thought the rent was reasonable for the size of the house.

The students mentioned that they were looking for someone who was home most of the time. They had a dog, and neither of them was home often to spend time with it. That suited Oscar as some of his subjects were to be completed online, meaning he could study at home. He also liked to (**engage in RI)** often, which he usually did at home. He liked (***looking up/doing something to do with RI)***. They also mentioned that the landlord had requested that prior to moving in the new tenant complete an inspection sheet, and keep the room that was available in good condition. He was happy to do this and agreed to move into the house.

Oscar moved in the following week. His house mates weren't home a lot as they were either at uni classes or work. This suited Oscar as he could study in silence most of the time. He did enjoy discussing (**RI**) with them occasionally, in particular ***(something about RI)***. They did have some disagreements about ***(something more specific about RI)*** though. They seemed to come home, shower, and go to work. They were very busy. Given how much he was home and using the power, Oscar thought he should pay more than a third of the electricity bill. When he questioned them about the power bill, they told him they would all split it evenly, and not to worry.

One day while Oscar was **(engaging in RI**) a neighbour knocked on the front door. It took him a few minutes to get to the door; he was so involved in ***(specific way of engaging in RI*)** that he missed the first few knocks. He had just found out something new, and found it really interesting. When he answered the door, the neighbour complained that the dog had been barking, and asked if Oscar could keep it inside while he was at home. Oscar agreed, and said he would let the dog inside the house. He apologised to the neighbour, and brought the dog inside. The dog sat by his feet wagging its tail while Oscar was studying.

Figure 2.1. Example of a no crime scenario template, where the protagonist moves into a new house, although in this version does not assist individuals who are growing marijuana by living in the house where the plants are kept, or by keeping a look out for police officers. Bold font indicates where information specific to the RI was incorporated (i.e., type a information). Bold italic font indicates where further information specific to the interest, which had not been provided by the participant was incorporated (i.e., type b information).

Oscar is a young man in his 20s who is studying medicine at university. Oscar really enjoys **musical theatre**. He spends many hours each day **either looking it up on the internet or listening to it,** as he just loves **how it relaxes him.** Oscar currently lives with his parents, but is hoping to move into a share house with some other students. While studying in the library one day Oscar saw an advertisement for a cheap room on a notice board. He called the number to arrange a meeting and walk through the house.

A few days later Oscar arrived at the house he had enquired about, and met the two other tenants. He found out that they were also students at his university. He was impressed when he found out that the other tenants liked **listening to musical theatre** too. Oscar was really passionate about **musical theatre** and thought he would enjoy living with others with similar interests to himself. He wondered ***if they had seen promotional video for The Lion King, which was touring soon*.** Oscar had a good discussion with the students, and thought the rent was reasonable for the size of the house.

The students mentioned that they were looking for someone who was home most of the time. They had a dog, and neither of them was home often to spend time with it. That suited Oscar as some of his subjects were to be completed online, meaning he could study at home. He also liked to **look up and listen to musical theatre** often, which he usually did at home. He liked ***looking up the shows currently touring, reading about the performers and listening to the songs*.** They also mentioned that the landlord had requested that prior to moving in the new tenant complete an inspection sheet, and keep the room that was available in good condition. He was happy to do this and agreed to move into the house.

Oscar moved in the following week. His house mates weren't home a lot as they were either at uni classes or work. This suited Oscar as he could study in silence most of the time. He did enjoy discussing **musical theatre** with them occasionally, in particular ***their favourite musicals.*** They did have some disagreements about ***the best songs*** though. They seemed to come home, shower, and go to work. They were very busy. Given how much he was home and using the power, Oscar thought he should pay more than a third of the electricity bill. When he questioned them about the power bill, they told him they would all split it evenly, and not to worry.

One day while Oscar was **looking up musical theatre** a neighbour knocked on the front door. It took him a few minutes to get to the door; he was so involved in ***reading about the current cast of Cats*** that he missed the first few knocks. He had just found out something new, and found it really interesting. When he answered the door, the neighbour complained that the dog had been barking, and asked if Oscar could keep it inside while he was at home. Oscar agreed, and said he would let the dog inside the house. He apologised to the neighbour, and brought the dog inside. The dog sat by his feet wagging its tail while Oscar was studying.

Figure 2.2. Example of a no crime scenario, where the protagonist moves into a new house, although in this version does not assist individuals who are growing marijuana by living in the house where the plants are kept, or by keeping a look out for police officers. This scenario has had RI information incorporated for a participant with an interest in musical theatre. Bold font indicates where information specific to the RI was incorporated (i.e., type a information). Bold italic font indicates where further information specific to the interest, which had not been provided by the participant was incorporated (i.e., type b information).

Non-RI scenarios. Prior to testing, each unique RI was matched with a dissimilar RI reported by another participant. These scenarios were matched so that each participant listened to eight scenarios with their RI incorporated, and to eight scenarios that referred to something dissimilar for which they did not report an interest. These scenarios are hereafter referred to as *non-RI* scenarios.

In order to pair each participant's RI with a dissimilar non-RI, the researcher separated the RIs reported in Phase 1 into themes based on the content of the interest and method of pursuit. An attempt was made to categorise the participants' RIs based on the categories reported in previous studies (e.g., Anthony et al., 2013; Baron-Cohen & Wheelwright, 1999; Caldwell-Harris & Jordan, 2014; Klin et al., 2007; South, Ozonoff, & McMahon, 2005; Tanidir & Mukaddes, 2014). However, a number of the interests from the current sample did not fit into the existing categories listed in these studies. Therefore the RIs were separated into new categories that best seemed to fit the data. A research assistant familiar with the project also separated the RIs into themes, blind to the procedure and categories of the first researcher. Inter-rater reliability was then calculated between the two researchers and was found to be substantial, $k = .75$ (Landis & Koch, 1977). The two researchers discussed the RIs that had been categorised differently, and reached agreement on their categorisation, resulting in 13 final categories. See Table 3 for the final list categories and Table D1 in Appendix D for the list of interests reported in Phase 1 and prior to Phase 2, and the assigned category for each interest.

Table 3

Categories of RIs reported in Phase 1

Category	Example of a reported RI
Games/Gaming	Warhammer
Factual information/Knowledge attainment	Archaeology
Vehicles and Machines/Mechanics	Model railways
Computers and Technology	Virtual reality programming
Pop culture (e.g., TV shows/Movies and Anime/Comics)	Dr Who
Sport/Fitness	Ice skating
Music	Electronic music
The Arts/Crafts/Creativity	Glassblowing
Nature and Animals	Horse training
Religion/belief systems and Politics	The Bible
Reading	Reading ‘A Song of Ice and Fire’
People	A friend
Miscellaneous	Mermaiding

In an attempt to pair the RI with a dissimilar non-RI in an objective manner, ten PhD students in the Flinders University School of Psychology were presented with the list of RIs separated into the final 13 categories. Each student was asked to browse the list of interests (including the topic of the RI, information regarding how it was pursued, and the participant’s favourite thing about the RI) and the category in which it had been placed. The students were then asked to rate how similar they believed each category was to each of the 12

other categories on a scale ranging from 1 (*Not at all similar*) to 10 (*Very similar*). Means for these similarity ratings were calculated. Categories were matched on the basis of being the least similar (i.e., the lowest mean similarity rating), and each RI was paired with a non-RI from this category. This process was undertaken to reduce the chance that the non-RI would remind the participant of their RI (e.g., if the RI 'Robotics' from the category 'Vehicles and Machines' was paired with the non-RI 'Computer Programming' from the 'Computers and Technology' category, the similarity of the non-RI may have reminded the participant of their RI. The non-RI 'Horse training' from the category 'Nature and Animals' may be less likely to elicit thoughts of robotics). The pairing of the RI and non-RI took into account second and third RIs that were reported by each participant, so that the chosen non-RI was not similar to any of the reported interests.

In the cases where, between phases, participants reported a RI that was different to that reported in Phase 1 (n = 28), or the participant had reported no RI in Phase 1 but reported a RI prior to Phase 2 (n = 12), both the researcher and research assistant placed the new RI into one of the 13 categories, blind to the choice of the other. Inter-rater reliability was calculated between the two researchers for the categorisation of this new RI data and was found to be almost perfect, k = .94 (Landis & Koch, 1977). The RIs that had been categorised differently were discussed, and agreement was reached on their categorisation. These RIs were then paired with a non-RI from the appropriate category. See Table 4 for an example of RI and non-RI pairing.

Table 4

Example of the Pairing of RI and Non-RIs

RI	Paired non-RI
Pharmacology	Dressage
Archery	Politics
Vintage radio restoration	Gardening
Warhammer	Horse training
Art history	Weight lifting

In total, 16 scenarios were prepared for each participant. Eight of these scenarios were tailored to their RI (four crime, four no crime), and eight scenarios included the chosen dissimilar non-RI (four crime, four no crime). Approximately 800 unique scenarios were created in total. The two sets of eight scenarios each participant listened to were the same with the exception of the RI/non-RI information that was embedded.

Latency measure. A four button response box was created in order to measure if, and how quickly, individuals with ASD could recognise the suspicious activity that occurred in the crime scenarios. The response box displayed four coloured, high tactile feel industrial buttons which were spaced 50mm apart. The buttons were labelled ‘May be suspicious’, ‘Definitely suspicious’, ‘No longer suspicious’, and ‘Nothing was suspicious’. See Figure 3 for an image of the response box.

Figure 3. Response box for the Crime Recognition task.

The response box was created using a USB-6008OEM National Instruments board, which interfaced using National Instruments NIMAX software into the NeuroBehavioural Systems Presentation program as a port device, allowing detection of the actuation of the response box buttons.

Participants were informed that for the purpose of the task 'suspicious' was defined as "Feeling that a person's behaviour or a situation is questionable, dishonest, wrong, and/or illegal". Participants were asked to listen to the scenarios and try to imagine that the events were happening in real life. They were instructed that while they were listening to the audio scenarios, they were to press a button as soon as they thought it appropriate to do so. Each button could be pressed at any time they felt appropriate, however each button could only be pressed once during each scenario, and only one button could be pressed at a time. The following instructions were displayed on screen prior to the task:

"This task will involve you listening to some short scenarios which will play on the laptop. Please listen to each scenario, try

> to imagine the events happening in real life, and press the buttons on the box in front of you as per the instructions below: If you think that something that is happening in the scenario MAY BE SUSPICIOUS, please press the YELLOW button as soon as you have that thought. If you think that something that is happening in the scenario is DEFINITELY SUSPICIOUS, please press the RED button as soon as you have that thought. If you have pressed the yellow or red button and change your mind so that you NO LONGER THINK THAT ANYTHING IS SUSPICIOUS, please press the GREY button as soon as you have that thought. If you DON'T THINK THAT ANYTHING WAS SUSPICIOUS throughout the scenario, please press the WHITE BUTTON at the end of the story".

A laminated paper copy of the instructions and the definition of suspicious were visible to participants throughout the length of the task.

Industrial high tactile feel buttons were used to decrease the likelihood that a button could be pressed accidently, and to provide participants with a tactile indicator that the button had been pressed correctly. Additionally, while the audio scenarios were playing the screen remained black, and a circle the colour of the pressed button was presented on screen as a visual indicator that a button had been pressed. Prior to listening to the scenarios, participants were presented with a screen asking them to press each of the buttons so that they received feedback regarding the pressure required to press the buttons. This test was included to prevent a participant thinking that they had pressed a button when they had not.

Practice scenarios. Two practice scenarios were created to be presented prior to the crime and no crime scenarios, to ensure that participants could hear and attend to the audio, and correctly operate the response box. The first practice scenario described two lifeguards working at a local pool assisting a small boy, and did not include criminal behaviour. Therefore, it was only appropriate to press the 'Nothing was suspicious' button. The second practice scenario described the protagonist as a 'get away' driver for two individuals committing theft, and thus did include criminal behaviour. Neither of the practice scenarios referenced an interest. See Figure 4 for a flow chart of the Crime Recognition task.

Considerations. As individuals with ASD may have difficulty interpreting non-literal language (Happé, 1993), each of the scenarios was worded using language that could be interpreted literally. Care was taken to ensure that the names of the protagonists did not match the names of any of the participants. Both male and female sexes were equally represented in the protagonists described in the scenarios.

After the presentation of each of the scenarios, participants were asked three multiple-choice questions which served as checks to determine whether they had attended to the audio. Each of the three questions had one correct answer and two foils. The questions enquired about events referred to throughout the scenarios so that attention was required throughout in order to respond to all questions correctly. The first question referred to something that occurred within the first 100 words of the audio script, the second between 101 and 300 words, and the third question something that occurred between 301 and 450 words of the script.

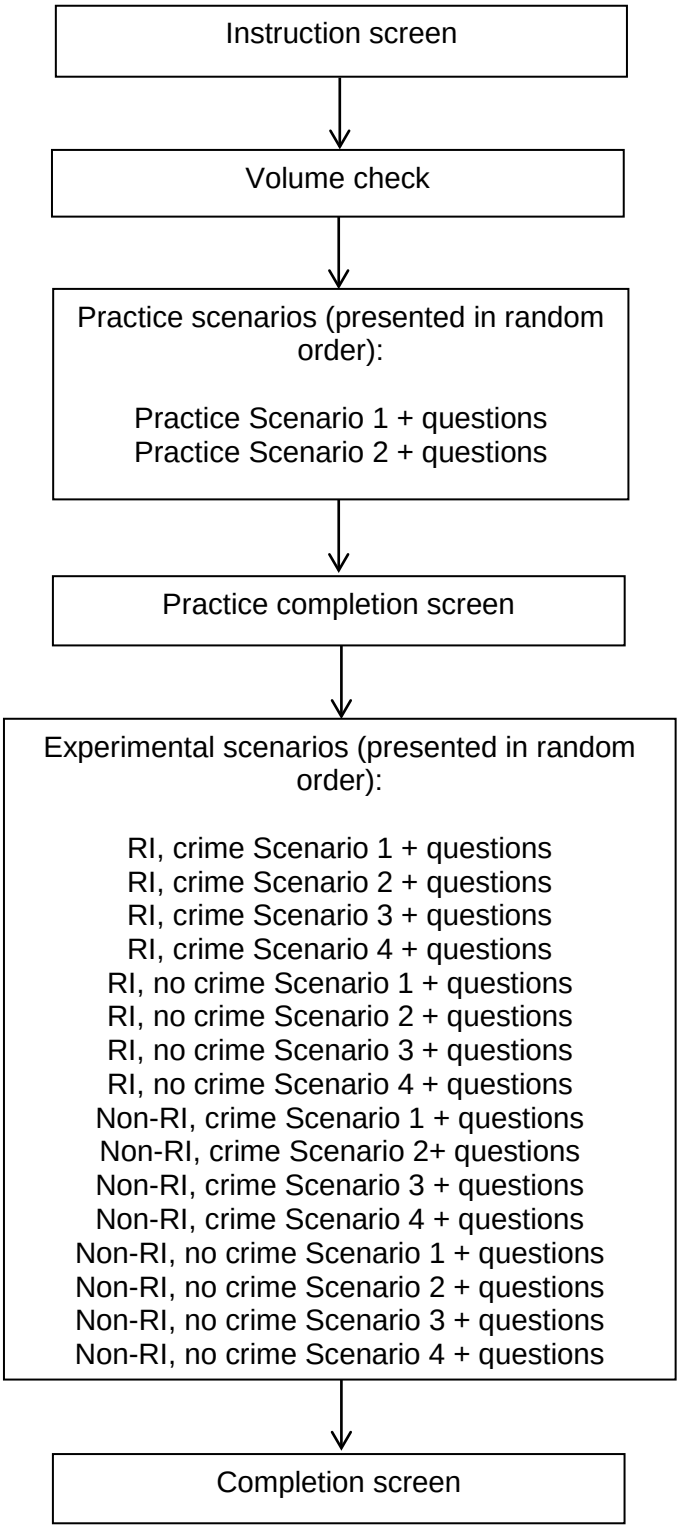

Figure 4. Flowchart for the Crime Recognition task.

For example, the first question for crime Scenario 1 (as referred to in Figure 1.1 and Figure 1.2), was “The scenario you just heard was about a young woman named Cherie. Why did Cherie move house?” a) “She wanted a bigger bedroom”, b) “She wanted to buy her own house”, and the correct response, c) “She wanted to find a house with cheaper rent”. See Appendix E for all of the multiple-choice questions. Participants were then presented with two further questions; one question to assess their understanding of the events in the scenario (“Please describe in one short sentence what you believe happened in the scenario you just heard”), and one question to assess any difficulty they may have had keeping track of the scenario while listening to it (“Please rate on a scale of 0-10 how difficult you found it to concentrate on what was happening in the scenario you just heard. A score of 0 reflects that you found it ‘Not at all difficult’ to concentrate and a score of 10 reflects that you found it ‘Very difficult’ to concentrate”). For the latter question, participants were presented with a rating scale with anchors between 0 and 10.

Procedure.

Pilot testing the Crime Recognition task.

No autism spectrum disorder diagnosis. Prior the main study, a random selection of the crime and no crime scenarios were presented to 20 staff and PhD students in the School of Psychology who did not have a diagnosis of ASD in order to determine whether the task instructions made sense, and whether the two types of scenario (i.e., crime, no crime) could be accurately differentiated. Participation occurred at the Flinders University campus. These staff and students were aged between 22 and 52 years (M = 30.6, SD = 9.3), and the majority were female (n = 18). As the pilot participants did not have a diagnosis of ASD and

therefore were not expected to have interests as intense as the individuals with ASD, they were presented with scenarios including one of the RIs reported by the participant sample in Phase 1. Scenarios were created that were tailored to five different RIs (i.e., model trains, loom bands, The Closer [television show], genealogy, and sport), and two pilot participants listened to scenarios referencing each of these RIs. Each pilot participant listened to two crime and two no crime scenarios that were presented in random order. After listening to the scenarios, these participants were asked if they had any interests to ensure that their responses were not influenced by the RI included in the scenarios. The audio scenarios were presented to participants on a Dell Latitude E6530 laptop with Sennheiser high passive noise attenuating headphones.

Of the 40 crime scenarios played, 38 were reported as being 'Definitely Suspicious'. The majority of the no crime scenarios were reported as not suspicious (72.50%). Eleven of the 40 no crime scenarios (27.50%) were reported as 'May be suspicious', with six of these scenarios (54.55%) reported later as 'No longer suspicious'. The presented RI did not match any interest held by the pilot participants.

Autism spectrum disorder diagnosis. Four individuals with a diagnosis of ASD who participated in the first phase of data collection, but who did not report having a RI in Phase 1 participated in the pilot phase of the study. Participants were aged between 22 and 38 years of age (M = 27.5, SD = 7.2), and were two males and two females. Sessions took place at the university campus (n = 1), and at participants' homes (n = 3), which were up to 35 kilometres from the university. As these participants reported that they did not have an interest in Phase 1, they were presented with the same five sets of scenarios as the non-ASD

pilot participants. After they had listened to the scenarios participants were asked to complete the RIs questionnaire to ensure they had not developed an interest between Phase 1 and pilot testing that may have influenced their response to the scenarios. These individuals were presented with the scenarios to ensure there were no issues with comprehension of the instructions or the wording of the scenarios (e.g., regarding non-literal language). Participants were asked for their feedback after participation regarding any suggested changes that would make the task easier to follow.

All four pilot participants reported the crime scenarios as being 'Definitely suspicious'. Half of the eight no crime scenarios were reported as not suspicious (50%). Three of the no crime scenarios (37.50%) were reported as 'May be suspicious', with two of these scenarios (25%) reported later as 'No longer suspicious'. One of the eight no crime scenarios was reported as 'Definitely suspicious', but later reported as 'No longer suspicious', demonstrating that participants could differentiate between the crime and no crime scenarios. While three of the four participants stated they had developed an interest between Phase 1 and pilot testing, these were not similar to the interest they were presented with in the scenarios (e.g., a participant who was presented with scenarios referencing 'Loom bands' reported an interest in 'Australian sign language'). Each participant indicated the task instructions could be followed and the audio recordings could be heard clearly. As a result of participant feedback, minor changes were made to the task instructions and the wording of questions to improve clarity.

Autism spectrum disorder experimental sample. The second phase of the study took place in a quiet location nominated by the participant (i.e., the

university campus [*n* = 61], their place of residence [*n* = 39] or a library [*n* = 1]). As in Phase 1, in the cases where participants' completed the study at their place of residence, a second individual (an undergraduate psychology student) attended the session as a chaperone. Sessions took place in various suburbs of Adelaide and towns in South Australia, which were up to a distance of 90 kilometres from the Flinders University campus.

Prior to the beginning of the task, participants were presented with a short audio recording and were asked to adjust the volume according to their preference. The recording stated "Please adjust the volume so that you can hear this recording clearly. When you have adjusted the volume to a level that suits you, please inform the researcher." Participants were then informed that they would be listening to a number of recorded scenarios, and were presented with the Crime Recognition task. The audio scenarios were presented to participants on a Dell Latitude E6530 laptop with Sennheiser high passive noise attenuating headphones. Each participant was then presented with the abovementioned two practice audio scenarios (one crime, one no crime) to assess their ability to hear the scenarios and use the response box appropriately, followed by 16 further scenarios (eight of which were RI scenarios; half crime, half no crime, and eight of which were non-RI scenarios; half crime, half no crime). Scenarios were presented in random order. If a button was not pressed throughout the scenario, the sentence "Please press a response button" appeared on screen until a button was chosen, so that all participants were required to press at least one button in response to each scenario. Task instructions and the definition of 'suspicious' for the purpose of the task remained available to participants for the duration of the session on a laminated sheet of paper. Completion of the Crime Recognition task

took approximately 2 hours. Due to the length of the task, the software included mandatory breaks after listening to each group of six scenarios (i.e., two practice trials, four test trials, break, six test trials, break, six test trials). Participants were informed they could take a break for as long as they required, although the software would not allow the task to be resumed for a minimum of 30 seconds. Participants were also informed that they could request breaks at any point throughout the task.

Participants then completed the RI questionnaire for a third time to ensure the RI incorporated in the scenarios remained their current interest, and to ensure that the two non-RI scenarios did not match an interest that may have developed between the different phases of the study. Session length for this phase ranged from 2 to 3.5 hours. Figure 5 displays a flowchart of the stages of the study.

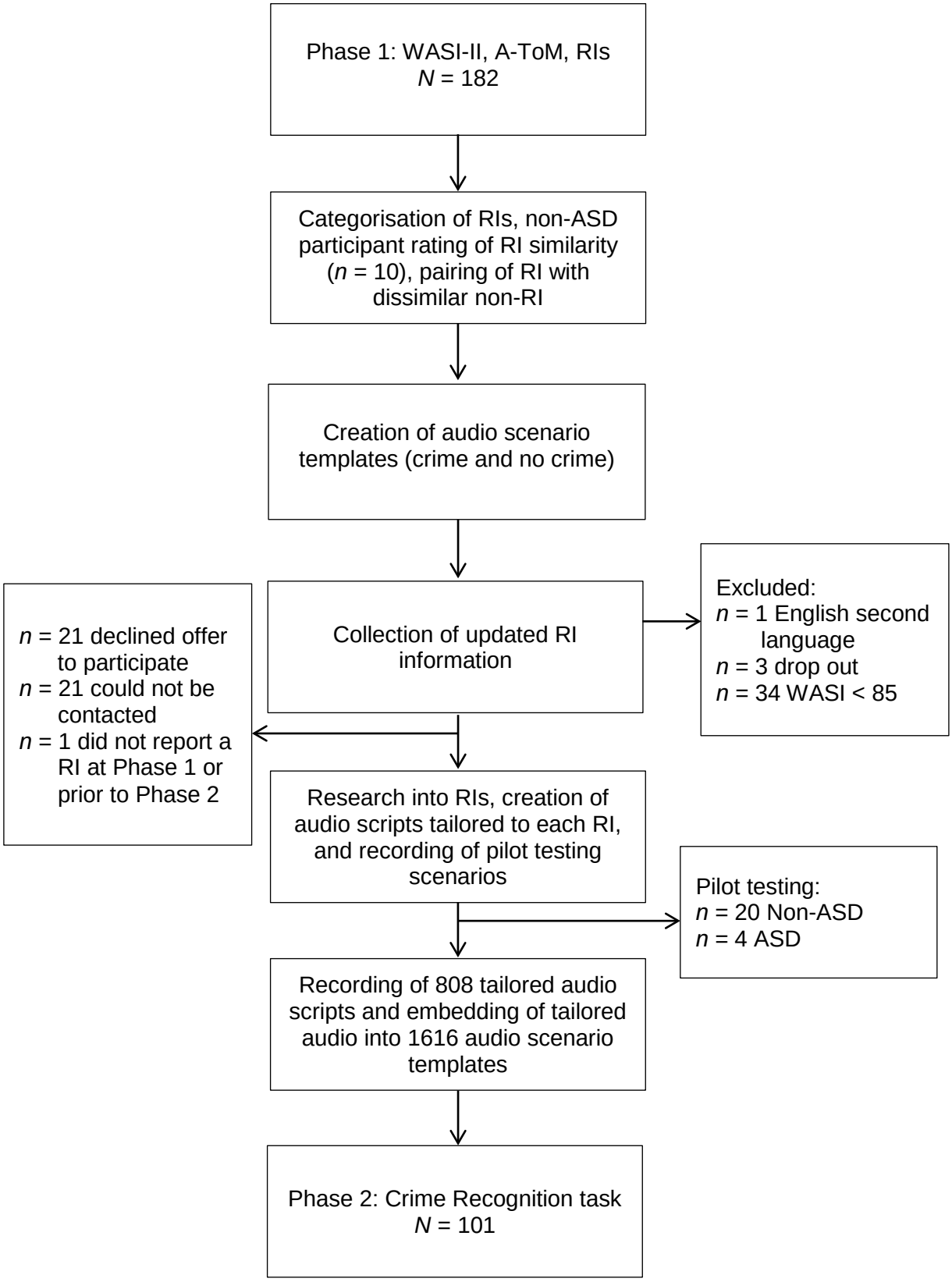

Figure 5. Flowchart illustrating the different stages of the study.

Chapter 3: Results

Participant Characteristics

Table 5 displays the demographic information for participants in Phase 1 and those who returned to participate in Phase 2.

Table 5

Participant Characteristics Across the Two Phases of the Study

Phase	Gender	Age			FSIQ		
		n	*Range*	*M(SD)*	*n*	*Range*	*M(SD)*
1	Male	128	16-78	27.6 (13.1)	120	59-146	103.5 (16.5)
	Female	54	17-62	31.4 (13.0)	49	70-132	105.1 (14.4)
2[a]	Male	71	16-60	26.8 (11.9)	71	85-146[b]	108.2 (13.5)
	Female	30	18-62	32.0 (13.8)	30	87-122	108.0 (10.0)

Note. FSIQ = full scale intelligence quotient. The results from this section onwards will include only data for participants who took part in both Phase 1 and Phase 2 of the study. [a] All participants in Phase 2 had participated in Phase 1. [b] Participants in Phase 1 were invited to participate in Phase 2 if they had a FSIQ above 85.

Data Preparation

Excluded participants. During the Crime Recognition task, participants were asked to press a response button/s for each scenario when they thought something ‘May be suspicious’, was ‘Definitely suspicious’, was ‘No longer suspicious’, or if ‘Nothing was suspicious’. Thirteen participants pressed ‘Definitely suspicious’ during a no crime scenario (i.e., a scenario where the protagonist did not engage in criminal activity) without correcting by later pressing ‘No longer suspicious’ or ‘Nothing was suspicious’; however, nine participants did this on more than one occasion. None of the participants without a diagnosis of autism spectrum disorder (ASD) who pilot tested the study pressed the ‘Definitely suspicious’ button during the no crime scenarios. Given these

participants responded inappropriately (i.e., reported both crime and no crime scenarios as definitely suspicious), it was decided that the nine participants who did this on more than occasion may not have understand the nature of the task (i.e., these participants seemed to have had difficulty differentiating between the experimental [crime] and control [no crime] scenarios). Further, the response patterns of these participants for the remaining no crime scenarios was examined, which, in almost each case consisted of multiple button presses, including the buttons indicating suspicious behaviour. While the task was designed to assess the ability to detect suspicious behaviour (and the responses of these participants suggest they performed poorly), given the disorganised response patterns of these participants, it was determined that the response latency for the crime scenarios may not have been a valid indicator of suspicious activity for these participants, and their data were excluded from the analyses assessing the hypotheses. However, the data for these nine participants were retained for comparison with the data from the remaining participants (see 'Exploratory analyses', page 120).

Missing data. Data were analysed using IBM SPSS Statistics version 23. Missing values analysis was conducted. There were no missing values for the Adult Theory of Mind (A-ToM) or WASI-II tasks. Two participants ceased their participation prior to completion of the Crime Recognition task, missing three and six of the audio scenarios. One of these participants was later excluded from analyses that included the restricted interest (RI) scenarios[15] (i.e., those which included references to each participant's unique RI). As the other participant missed only the no crime scenarios, his data were retained for the crime scenario analyses.

[15] While this participant reported his RI (which was congruent with that presented in the RI scenarios), he failed to complete the RI questionnaire.

Four participants stated that they did not have a RI at Phase 2 (after having previously reported a RI). In addition, three individuals failed to complete the RI questionnaire at Phase 2 (one of whom withdrew from the study as above), despite reporting a RI congruent with that presented in the RI scenarios. These cases were excluded from analyses including the RI variables.

Following each of the 16 scenarios in the Crime Recognition task, participants were asked to type one sentence describing what they believed had occurred. Seven participants failed to type one or more of these sentences. The response pattern of these participants was assessed. Six of these seven participants missed no more than three of the 16 sentences. They correctly answered at least two of the three questions used as manipulation checks for these scenarios, and were therefore retained in the dataset. The remaining participant failed to complete eight of the 16 sentences, however for the scenarios missed, he answered all 24 manipulation check questions correctly, and was therefore retained in the dataset. As a result, after accounting for missing data, $n = 7$ participants were excluded from analyses including the RI variables, leaving $n = 85$ participants for these analyses.

Assessing univariate outliers. Univariate outliers were assessed for the WASI-II (Perceptual Reasoning Index [PRI] and Verbal Comprehension Index [VCI] subscales), A-ToM (Social and Physical subscales), RI questionnaire, and Crime Recognition tasks. An outlier was considered to be any score that fell outside the range of $z \pm 3.29$ (i.e., z boundaries corresponding to the criterion of $\alpha = .001$; Tabachnick & Fidell, 2013). One outlier was identified for the number of hours spent weekly in pursuit of the RI ($z = 4.18$; 84 hours). As responses for this variable were verbally confirmed with participants at the time of participation,

this response was considered a true data point (rather than an error), and as such was changed to be one unit above the second highest case (61 hours/week; as per Tabachnick & Fidell, 2013), and retained for analyses.

Four outliers were identified for the Crime Recognition task. One participant responded to a crime scenario by pressing 'Definitely suspicious' earlier than the other participants (z = - 3.41; 29507ms). This case was assigned the next most extreme value minus one unit (84576ms; as per Tabachnick & Fidell, 2013) and was retained for analyses. Four participants responded with 'May be suspicious' later than the acceptable standard (z = 3.29) as compared to the other participants for four different crime scenarios (z = 3.33, z = 3.35, z = 3.43, and z = 3.57). These cases were assigned the next most extreme value plus one unit (225260ms, 226190ms, 241473ms, and 182327ms; as per Tabachnick & Fidell, 2013).

Assessing unidimensionality of constructs.

Adult Theory of Mind. Item-total correlations[16] were acceptable for the A-ToM Social subscale (r = .36 - .52; Field, 2005). The item-total correlations for the A-ToM Physical subscale were below .30 and hence were not considered acceptable (Field, 2005; r = .13 - .22). These item-total correlations were below that reported by the authors (r =.25 - .34; Brewer et al., 2016). Given the A-ToM Physical subscale was not included in analyses assessing the hypotheses; the measure was retained, only for the presentation of descriptive statistics.

Restricted interests. The RI questionnaire was split into four separate measures of intensity: Number of hours, Absorption, Interruption, and

[16] Recent research has suggested that Cronbach's alpha is not a measure of reliability and is a questionable index of internal consistency (e.g., Sijtsma, 2009). However, Cronbach's alpha is commonly presented within the social sciences has therefore been presented here for the reader. Cronbach's alpha for the A-ToM Social and Physical subscales were α = .68 and α = .42, respectively.

Importance. Number of hours was a measure of the number of hours spent in pursuit of the RI per week, Absorption was a measure of the intensity of absorption when pursuing the RI (e.g., "When you are pursuing or engaging in this interest, do you ever forget to eat?"), Interruption was a measure of how the individual responded to interruption while in pursuit of the RI (e.g., "If you are interrupted while you are pursuing or engaging in the interest, and have to stop, do you find it distressing?"), and Importance was a measure of the importance of the RI to the individual (e.g., "When I am pursuing or engaging in this interest I feel happy"). The item-total correlations[17] were assessed for each subscale (aside from Number of hours).

The Absorption, Interruption and Importance subscales had acceptable item-total correlations of r = .35-.65, r = .39-.66 and r = .53-.81, respectively. Each of the subscales was retained for analyses.

Assessing normality of the distribution of scores. Standardised skewness and kurtosis indices (z) were calculated to assess the normality of distribution of scores. A criterion of $\alpha = .001$ was employed, which corresponds to z boundaries of ± 3.29 (see Tabachnick & Fidell, 2013). Skewness and kurtosis indices fell within the acceptable range for the FSIQ, PRI, VCI, A-ToM Physical, and RI Number of hours, RI Absorption and RI Interruption variables. Scores for the A-ToM Social were negatively skewed (z-skewness = - 5.09) as were scores for RI Importance (z-skewness = - 4.25).

Skewness and kurtosis indices were assessed at scenario level for the latency of responses of 'May be suspicious' and 'Definitely suspicious' for the crime scenarios in the Crime Recognition task. Responses for four of the 'May be

[17] Cronbach's alpha for the subscales were as follows: Absorption $\alpha = .70$, Interruption $\alpha = .80$ and Importance $\alpha = .87$.

suspicious' variables were positively skewed (one RI scenario, three non-RI scenarios; *z*-skewness = 4.97, 4.16, 4.90, 3.31). Responses for two of the 'Definitely suspicious' variables were negatively skewed (one RI scenario, one non-RI scenario; *z*-skewness = -3.44, -3.81). The skewed variables were not transformed. Nonparametric analyses were conducted throughout to account for these non-normal distributions.

Assessing the validity of the Crime Recognition task.

Assessment of response latency. At the beginning of each scenario the protagonist/s were introduced. Nothing suspicious occurred during this first paragraph of the scenario (e.g., "Cherie is a young woman in her 20s who is studying social work at university. Cherie really enjoys [RI data]. She spends many hours each day [engaging in RI], as she just loves [favourite data]. Cherie currently lives on her own, but is finding it hard to pay rent while working on a casual basis…"). During pilot testing of individuals without a diagnosis of ASD neither of the buttons 'May be suspicious' nor 'Definitely suspicious' were pressed during these sections of each scenario.

Responses were screened to see if any of the participants in the experimental sample pressed the 'May be suspicious' or 'Definitely suspicious' button during this first paragraph, which could indicate inattention (i.e., pressing a response button without listening to the scenario) or difficulty detecting suspicious behaviour (i.e., pressing a response button when nothing suspicious had yet to occur). One response of 'Definitely suspicious' occurred prior to the completion of the introduction of the protagonists in one of the crime scenarios. These data were however retained because after each scenario participants were asked to write one sentence about what they believed had occurred. The

participant's explanation of this scenario was correct, suggesting that he did listen to the scenario. This response was, however, an outlier, and was altered to one unit below the next most extreme value (as mentioned above).

Attention to scenarios. The following analyses were undertaken to determine whether participants had attended to, and engaged in, the Crime Recognition task.

Assessing attention. After the presentation of each of the 16 scenarios, participants were asked three multiple-choice questions that enquired about events referred to throughout the scenarios. These events were unrelated to suspicious activity, and were included as a check that participants had paid attention to the task. On average, participants correctly responded to 45 of the 48 questions posed (M = 45.61, SD = 2.56), which was interpreted to suggest that participants did attend to the task. No participant responded incorrectly to less than 36 of the 48 items, which was considered acceptable.

Self-reported attention. After each scenario, participants were asked to rate the difficulty they had listening to the scenario on a scale from 1-100, with a higher number indicating more difficulty. This check was included to assess whether participants found it more difficult to attend to either the RI or non-RI scenarios. A Wilcoxon signed-rank test[18] was conducted to assess any differences in self-reported difficulty for the two types of crime scenarios (i.e., RI, non-RI). Participants reported having less difficulty attending to the four crime scenarios involving their RI (Mdn = 58) compared to non-RI crime scenarios (Mdn = 66), Z = -2.27, p = .023, r = -.26[19].

[18] The effect sizes for the Wilcoxon signed-rank test (r) was calculated from the z score.
[19] The magnitude of effect size for r can be interpreted using Cohen's criteria; namely, .10, .30, and .50 as small, medium, and large effects, respectively (see Cohen, 1992).

Understanding of scenarios. After each scenario participants were asked to type a sentence about what they believed had happened in order to determine whether, by the conclusion of each scenario, the listener could determine what had occurred, and to ensure the scenarios were not too complex. These sentences were coded to be correct (i.e., the individual understood a crime had taken place), or incorrect/unclear. In the crime scenarios, between 87-97% of responses were correct. The remaining responses were either incorrect, missing (i.e., the respondent left the section blank), or the respondent misunderstood the instructions regarding sentence length and wrote a sentence that was too long for the program to capture. For the no crime scenarios, 81-96% of participants correctly identified that a crime had not taken place. The remaining responses were incorrect, missing, or cut short. These responses indicate that by the end of the scenario the majority of participants understood that suspicious activity had or had not occurred, and suggests that the scenarios were not too complex.

Embedded information regarding the restricted interest. Participants completed the RI questionnaire at the end of Phase 2 to determine whether the RI incorporated into the eight RI scenarios remained their interest at the time of participation. In six cases the RI incorporated into the audio was not reported at the end of Phase 2 (i.e., it was no longer considered to be an interest). These cases were excluded from analyses including the RI scenarios, but retained for analyses including the non-RI scenarios[20].

One participant reported that the non-RI included in the audio scenarios was an interest at Phase 2. This case was therefore excluded from analyses including non-RI scenarios (but retained for analyses including the RI scenarios).

[20] The RI scenarios and Non-RI scenarios were treated as separate dependent variables.

Therefore, after accounting for missing data and exclusions, there remained *n* = 79 cases for analyses including the RI scenarios, and *n* = 91 cases for analyses including the non-RI scenarios.

Descriptive Statistics

Independent variables. Means, standard deviations, and the range of scores for each independent variable are presented in Table 6. As can be noted in Table 6, scores for the A-ToM Social and Physical subscales spanned almost the entire range of possible scores. While scores for RI Number of hours and RI Importance demonstrated variability, scores for RI Absorption and RI Interruption had limited variability and low means (see Table 6). While it may have been useful to have evaluated overall RI intensity by combining the four different RI subscales, this was not conducted given the weak correlations between the subscales, which suggested that each of the subscales represented a separate construct.

Dependent variables. During the Crime Recognition task, participants were presented with 16 scenarios. Eight scenarios were tailored to their RI (four crime, four no crime), and eight scenarios included the dissimilar non-RI (four crime, four no crime). Each button could be pressed no more than once per scenario. Tables 7 and 8 display the number of participants that pressed each button during (or after) each scenario, and the latency of these responses.

Table 6

Means, Standard Deviations and Range for the IQ, ToM, and RI Measures

Measure	*n*	*M (SD)*	Range
Age (years)	92	28.66 (12.89)	16-62
PRI	92	109.38 (13.81)	76[21]-139
VCI	92	106.87 (12.73)	81-149
FSIQ	92	109.16 (12.41)	85-146
A-ToM Social	92	9.34 (2.26)	2-12[a]
A-ToM Physical	92	7.78 (2.40)	2-12
RI- Number of hours	79	21.80 (13.75)	4-61
RI- Absorption	79	1.92 (1.77)	0-7[b]
RI- Interruption	79	3.84 (2.82)	0-11[c]
RI- Importance	79	5.87 (2.06)	0-8[d]

[a] The highest possible score for A-ToM Social and Physical subscales was 12. [b] The highest possible score for the RI Absorption scale was 9. [c] The highest possible score for RI Interruption was 16. [d] The highest possible score for RI Importance was 8.

As displayed in Table 7, in each of the crime scenarios only approximately half of the participants pressed 'May be suspicious' (53 - 71%), while almost all participants pressed 'Definitely suspicious' (88 - 97%). Therefore, it is possible that the data for these two types of responders (i.e., those who pressed 'Definitely suspicious' after pressing 'May be suspicious' and those who pressed only 'Definitely suspicious') were not as comparable as they would have been if there was only one response button for indicating suspicious activity, or if all participants had pressed both response buttons. That is, it is likely that in

[21] While only individuals with a FSIQ above 85 were invited to participate in Phase 2, some individuals had either a VCI or PRI score below 85. These participants were invited to participate in Phase 2 as it has been established that a number of individuals with ASD have an uneven IQ profile (e.g., Happé, 1994b).

each scenario the participants in each group were employing a different criterion or rule before responding, or they may have had a different ability to detect the behaviour. For example, it is possible that individuals who pressed ‘May be suspicious’ considered when to press ‘Definitely suspicious’ more carefully than the participants who pressed only ‘Definitely suspicious’, as they had already provided some indication that they thought something dubious might have been happening. Individuals who pressed only ‘Definitely suspicious’, however, may have responded at the first cue where they thought something was suspicious.

Table 7

Mean Latency (Secs) for the Crime Scenarios

			RI (*n* = 79)		Non-RI (*n* = 79)		Non-RI (*n* = 91)	
Scenario No.	Duration of scenario (s)	Response button	*n*[a] (%)	*M (SD)*	*n*[b] (%)	*M(SD)*	*n*[c] (%)	*M (SD)*
1	233.40	May be suspicious	45 (57)	131.77 (30.86)	51 (65)	125.91 (31.53)	59 (65)	125.75 (30.29)
		Definitely suspicious	74 (94)	181.83 (42.66)	75 (95)	182.15 (44.17)	85 (93)	183.57 (44.32)
		No longer suspicious	1 (1)	185.01	1 (1)	90.24	1 (1)	90.24
		Nothing was suspicious	4 (5)	65.25 (30.92)	3 (4)	66.76 (29.84)	3 (3)	91.97 (66.76)
2	237.04	May be suspicious	44 (56)	108.41 (29.61)	47 (59)	112.17 (41.25)	54 (59)	113.93 (41.33)
		Definitely suspicious	75 (95)	161.82 (57.05)	76 (96)	167.38 (55.68)	88 (97)	169.89 (56.50)
		No longer suspicious	0	-	1 (1)	110.04	1 (1)	110.04
		Nothing was suspicious	3 (4)	44.28 (22.19)	2 (3)	53.23 (25.30)	2 (2)	53.23 (25.30)
3	238.40	May be suspicious	49 (62)	129.98 (52.83)	56 (71)	135.36 (50.56)	64 (70)	134.24 (48.67)
		Definitely suspicious	71 (90)	193.85 (47.81)	72 (91)	194.94 (46.36)	83 (91)	197.24 (46.05)
		No longer suspicious	0	-	0	-	0	-
		Nothing was suspicious	5 (6)	111.35 (86.43)	3 (4)	81.97 (54.27)	3 (3)	81.97 (54.27)
4	232.80	May be suspicious	42 (53)	127.21 (39.11)	43 (54)	128.45 (41.66)	50 (55)	128.87 (39.35)
		Definitely suspicious	73 (92)	164.75 (46.21)	71 (90)	167.18 (50.09)	80 (88)	170.07 (50.73)
		No longer suspicious	1 (1)	135.82	1 (1)	66.19	1 (1)	66.19
		Nothing was suspicious	3 (4)	71.95 (28.68)	3 (4)	231.66 (3.37)	3 (3)	23.17 (3.37)

[a] *n* = 5 excluded due to reporting no RI at Phase 2, *n* = 6 excluded due to reporting a different RI to the audio at Phase 2, *n* = 3 excluded for failing to complete the RI questionnaire at Phase 2 (resulting in the inability to calculate RI intensity). [b] To allow for within groups comparison between RI and Non-RI conditions, this column displays results for the Non-RI scenarios for only the participants who were included in the RI analyses (*n* = 79).[c] This column includes participants who were excluded from RI analyses, but included in Non-RI analyses. *n* = 1 excluded for reporting the non-RI as a RI at Phase 2, *n* = 1 missing from non-RI Scenario 3 due to withdrawal from the study prior to this scenario.

Table 8

Mean Latency (Secs) for the No Crime Scenarios

			RI (*n* = 79)		Non RI (*n* = 79)		Non-RI (*n* = 91)	
Scenario No.	Duration of scenario (s)	Response button	*n*[a] (%)	*M (SD)*	*n*[b] (%)	*M(SD)*	*n*[c] (%)	*M (SD)*
1	215.12	May be suspicious	5 (6)	122.40 (68.58)	9 (11)	124.64 (71.66)	9 (10)	124.64 (71.66)
		Definitely suspicious	2 (3)	96.84 (12.28)	0	-	0	-
		No longer suspicious	3 (4)	174.36 (29.54)	7 (9)	189.26 (47.65)	6 (7)	183.94 (49.86)
		Nothing was suspicious	74 (94)	205.51 (34.56)	69 (87)	204.71 (37.48)	81 (89)	207.58 (35.45)
2	215.60	May be suspicious	19 (24)	169.50 (57.48)	21 (27)	164.61 (50.58)	23 (25)	162.58 (50.38)
		Definitely suspicious	0	-	0	-	0	-
		No longer suspicious	5 (5)	160.69 (38.30)	4 (5)	146.63 (50.97)	4 (4)	146.63 (50.97)
		Nothing was suspicious	63 (80)	207.61 (40.66)	62 (78)	194.73 (51.58)	70 (77)	197.78 (49.25)
3	241.77	May be suspicious	21 (27)	174.83 (58.96)	26 (33)	186.11 (52.75)	31 (34)	183.91 (54.80)
		Definitely suspicious	1 (1)	194.94	0	-	0	-
		No longer suspicious	12 (15)	207.02 (54.54)	12 (15)	191.98 (51.71)	13 (14)	195.57 (51.15)
		Nothing was suspicious	56 (71)	220.23 (57.30)	57 (72)	218.17 (57.18)	64 (70)	221.32 (54.67)
4	235.15	May be suspicious	7 (9)	132.84 (85.09)	8 (10)	148.74 (80.65)	10 (11)	180.97 (109.53)
		Definitely suspicious	1 (1)	215.49	0	-	0	-
		No longer suspicious	4 (5)	163.90 (54.29)	7 (9)	197.38 (59.59)	8 (9)	203.64 (57.94)
		Nothing was suspicious	74 (94)	219.60 (48.67)	72 (91)	216.64 (49.83)	81 (89)	219.34 (47.58)

[a] *n* = 5 excluded due to reporting no RI at Phase 2, *n* = 6 excluded due to reporting a different RI to the audio at Phase 2, *n* = 3 excluded for failing to complete the RI questionnaire at Phase 2 (resulting in the inability to calculate RI intensity). [b] To allow for within groups comparison between RI and Non-RI conditions, this column displays results for the Non-RI scenarios for only the participants who were included in the RI analyses (*n* = 79). [c] This column includes participants who were excluded from RI analyses, but included in Non-RI analyses. *n* = 1 excluded for reporting the non-RI as a RI at Phase 2, *n* = 1 missing from non-RI Scenario 3 due to withdrawal from the study prior to this scenario.

Two approaches were therefore taken in the analyses reported below in relation to the first hypothesis regarding the relationship between ToM and response latency. The first approach was an assessment of the data for both the response of 'May be suspicious', and 'Definitely suspicious', and the second approach involved examining the first button pressed per scenario. These two approaches are detailed below.

First approach to data analyses. The data for any participant who did not press either the 'May be suspicious' or 'Definitely suspicious' response button was imputed so that for the first approach to data analyses all participants were included. The information regarding data imputation is reported below (p.89).

Second approach to data analyses. Given that during each scenario only approximately half of the participants pressed the 'May be suspicious' response button, the second approach to data analysis was to examine only the first response of participants to each scenario (whether this was a response of 'May be suspicious' or 'Definitely suspicious'). This involved analysing data for those who pressed 'May be suspicious' as their first response and those who pressed 'Definitely suspicious' as their first response separately. This second approach to analyses was taken for two reasons: a) the response time for all individuals making up each variable was an indication of their first button pressed, and b) the response time for all individuals making up each variable was for the same button.

The following paragraphs regarding Hypothesis 1 will describe the first approach to data analysis (i.e., imputed data for 'May be suspicious' and 'Definitely suspicious'), followed by the second approach to data analysis (i.e., an examination of the first button pressed by each participant).

Response distribution for the Crime Recognition task. See Figures F1 to F16 in Appendix F for histograms illustrating the response pattern for each of the crime scenarios for the buttons 'May be suspicious' and 'Definitely suspicious'. Across the crime scenarios, 23-39% of participants failed to recognise behaviour was 'Definitely suspicious' until police officers were mentioned, and 18-25% of participants failed to recognise behaviour was suspicious until after the scenario had ended (when it had been made clear that criminal activity had occurred). Further, up to 14% of participants failed to press 'Definitely suspicious' during the crime scenarios, responding only with 'May be suspicious'. Taken together, the button presses suggest that up to 37% of participants for any one scenario either failed to determine that something definitely suspicious had occurred, or determined this only after the scenario had ended.

Data imputation. The Crime Recognition task required participants to make a decision regarding whether or not they thought something was suspicious. Across the crime scenarios, 27-43 participants failed to press the 'May be suspicious' button, and 3-12 participants failed to press the 'Definitely suspicious' button. An imputation rule was created to include these participants in each of the crime scenario analyses. Any participant who failed to press the 'May be suspicious' button had their response time for 'Definitely suspicious' assigned to that variable, so that the imputed response times for 'May be suspicious' effectively demonstrated the first time a participant pressed any button to indicate that something in the scenario was suspicious (and thus imputed data for 'May be suspicious' will hereafter be referred to as *First indication*). Any participant who did not press the 'Definitely suspicious' button was assigned the longest value for 'Definitely suspicious' for that scenario plus one unit (millisecond), or if their button press of 'May be suspicious' was longer than that (n = 1), the case was

assigned the time of their press for ‘May be suspicious’ plus one unit. This rule was similar to that applied to treat outlying data points (Tabachnick & Fidell, 2013). By assigning these participants the most extreme value plus one unit, the analyses take into consideration individuals who were so poor at recognising suspicious behaviour that they did not press the ‘Definitely suspicious’ button. Any participant who failed to press either ‘May be suspicious’ or ‘Definitely suspicious’ buttons (n = 3, for one scenario each) was assigned the longest ‘suspicious’ response time for that scenario (whether it was from ‘May be suspicious’ or ‘Definitely suspicious’), plus one unit (millisecond).

On occasion participants prematurely pressed the ‘No longer suspicious’ (n = 5), or ‘Nothing was suspicious’ (n = 26) buttons during the crime scenarios, but followed this by pressing the ‘May be suspicious’ or ‘Definitely suspicious’ buttons. In these cases, the ‘May be suspicious’ and/or ‘Definitely suspicious’ response times were not altered. From this point onwards it will be made clear if raw or imputed data were used for each analysis.

Benefits and limitations of using imputed response latency data. Given that each of the variables provided different information about the responses of participants, analyses were reported for both the imputed ‘First indication’ and ‘Definitely suspicious’ data.

Analyses were conducted with the ‘First indication’ data to determine whether there was a relationship between A-ToM scores and the first time each participant provided a response indicating that they had detected something suspicious. A limitation of the ‘First indication’ variable, however, was that the data represented two groups of participants, who may have pressed a response button for different reasons: those who pressed ‘May be suspicious’ (who may have been unsure if something occurring was or was not suspicious), and those

who pressed ‘Definitely suspicious’ (who may have been more confident that suspicious activity was taking place). However, this variable provided information about the first time suspicious activity was reported for each participant in the dataset, and thus was retained for analyses while acknowledging these limitations.

Analyses were also conducted with the imputed ‘Definitely suspicious’ data. This variable was of interest as unlike the responses of ‘May be suspicious’, it is possible that when participants pressed the ‘Definitely suspicious’ button, they were more confident in their belief that something dubious was occurring. Given that for each scenario most participants pressed the ‘Definitely suspicious’ button, the sample size for this variable was also large, with only a few responses having been imputed. A limitation of this variable, however, was that it also included two groups: those who have already pressed a response button to indicate suspicious activity, and those who have not. While this did not mean the two groups of responders for this variable were not comparable, as mentioned above, this may have somewhat hindered interpretation of the data given for some participants they had already pressed a response button.

RI and non-RI scenarios. Several Wilcoxon signed-rank tests were conducted to examine if there were differences in response latency between the RI and non-RI crime scenarios[22] for both the ‘First indication’ of suspicious behaviour and the ‘Definitely suspicious’ (imputed) button presses. Response latency for the ‘First indication’ of suspicious behaviour for Scenario 1 was later for the RI condition (*Mdn* = 123771.50ms), than the non-RI condition (*Mdn* =

[22] As the Wilcoxon signed-rank test is the nonparametric equivalent of a paired samples test, only participants who reported a RI matching the audio scenarios in the Crime Recognition task were included in this analysis. The one participant who reported the non-RI as an interest was also excluded.

120809.50ms), $Z = -2.05$, $p = .040$, $r = -.23$. There were no differences for the remaining pairs of scenarios (i.e., RI and non-RI). See Tables G1 and G2 in Appendix G for the comparisons of each pair of scenarios.

The Relationship between Theory of Mind and Response Latency

Correlations between theory of mind and latency. To investigate Hypothesis 1, which was to determine whether there was a relationship between theory of mind (ToM) and response latency; correlations between the A-ToM Social subscale and Crime Recognition task variables after partialling out VCI[23] scores were examined for each of the RI and non-RI scenarios using Spearman's rank-order correlations with bootstrapped bias corrected and accelerated (BCa) 95% confidence intervals. Bootstrapping (Efron & Tibshirani, 1994) is a nonparametric method that creates a 95% CI around the parameter of interest. The bootstrapping procedure treats the sample data as a population and reanalyses random samples of the data (bootstrap samples) multiple times[24]. Correlations were conducted between A-ToM Social scores and response latency for the 'First indication' of suspicious behaviour (i.e., the imputed data for the response of 'May be suspicious'), and for the latency of the responses of 'Definitely suspicious'.

The Spearman's rank order correlations are presented in Tables 9 and 10. The correlations indicated that latency for all responses for scenarios were positively correlated, suggesting consistency in response from one scenario to the next despite each of the crime scenarios pertaining to a different situation, and

[23] VCI was partialled out due to the verbal nature of the Crime Recognition task. The same pattern of results occurred when partialling out PRI and VCI to when only VCI was partialled out.

[24] The default number of bootstrap samples analysed in IBM SPSS Statistics is 1000. Unless otherwise stated, 1000 bootstrap samples were conducted in the following analyses.

resulting in a different offence. All correlations between A-ToM Social[25] and response latency were in the hypothesised direction, with lower A-ToM Social scores being associated with longer response time. However, these correlations were weak, and only two were statistically significant: the 'First indication' of suspicious behaviour for Scenario 4 indicated a statistically significant negative relationship between A-ToM Social score and response latency, $r_s(76) = -.22$ (95% CI -.42, -.01), $p = .050$, and the Scenario 1 (RI condition) response of 'Definitely suspicious' indicated a statistically significant weak negative relationship with A-ToM Social score, $r_s(76) = -.28$ (95% CI -.45, -.05), $p = .014$.

When VCI was not partialled out, the correlation between VCI and A-ToM Social was $r_s = .32$, and was statistically significant.

[25] As a part of a larger study the participants also completed the Strange Stories task (Happé, 1994a). Spearman's rank order correlations were also conducted between the Strange Stories Social subscale and response latency for each scenario in the Crime Recognition task, which resulted in the same pattern of small, negative correlations.

Table 9

Spearman's Rank Order Correlations for ToM and Response Latency for Each RI Crime Scenario with VCI Partialled Out (n = 79).

Variable	1	2	3	4	5	6	7	8	9
1. A-ToM Social	-	.							
2. Scenario 1 first indication	-.19	-							
3. Scenario 2 first indication	-.17	.71**†	-						
4. Scenario 3 first indication	-.06	.51**†	.44**†	-					
5. Scenario 4 first indication	-.22†	.49**†	.59**†	.53**†	-				
6. Scenario 1 definitely suspicious	-.28*†	-	-	-	-	-			
7. Scenario 2 definitely suspicious	-.09	-	-	-	-	.51**†	-		
8. Scenario 3 definitely suspicious	-.10	-	-	-	-	.51**†	.50**†	-	
9. Scenario 4 definitely suspicious	-.11	-	-	-	-	.39**†	.46**†	.56**†	-

* $p < .05$. ** $p < .01$. † 95% bootstrapped CI does not span zero

Note. Correlations between the 'First indication' of suspicious behaviour and 'Definitely suspicious' are not shown. Due to the imputation rule that was created, some of the response times for these two categories would be the same; therefore the correlation coefficient would be misleading. These variables were treated as separate dependent variables. When VCI was not partialled out, the correlation between A-ToM Social and VCI was $r_s = .32$, and the correlations between A-ToM Social and the scenarios were -.24, -.10, -.03, -.18 for 'First indication', and -.24, -.08, -.14, -.16 for definitely suspicious. VCI was not significantly correlated with response latency for any of the scenarios.

Table 10

Spearman's Rank Order Correlations for ToM and Response Latency for Each Non-RI Crime Scenario with VCI partialled Out (n = 91).

Variable	1	2	3	4	5	6	7	8	9
1. A-ToM Social	-	.							
2. Scenario 1 first indication	-.10	-							
3. Scenario 2 first indication	-.11	.64**†	-						
4. Scenario 3 first indication	-.03	.59**†	.62**†	-					
5. Scenario 4 first indication	-.16	.73**†	.69**†	.71**†	-				
6. Scenario 1 definitely suspicious	-.20	-	-	-	-	-			
7. Scenario 2 definitely suspicious	-.16	-	-	-	-	.49**†	-		
8. Scenario 3 definitely suspicious	-.11	-	-	-	-	.32*†	.45**†	-	
9. Scenario 4 definitely suspicious	-.16	-	-	-	-	.44**†	.52**†	.41**†	-

* $p < .05$. ** $p < .01$. † 95% bootstrapped CI does not span zero

Note. Correlations between the 'First indication' of suspicious behaviour and 'Definitely suspicious' are not shown. Due to the imputation rule that was created, some of the response times for these two categories would be the same; therefore the correlation coefficient would be misleading. These variables were treated as separate dependent variables. When VCI was not partialled out, the correlation between A-ToM Social and VCI was $r_s = .32$, and the correlations between A-ToM Social and the scenarios were -.26, -.21, -.06, -.25 for 'First indication', and -.28, -.24, -.19, -.22 for definitely suspicious. VCI was significantly correlated with response latency for definitely suspicious scenarios 1 ($r_s = -.23$) and 3 ($r_s = -.25$).

Multiple regressions with theory of mind and latency. To further investigate Hypothesis 1, a series of hierarchical multiple regressions with bootstrapping were conducted to assess whether A-ToM Social predicted response latency for either the 'First indication' of suspicious behaviour or 'Definitely suspicious' button press after controlling for VCI and PRI.

Combined crime scenarios. The latency of responses for each scenario were significantly correlated with each other, suggesting that participants responded reasonably consistently across the different crime scenarios (within RI and non-RI groups). Given that each audio scenario was a different length, included different events, and had suspicious activity occur at different times, participants' response times in their original state were not comparable from one scenario to the next. In order to render the response times between scenarios comparable so that the responses from each of the crime scenarios could be combined, *z* scores were calculated for each crime scenario for both the 'First indication' of suspicious activity and responses of 'Definitely suspicious'. A mean *z* score was then calculated for each participant for their responses across the four crime RI scenarios and the four crime non-RI scenarios, leaving each participant with mean *z* RI 'First indication', mean *z* RI 'Definitely suspicious', mean *z* non-RI 'First indication', and mean *z* non-RI 'Definitely suspicious' as dependent variables.

The regression model for 'Definitely suspicious' button press for the non-RI scenarios was significant, $F(3, 87) = 3.15$, $p = .029$, adj $R^2 = .07$, with only VCI as a significant predictor, $B = -.02$, $p = .017$. VCI was also a significant predictor for the 'First indication' for the non-RI scenarios, $B = -.02$, $p = .012$,

although the model was not significant, $F(3, 87) = 2.06$, $p = .111$, adj $R^2 = .03$. The remaining results are displayed in Appendix H, Tables H1 and H2.

Individual crime scenarios. Hierarchical regressions with bootstrapping were also conducted to assess whether A-ToM Social predicted response latency (after controlling for VCI and PRI) among each scenario separately (i.e., rather than using the combined mean *z* variable). No models were significant among the RI scenarios. A-ToM Social was a significant predictor for Scenario 1, 'First indication', $B = -4214.84$, $p = .048$, and 'Definitely suspicious' latency, $B = -5532.38$, $p = .005$. Among the non-RI scenarios, the regression model was significant for Scenario 1, 'First indication', $F(3, 87) = 2.96$, $p = .037$, adj $R^2 = .06$, with VCI as the only significant predictor, $B = -1225.95$, $p = .005$. The regression model was also significant for non-RI Scenario 1, 'Definitely suspicious' latency, $F(3, 87) = 4.26$, $p = .007$, adj $R^2 = .10$, with VCI as the only significant predictor, $B = -1104.54$, $p = .001$.

First button press and theory of mind. In each scenario, three main types of response were apparent: a) individuals who pressed 'May be suspicious' only, b) individuals who pressed 'May be suspicious' followed by 'Definitely suspicious', and c) individuals who pressed only 'Definitely suspicious'. Examining response latency for either of the two variables mentioned above (i.e., 'First indication', definitely suspicious), had a degree of error, as these groups may be different in the criterion they applied for suspicious behaviour, or in their ability. Therefore, examining each participant's first response in separate groups may provide a clearer indication of any relationship between ToM and response latency as these participants were pressing the same button, and for each participant it was their first response to indicate suspicious behaviour.

Prior to examining the first response of ‘May be suspicious’ and ‘Definitely’ suspicious separately, it was of interest to see whether, at scenario level, these three groups differed in either of the IQ variables, or in their A-ToM Social scores. These groups were analysed at scenario level, as displayed in Tables 11 and 12. Please note that in the following section each participant is only represented once per scenario (i.e., their first button press), and therefore the data reported in the following paragraphs is not imputed.

Table 11

IQ and ToM Means and Standard Deviations for First Button Press Groups for the Crime RI Scenarios (n= 79)

Scenario	Group	*n*	PRI *M (SD)*	VCI *M (SD)*	A-ToM Social *M (SD)*
RI Scenario 1	MS only	5	102.20 (7.36)	100.20 (9.65)	9.00 (2.55)
	MS/DS	37	113.81 (13.59)	112.57 (12.13)	9.35 (2.29)
	DS only	33	103.85 (12.97)	102.30 (12.29)	9.48 (2.33)
RI Scenario 2	MS only	4	109.00 (16.27)	110.50 (15.42)	11.50 (0.58)
	MS/DS	38	112.68 (13.56)	110.08 (13.19)	9.00 (2.21)
	DS only	34	104.62 (13.18)	103.44 (11.90)	9.59 (2.36)
RI Scenario 3	MS only	6	113.17 (11.92)	106.67 (13.71)	7.17 (4.07)
	MS/DS	40	111.93 (12.69)	110.10 (13.54)	9.55 (1.89)
	DS only	28	104.07 (14.11)	103.14 (11.49)	9.54 (2.20)
RI Scenario 4	MS only	5	116.80 (11.17)	116.80 (7.66)	8.40 (3.78)
	MS/DS	36	110.50 (13.22)	107.64 (13.26)	9.69 (1.80)
	DS only	35	106.51 (14.59)	105.20 (12.93)	9.26 (2.45)

Note. Participants who pressed ‘Nothing suspicious’ or ‘No longer suspicious’ as their first response were not included. MS = May be suspicious; DS = Definitely suspicious.

Table 12

IQ and ToM Means and Standard Deviations for First Button Press Groups for the Crime Non-RI Scenarios (n = 91)

Scenario	Group	*n*	PRI *M (SD)*	VCI *M (SD)*	A-ToM Social *M (SD)*
Non-RI Scenario 1	MS only	6	103.33 (11.13)	93.17 (11.39)	8.50 (3.78)
	MS/DS	50	111.02 (14.17)	111.16 (12.51)	9.54 (2.28)
	DS only	32	107.44 (13.25)	104.69 (10.12)	9.47 (1.61)
Non-RI Scenario 2	MS only	3	99.00 (1.73)	100.67 (4.04)	10.00 (3.46)
	MS/DS	50	112.04 (13.18)	109.24 (12.95)	9.12 (2.25)
	DS only	36	106.44 (13.43)	105.33 (12.27)	9.78 (1.97)
Non-RI Scenario 3	MS only	7	102.00 (11.02)	99.43 (14.11)	9.14 (3.39)
	MS/DS	54	111.24 (13.55)	110.39 (12.32)	9.31 (1.99)
	DS only	26	106.50 (13.04)	103.88 (11.38)	9.58 (2.28)
Non-RI Scenario 4	MS only	10	110.30 (12.89)	108.40 (16.24)	7.20 (3.29)
	MS/DS	41	112.14 (13.00)	110.00 (13.21)	9.59 (1.99)
	DS only	37	106.56 (14.17)	104.95 (10.88)	9.83 (1.66)

Note. Participants who pressed 'Nothing suspicious' or 'No longer suspicious' as their first response were not included. MS = May be suspicious; DS = Definitely suspicious.

Visual inspection of the IQ scores reported in Tables 11 and 12 suggest those who pressed 'May be suspicious' followed by 'Definitely suspicious' (i.e., MS/DS group in Tables 11 and 12) had higher VCI and PRI scores than those participants who pressed only 'Definitely suspicious'. Several Mann-Whitney

U[26,27] tests were conducted to examine whether the observed differences were statistically significant. As expected, group differences were found for PRI and VCI scores across a number of the scenarios, with those who progressed from 'May be suspicious' to 'Definitely suspicious' demonstrating verbal comprehension and perceptual reasoning scores that were statistically significantly higher than those who only pressed 'Definitely suspicious'. Tables 13 and 14 display the results of these comparisons.

[26] In each Mann-Whitney *U* test, exact sampling distributions for U are reported (Dinneen & Blakesley, 1973).
[27] Effect sizes for all Mann-Whitney *U* tests (*r*) were calculated from the *z* scores.

Table 13

Mann-Whitney U Tests Comparing Means for IQ and ToM Measures Between Button Press Groups for RI Crime Scenarios

Scenario	Scale	*U*	*Z*	*r*
RI Scenario 1	PRI	368.50	-2.85**	-.34
	VCI	331.50	-3.29**	-.39
	A-ToM Social	581.50	-0.35	-.04
	A-ToM Physical	600.50	-0.12	-.01
RI Scenario 2	PRI	425.00	-2.50*	-.29
	VCI	459.50	-2.11*	-.25
	A-ToM Social	512.00	-1.55	-.19
	A-ToM Physical	621.50	-0.28	-.03
RI Scenario 3	PRI	367.00	-2.41*	-.29
	VCI	391.50	-2.10*	-.25
	A-ToM Social	541.00	-0.24	-.03
	A-ToM Physical	477.00	-1.04	-.13
RI Scenario 4	PRI	528.50	-1.17	-.14
	VCI	566.50	-0.73	-.09
	A-ToM Social	576.50	-0.63	-.07
	A-ToM Physical	577.00	-0.62	-.07

* $p < .05$. ** $p < .01$.

Table 14

Mann-Whitney U Tests Comparing Means for IQ and ToM Measures Between Button Press Groups for Non-RI Crime Scenarios

Scenario	Scale	*U*	*Z*	*r*
Non-RI Scenario 1	PRI	707.00	-0.89	-.10
	VCI	560.50	-2.28*	-.25
	A-ToM Social	704.00	-0.93	-.10
	A-ToM Physical	797.00	-0.03	.00
Non-RI Scenario 2	PRI	682.00	-1.91	-.21
	VCI	742.50	-1.38	-.15
	A-ToM Social	751.00	-1.34	-.14
	A-ToM Physical	866.50	-0.30	-.03
Non-RI Scenario 3	PRI	562.00	-1.44	-.16
	VCI	496.50	-2.11*	-.24
	A-ToM Social	623.00	-0.83	-.09
	A-ToM Physical	661.00	-0.43	-.05
Non-RI Scenario 4	PRI	594.50	-1.64	-.19
	VCI	600.50	-1.58	-.18
	A-ToM Social	725.00	-0.35	-.04
	A-ToM Physical	652.00	-1.08	-.12

* $p < .05$.

Correlations between latency of first button press and theory of mind. Spearman's rank-order correlation with bootstrapped BCa 95% CIs were conducted to examine the relationship between response latency for those who pressed 'May be suspicious' as their first response and A-ToM Social after controlling for VCI. See Table 15 for these correlations. As mentioned above,

these data may provide a clearer indication of any relationship between A-ToM Social score and response latency given a) this is the first time each participant pressed a response button to indicate they thought something suspicious either might be, or was definitely occurring, and b) they were all responding to the same criteria (i.e., they were either reporting that something 'May be suspicious' or was 'Definitely suspicious', but they all pressed the same button). This is unlike the imputed data which includes information from different buttons in the same variable (i.e., imputed 'First indication' data), and combines individuals who had already pressed a response button with those who were responding for the first time (i.e., 'Definitely suspicious' imputed data). All but one of the correlations between ToM and response latency remained in the hypothesised direction, and the four of the correlations were stronger comparative to the imputed data for 'May be suspicious' (i.e., First indication).

Data for the first button press of 'Definitely suspicious' were particularly important as it is possible that these participants were more confident in their belief that something suspicious was occurring than those who pressed 'May be suspicious'. Spearman's rank-order correlation with bootstrapped BCa 95% CIs were also conducted to examine the relationship between response latency for those who pressed 'Definitely suspicious' as their first response and A-ToM Social after controlling for VCI. These correlations are presented in Table 16. It can be noted that as with the first button press for 'May be suspicious', all correlations remained in the hypothesised direction, and the strength of the correlations was stronger comparative to the imputed 'Definitely suspicious' data.

Table 15

Spearman's Rank Order Correlations for 'May be Suspicious' Latency (First Button) with A-ToM Social (VCI Partialled Out)

Scenario	Correlation with A-ToM Social (r_s)	*n*
RI Scenario 1	-.18	42
RI Scenario 2	-.10	42
RI Scenario 3	-.23	46
RI Scenario 4	-.32	41
Non-RI Scenario 1	-.25	56
Non-RI Scenario 2	-.11	54
Non-RI Scenario 3	.03	62
Non-RI Scenario 4	-.42**[†]	45

* $p < .05$. ** $p < .01$. [†] 95% bootstrapped CI does not span zero

While only two of the correlations were statistically significant (r_s = -.48, and r_s = -.38), given the small sample sizes and stronger correlations for many of the scenarios in the hypothesised direction (i.e., five of eight correlations being stronger than r_s = -.20), interpretation of this pattern of correlations provides a promising indication of some form of relationship between impaired ToM and recognition ability.

Table 16

Spearman's Rank Order Correlations for 'Definitely Suspicious' Latency (First Button) with A-ToM Social (VCI Partialled Out)

Scenario	Correlation with A-ToM Social (r_s)	*n*
RI Scenario 1	-.48**†	33
RI Scenario 2	-.38*†	34
RI Scenario 3	-.28	28
RI Scenario 4	-.12	35
Non-RI Scenario 1	-.07	32
Non-RI Scenario 2	-.28	36
Non-RI Scenario 3	-.34	26
Non-RI Scenario 4	-.18	41

* $p < .05$. ** $p < .01$. † 95% bootstrapped CI does not span zero

Frequency of each type of response. Frequency tables were created to examine the participants' first button press during each scenario and A-ToM Social score[28]. These analyses were conducted as an alternative way to examine any patterns in the data regarding the possible relationship between ToM impairments and the ability to recognise suspicious activity.

Again the first button press of each participant was examined per scenario, and therefore each participant is only represented once in each table. Additionally, the responses were separated into two groups: a) those who pressed their first response button during the scenario, and b) those who responded after

[28] As these tables demonstrate the first button each participant pressed, imputed data is not relevant.

the end of the scenario. Participants were separated into these groups to investigate whether there were differences between individuals who responded at some stage during the scenario as compared to those who responded after the criminal activity had been revealed in regards to VCI, PRI or A-ToM Social scores. See Table 17 to Table 24 for the frequency tables for each crime scenario.

There did not seem to be a discernible pattern in regards to the VCI or PRI scores of individuals who pressed ‘Definitely suspicious’ during the scenario as compared to those who responses after the scenario had ended. However, in each of the scenarios, the A-ToM Social score was higher for participants who pressed ‘Definitely suspicious’ during the scenario, than for those who responded after the scenario had ended.

Table 17

First Button Press for Crime Scenario 1 (RI condition), and A-ToM Social Score (n = 79)

First button press		During scenario	After scenario
May be suspicious	*n*	42	0
	A-ToM Social	9.31 (2.29)[a]	-
	VCI	111.10 (12.44)	-
	PRI	112.43 (13.49)	-
Definitely suspicious	*n*	21	12
	A-ToM Social[b]	9.71 (2.35)	9.08 (2.35)
	VCI	101.38 (12.62)	103.92 (12.09)
	PRI	102.24 (11.59)	106.67 (15.23)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	4	0
	A-ToM Social	9.00 (2.45)	-
	VCI	97.50 (3.00)	-
	PRI	108.00 (15.17)	-

[a] *M (SD).*

Table 18

First Button Press for RI Crime Scenario 2, and A-ToM Social Score (n = 79)

First button		During scenario	After scenario
May be suspicious	*n*	42	0
	A-ToM Social	9.24 (2.23)[a]	-
	VCI	110.12 (13.21)	-
	PRI	112.33 (13.66)	-
Definitely suspicious	*n*	23	11
	A-ToM Social[b]	9.91 (2.33)	8.91 (2.39)
	VCI	102.78 (11.90)	104.82 (12.34)
	PRI	103.04 (11.89)	107.91 (15.63)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	3	0
	A-ToM Social	8.67 (2.89)	-
	VCI	96.67 (3.06)	-
	PRI	102.00 (11.36)	-

[a] *M (SD).*

Table 19

First Button Press for RI Crime Scenario 3, and A-ToM Social Score (n = 79)

First button		During scenario	After scenario
May be suspicious	*N*	45	1
	A-ToM Social	9.27 (2.39)[a]	8.00 (-)
	VCI	109.60 (13.60)	112.00 (-)
	PRI	111.89 (12.54)	121.00 (-)
Definitely suspicious	*n*	14	14
	A-ToM Social[b]	10.00 (1.84)	9.07 (2.50)
	VCI	100.93 (9.93)	105.36 (12.85)
	PRI	100.50 (9.76)	107.64 (17.05)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	4	1
	A-ToM Social	9.00 (2.31)	12.00 (-)
	VCI	100.00 (10.03)	100.00 (-)
	PRI	103.50 (19.57)	97.00 (-)

[a] *M (SD).*

Table 20

First Button Press for RI Crime Scenario 4, and A-ToM Social Score (n = 79)

First button		During scenario	After scenario
May be suspicious	*n*	40	1
	A-ToM Social	9.60 (2.10)[a]	7.00 (-)
	VCI	108.68 (13.16)	112.00 (-)
	PRI	111.05 (13.12)	120.00 (-)
Definitely suspicious	*n*	26	9
	A-ToM Social[b]	9.46 (2.44)	8.67 (2.55)
	VCI	106.08 (13.74)	102.67 (10.52)
	PRI	106.85 (13.85)	105.56 (17.44)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	3	0
	A-ToM Social	8.33 (3.21)	-
	VCI	97.00 (3.00)	-
	PRI	97.00 (3.00)	-

[a] *M (SD).*

Table 21

First Button Press for Non-RI Crime Scenario 1, and A-ToM Social Score (n = 91)

First button		During scenario	After scenario
May be suspicious	*n*	56	0
	A-ToM Social	9.43 (1.54)[a]	-
	VCI	109.23 (13.52)	-
	PRI	110.20 (14.00)	-
Definitely suspicious	*n*	17	15
	A-ToM Social[b]	9.65 (1.54)	9.27 (1.71)
	VCI	107.29 (10.52)	101.73 (9.10)
	PRI	105.71 (11.74)	109.40 (14.95)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	3	0
	A-ToM Social	8.33 (2.31)	-
	VCI	93.33 (3.06)	-
	PRI	106.00 (10.82)	-

[a] *M (SD).*

Table 22

First Button Press for Non-RI Crime Scenario 2, and A-ToM Social Score (n = 91)

First button		During scenario	After scenario
May be suspicious	*n*	52	1
	A-ToM Social	9.12 (2.28)[a]	12.00 (-)
	VCI	108.92 (12.82)	100.00 (-)
	PRI	111.58 (13.12)	97.00 (-)
Definitely suspicious	*n*	23	13
	A-ToM Social[b]	10.00 (2.13)	9.38 (1.66)
	VCI	106.35 (14.21)	103.54 (8.00)
	PRI	105.70 (11.75)	107.77 (16.42)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	2	0
	A-ToM Social	9.00 (2.83)	-
	VCI	95.50 (0.71)	-
	PRI	98.00 (24.04)	-

[a] *M (SD).*

Table 23

First Button Press for Non-RI Crime Scenario 3, and A-ToM Social Score (n = 90)

First button		During scenario	After scenario
May be suspicious	*N*	62	0
	A-ToM Social	9.26 (2.16)[a]	-
	VCI	108.89 (12.93)	-
	PRI	109.92 (13.58)	-
Definitely suspicious	*N*	14	12
	A-ToM Social[b]	10.36 (1.55)	8.67 (2.71)
	VCI	105.21 (12.62)	102.33 (10.06)
	PRI	105.93 (12.08)	107.17 (14.60)
No longer suspicious	*N*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*N*	2	0
	A-ToM Social	11.50 (0.71)	-
	VCI	95.00 (7.07)	-
	PRI	103.00 (8.49)	-

[a] *M (SD).*

Table 24

First Button Press for Non-RI Crime Scenario 4, and A-ToM Social Score (n = 91)

First button		During scenario	After scenario
May be suspicious	*n*	45	2
	A-ToM Social	9.31 (2.50)[a]	4.00 (2.83)
	VCI	110.69 (13.08)	86.50 (4.95)
	PRI	112.09 (12.70)	104.00 (19.80)
Definitely suspicious	*n*	27	14
	A-ToM Social[b]	9.85 (1.83)	9.79 (1.31)
	VCI	104.96 (12.52)	104.93 (7.12)
	PRI	105.26 (13.86)	109.07 (14.93)
No longer suspicious	*n*	0	0
	A-ToM Social	-	-
	VCI	-	-
	PRI	-	-
Nothing suspicious	*n*	3	0
	A-ToM Social	8.67 (2.89)	-
	VCI	96.67 (3.05)	-
	PRI	102.00 (11.36)	-

[a] *M (SD).*

In order to determine whether the differences in A-ToM Social were statistically significant, several one way analysis of covariance (ANCOVA) with bootstrapped BCa 95% CIs were conducted, controlling for VCI. Table 25

displays the results of the ANCOVAs. While none of the contrasts were statistically significant, the effect sizes shown ranged from small to large[29].

Table 25

1 X 1 ANCOVAs Assessing A-ToM Social Differences for 'Definitely Suspicious' During and After Scenario

Scenario	Timing	*n*	*M (SD)*	*F*	*f*
RI Scenario 1	During	21	9.71 (2.35)	1.42	.22
	After	12	9.08 (2.35)		
RI Scenario 2	During	23	9.91 (2.33)	2.64	.29
	After	11	8.91 (2.39)		
RI Scenario 3	During	14	10.00 (1.84)	3.84	.39
	After	14	9.07 (2.50)		
RI Scenario 4	During	26	9.46 (2.44)	0.37	.11
	After	9	8.67 (2.55)		
Non-RI Scenario 1	During	17	9.65 (1.54)	0.05	.04
	After	15	9.27 (1.71)		
Non-RI Scenario 2	During	23	10.00 (2.13)	0.40	.19
	After	13	9.38 (1.66)		
Non-RI Scenario 3	During	14	10.36 (1.55)	3.77	.40
	After	12	8.67 (2.71)		
Non-RI Scenario 4	During	27	9.85 (1.83)	0.01	.02
	After	14	9.79 (1.31)		

[29] The magnitude of effect size for *f* can be interpreted using Cohen's criteria, namely: .10, .25, and .40 as small, medium, and large effects, respectively (see Cohen, 1992).

The Relationship between Theory of Mind and Response Latency with Restricted Interest as a Moderator

The analyses below (regarding the assessment of the second hypothesis) were undertaken using the first approach to data analyses, which was to use the imputed data for the response of 'May be suspicious' and 'Definitely suspicious'. The second approach to data analysis (i.e., analysing only the first button pressed by participants to indicate suspicious activity) was not conduced for analyses regarding the second hypothesis due to the small sample sizes that varied per scenario.

Correlations between theory of mind, restricted interest variables, and response latency. In order to assess the relationship between A-ToM score, RI intensity and response latency, correlations between the A-ToM Social subscale, RI variables and Crime Recognition task variables after controlling for VCI were examined for each of the RI and non-RI scenarios using Spearman's rank-order correlation with bootstrapped BCa 95% confidence intervals. See Table 26 for these correlations. It can be noted that with the exception of the Absorption and Interruption subscales (r_s = .24), the RI subscales were not statistically significantly correlated. This can be interpreted to suggest that these variables may present different areas of intensity and as such should be measured separately.

Table 26

Spearman's Rank Order Correlations of all Variables for Each RI Crime Scenario with VCI Partialled Out (n =79).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. A-ToM Social	-												
2. RI- Number of hours	.05	-											
3. RI- Absorption	.04	.15	-										
4. RI- Interruption	-.12	-.09	.24*†	-									
5. RI- Importance	-.10	-.03	-.09	-.03	-								
6. Scenario 1 first indication	-.19	.14	.08	.03	.11	-							
7. Scenario 2 first indication	-.17	-.01	-.09	.11	.03	.71**†	-						
8. Scenario 3 first indication	-.06	.02	.05	.17	.02	.51**†	.44**†	-					
9. Scenario 4 first indication	-.22†	.02	.07	.20	.08	.49**†	.59**†	.53**†	-				
10. Scenario 1 definitely suspicious	-.28*†	-.01	.04	.24*†	.12	-	-	-	-	-			
11. Scenario 2 definitely suspicious	-.09	.09	-.09	.17	.00	-	-	-	-	.51**†	-		
12. Scenario 3 definitely suspicious	-.10	-.09	.01	.19	-.08	-	-	-	-	.51**†	.50**†	-	
13. Scenario 4 definitely suspicious	-.11	.02	-.02	.12	.14	-	-	-	-	.39**†	.46**†	.56**†	-

* $p < .05$. ** $p < .01$. † 95% bootstrapped CI does not span zero

Note. Correlations between the 'First indication' of suspicious behaviour and 'Definitely suspicious' are not shown. Due to the imputation rule that was created, some of the response times for these two categories will be the same; therefore the correlation coefficient would be misleading. These variables are treated as separate dependent variables. The correlation between VCI and RI Interruption was $r_s = .26$. The remaining correlations between VCI and the RI subscales were not statistically significant.

Moderation analysis. To investigate Hypothesis 2, to determine whether RI intensity moderated the relationship between ToM and response time in the Crime Recognition task while controlling for IQ as a covariate (i.e., VCI, PRI); a moderation analysis was conducted. Only the scenarios including criminal activity (i.e., the crime scenarios), and each individual's unique RI were included in these analyses (i.e., RI scenarios). The moderation analysis is demonstrated as a conceptual diagram in Figure 6.

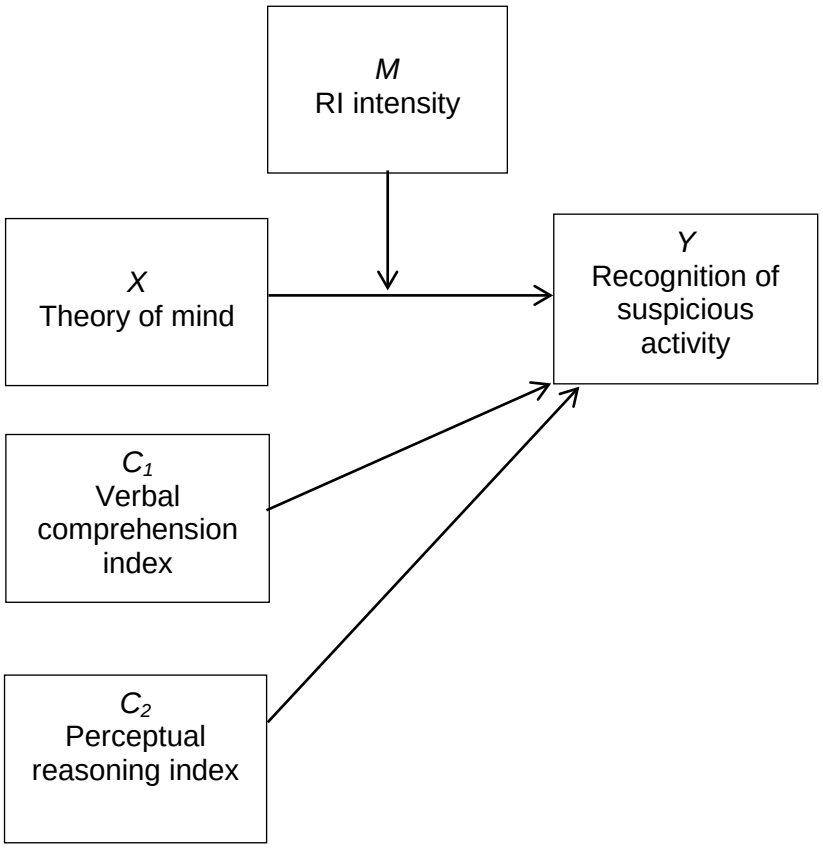

Figure 6. Conceptual diagram of the moderation of ToM on recognition of suspicious activity by RI intensity with two indices of intelligence as covariates.

Combined crime scenarios. Hierarchical regressions with bootstrapping were conducted for both dependent variables 'First indication' of suspicious behaviour and response of 'Definitely suspicious' mean z terms. These

regressions were conducted separately with each of the different RI variables (Number of hours, Absorption, Interruption, Importance) as potential moderators. Mean centred[30] independent variables were entered into the regression in the following order: 1) VCI, PRI, 2) A-ToM Social, RI variable, 3) A-ToM Social/RI variable interaction term. No regression model was significant, nor were there any significant predictors. The results of the regressions are displayed in Appendix I, Tables I1 to I4.

Individual crime scenarios. To further explore any possible moderation, the analyses were also conducted separately for each crime scenario. As stated above, these regressions were conducted for each RI variable separately, and both for 'First indication' and 'Definitely suspicious' responses. In none of the 32 regressions were the model or interaction terms significant. A-ToM Social score was a significant predictor for the response of 'Definitely suspicious' in only one scenario (Scenario 1) when each of the RI variables were moderators, Number of hours; B = -.5572.42, p = .019; Absorption, B = -5579.09, p = .006; Interruption, B = -5611.86, p = .025, and Importance, B = -5814.85, p = .019. Interaction terms are presented in Appendix J, Table J1.

Exploratory Analyses

Comparing included and excluded participants. Data were analysed to determine whether there were any differences between participants who were included in the data analyses as compared to those who were excluded because they appeared to identify suspicious behaviour when it was not present (i.e., these participants pressed 'Definitely suspicious' during more than one of the no crime scenarios; n = 9; see 'Excluded participants' above). While it was recognised that

[30] Mean centering has been recommended to reduce nonessential multicollinearity and aid interpretation of the results (Cohen, Cohen, West, & Aiken, 2003; Dalal & Zickar, 2012).

the size of the group of excluded participants was small, and therefore limited information could be interpreted from such a small group, exploratory analyses were conducted to examine any patterns in the data.

Several Mann-Whitney *U* tests were conducted to determine whether there were differences in the IQ, ToM, or RI variables between these two groups. Group differences were found for VCI, FSIQ, and A-ToM Social scores, whereby those who were excluded had lower scores on these subscales. The results are presented in Table K1, Appendix K.

A one-way ANCOVA with bootstrapping was conducted in order to determine whether group differences in A-ToM Social score persisted after accounting for VCI. After the effect of VCI was removed, the difference in A-ToM Social score between the included and excluded participants was not statistically significant, $F(1, 98) = 2.73$, $p = .101$, $f = .17$.

Responses of included and excluded individuals for the Crime Recognition task were also compared to determine whether there were differences in response latency between the excluded and included groups for the RI and Non-RI scenarios. Several Mann-Whitney *U* tests were conducted to determine whether there were differences between the included and excluded participants in the response latency for the 'May be suspicious' button press. Given these participants seemed to have difficulty detecting suspicious activity, it was unclear whether this would result in a faster or slower pattern of responses than the remaining, included participants. If these participants were overly suspicious, as their responses to the scenarios without criminal activity would suggest, these participants may have demonstrated a faster pattern of results for both the 'May be suspicious' and 'Definitely suspicious' response buttons.

In only one of the scenarios (Scenario 1) was a group difference found, which indicated that the excluded participants pressed 'May be suspicious' faster than the included participants. The results of the Mann-Whitney U tests are displayed in Appendix K, Table K2.

Several Mann-Whitney *U* tests were conducted to determine whether there were differences between the included and excluded participants in the response latency for the 'Definitely suspicious' button press. In six of the eight crime scenarios the excluded participants pressed 'Definitely suspicious' significantly faster than the participants included in the main analyses. Table K3 displays the results of the Mann-Whitney *U* tests.

Examining inconsistent responses. There were a number of participants who appeared to identify suspicious activity when none had occurred (i.e., responded with one of the suspicious buttons in the no crime scenarios). Data for these participants were examined to determine if they differed in any way from participants who consistently differentiated between the crime and no crime scenarios successfully, as it was unclear from their responses whether this group of participants had difficulty differentiating suspicious behaviour from that which was not, or whether they may have simply pressed one of the suspicious response buttons due to the demand characteristics of the task. Responses for any participant who pressed 'Definitely suspicious' once (n = 3) or pressed 'May be suspicious' more than twice[31] (n = 6) during the no crime scenarios, without correcting by later pressing 'No longer suspicious' or 'Nothing was suspicious' were examined. These participants were retained in the data set as it was unclear

[31] Forty individuals pressed the 'May be suspicious' button during the no crime scenarios without correcting by later pressing 'No longer suspicious' or 'Nothing was suspicious'. The median number of times for these button presses was 1, therefore only cases who pressed 'May be suspicious' three times or more without correcting were examined as these cases made the error on multiple occasions.

whether they believed that criminal activity had occurred, or whether they were overly suspicious; possibly due to the nature of the task where participants were informed that the scenarios may or may not be suspicious. These nine participants were combined with the nine excluded participants and examined as a group. In the following section this combined group will be referred to as the *inconsistent* participants (as compared to the remaining individuals in the dataset, referred to as the *consistent* participants).

Several Mann-Whitney *U* tests were conducted to determine whether there were differences in the IQ, ToM, or RI variables between the inconsistent participants and consistent participants. These comparisons are presented in Table L1, Appendix L.

A one-way ANCOVA with bootstrapping was conducted in order to determine whether group differences in A-ToM Social score persisted after accounting for VCI. After the effect of VCI was removed, the difference in A-ToM Social score between the consistent and inconsistent participants remained statistically significant, $F(1, 98) = 8.97$, $p = .003$, $f = .30$.

Responses for the Crime Recognition task were also compared between the consistent and inconsistent participants. Several Mann-Whitney *U* tests were conducted to determine whether there were differences in response latency for the 'May be suspicious' button between the consistent and inconsistent participants. Differences between participants were only found for two of the scenarios (RI Scenario 3 and Non-RI Scenario 3), whereby in both cases the inconsistent participants responded more quickly than the consistent participants. Results of the Mann-Whitney U tests are displayed in Appendix L, Table L2.

Several Mann-Whitney *U* tests were conducted to determine whether there were differences in response latency for the ‘Definitely suspicious’ button between the consistent and inconsistent participants. In each of the eight scenarios the inconsistent participants pressed ‘Definitely suspicious’ significantly faster than the consistent participants. Table L3 displays the results of the Mann-Whitney *U* tests.

Chapter 4: Discussion

Overview

The role autism spectrum disorder (ASD) plays in offending behaviour, if any, is not currently understood. While a number of researchers have claimed that features associated with ASD may heighten the vulnerability of individuals with ASD to naïve criminal involvement (e.g., Barry-Walsh & Mullen, 2004; Haskins & Silva, 2006; Katz & Zemishlany, 2006; Wing, 1997), these suggestions have largely been the result of single case studies, and to my knowledge these claims have not yet been empirically investigated. The focus of this thesis was to examine whether features associated with ASD, specifically theory of mind (ToM) deficits and restricted interests (RIs), affect the ability to detect suspicious behaviour. Difficulty recognising suspicious behaviour could heighten vulnerability to a number of negative outcomes, one of which is unwitting criminal involvement. The current study was conducted over two phases, the first of which involved the assessment of IQ, ToM and RI intensity, and the second of which attempted to examine the ability of participants to detect unfolding criminal activity by listening to a number of audio scenarios and recording response time for the recognition of suspicious activity as an indication of ability. This was the first study to recruit a large sample of individuals with ASD, and empirically assess whether ToM deficits and RIs play a role in the ability of adults with the disorder to recognise suspicious activity.

The results of the study found some evidence (although limited), to support the first hypothesis, which proposed that after accounting for intelligence, the degree to which a person experiences impairments in ToM would be associated with time taken to recognise suspicious behaviour. There was no

evidence to support the second hypothesis that RI intensity would moderate the relationship between ToM and the ability to recognise suspicious behaviour, whereby those with more impaired ToM and more intense RIs would take longer to detect suspicious activity. Exploratory analyses revealed group differences between individuals who were more able to differentiate the suspicious and non-suspicious behaviour in the Crime Recognition task and individuals who had difficulty making this distinction. These group differences may provide further information regarding the role of ToM in recognising unfolding suspicious behaviour.

The Detection of Suspicious Behaviour

The majority of participants were able to detect that the scenarios describing criminal activity were at least in some way suspicious, and differentiate these from the scenarios where criminal behaviour did not occur (and thus where the scenarios should not have been deemed suspicious). However, despite several cues throughout each scenario that suspicious behaviour was occurring, many of the participants failed to recognise behaviour as being 'Definitely suspicious' until ether the mention of police officers (23-39%) or until the end of the scenario (18-25%), at which point the scenarios were designed to be clearly suspicious. Further, despite increasingly obvious cues towards the end of each of the scenarios depicting criminal activity, a percentage (up to 14%) failed to recognise that these behaviours were definitely suspicious, and progressed only as far as reporting that behaviour 'May be suspicious'. While these results may indicate that individuals with ASD are generally poor at detecting suspicious behaviour, in the absence of a comparison group of individuals without ASD and further data regarding the validity of the recognition

measure, this cannot be determined. Further research with a comparison group of individuals without the disorder may be able to determine whether individuals with ASD are worse at detecting suspicious behaviour than their non-ASD counterparts, irrespective of any ToM deficits.

Theory of Mind and Response Latency

The first hypothesis; that ToM deficits would be associated with longer time taken to recognise suspicious behaviour, was partially supported by these data. While the relationship between ToM and response latency was found to be in the predicted direction in all cases (i.e., lower ToM scores correlated with longer response times in the scenarios where criminal activity occurred), there was a statistically significant relationship in only one of the scenarios, and this was weak. However, when looking at only the first button pressed by each participant (whether this was 'May be suspicious' or 'Definitely suspicious'), the relationship between ToM and response latency was stronger.

Examining the response latency data. While the scenarios where criminal behaviour occurred were designed to become increasingly suspicious as they progressed (i.e., there were several opportunities for a participant to think something 'May be suspicious' without yet being confident that something 'Definitely suspicious' was happening), for any one of these scenarios approximately only half of the participant group pressed the 'May be suspicious' response button. Therefore, it was determined that examining the response latency for the first button pressed to indicate suspicious activity for each participant (whether that was 'May be suspicious' or 'Definitely suspicious') may have provided a clearer indication of any relationship between ToM and response latency, given that participants in these groups had all pressed the same button,

and the variable represented the first time that any of the participants had responded to indicate suspicious activity. Interestingly, despite the small sample size of these two groups, the relationship between ToM and response latency among these groups was found to be stronger than the imputed data for 'First indication' of suspicious behaviour and 'Definitely suspicious' button press. This was particularly the case for the participants who pressed 'Definitely suspicious' as their first response. This is important, as while the scenarios were designed to be progressively suspicious (and therefore it was appropriate to press 'May be suspicious'), responses of 'May be suspicious' could have been triggered by almost anything given that the requirement for pressing the button was only to think that something untoward 'might be' happening. In the current study, the responses of individuals who pressed 'Definitely suspicious' as their first button for each scenario therefore provide the clearest indication of when participants were more likely to have been confident that suspicious behaviour was occurring. It was this variable where the strongest evidence of a relationship between ToM deficits and response latency was found. Despite small samples ranging from n = 26 to n = 41, across the eight crime scenarios correlations ranged from r_s = -.07 to r_s = -.48, with five of the eight scenarios demonstrating relationships between A-ToM Social and response latency stronger than r_s = -.20. The relationship was statistically significant for two of these scenarios (RI scenario 1, r_s = -.48, and RI scenario 2, r_s = -.38).

Further, responses of the participants who first pressed the 'Definitely suspicious' button were separated into those who responded before the scenario had ended, and those who responded after the scenario had ended (at which point scenarios were designed so that they were clearly suspicious). While the

differences in ToM were not statistically significant, ToM scores were higher for individuals who responded before the scenarios had ended. These differences were reflected by effect sizes which were medium to large for four of the eight scenarios. While the differences in A-ToM Social scores between those who pressed Definitely suspicious' during the scenario comparative to those who pressed after the scenario had ended were not statistically significant, this finding is encouraging given the novel nature of the recognition task, the other possible predictors of recognition ability, and the limited information regarding ToM deficits among adults with ASD. Despite the small relationships, together these findings can be interpreted to suggest that there may indeed be some kind of relationship between impaired ToM and the ability to detect unfolding suspicious activity.

There was variation in the responses of the participants in the current study to the scenarios (see Appendix F for histograms illustrating the response pattern for each of the crime scenarios), which may indicate that the scenarios were adequate to differentiate between the different abilities between individuals. However, it is possible that scenarios with less obvious criminal behaviour might assist in better understanding any relationship between ToM and recognition ability. Given that criminal behaviour was implied at the end of each scenario, a participant who was previously unsure may have immediately responded when the crime was revealed. If instead, the criminal behaviour wasn't made as obvious, it is possible that the pattern of responses would show a clearer difference between individuals who had difficulty with the task from those who were simply making sure they were certain before responding.

It should be acknowledged that in many of the scenarios there were group differences between participants who pressed both suspicious buttons compared to those who pressed only ‘Definitely suspicious’, whereby those who pressed both buttons in many of the scenarios had better verbal comprehension and perceptual reasoning ability. These differences may have occurred as individuals with comparatively better verbal abilities may have been able to notice more subtle cues in the scenario that were missed by those with poorer verbal abilities. It may also indicate that these individuals were more likely to follow task instructions. While participants were informed they could press any of the response buttons throughout the scenarios, having two buttons might have implied to some participants that both should be pressed. However, it should be noted that the average verbal comprehension and perceptual reasoning ability of the ‘low’ group was still within the average range of the general population (as per Wechsler, 2011).

In hindsight, having one response option for the detection of suspicious behaviour may have provided a clearer indication of when participants believed something dubious was occurring, and these responses would have been comparable across the whole sample. The inclusion of an additional button ‘May be suspicious’ allowed for more variability in responses which wasn’t measured (e.g., a participant could have responded that it ‘May be suspicious’ that the protagonist had an interest in trains rather than responding due to the behaviour of an individual in the scenario being suspicious). Nonetheless, finding stronger correlations with the smaller sample size is a promising sign of the possibility of some kind of relationship between ToM and the ability to recognise suspicious behaviour. However, the strength of this relationship is unknown. The next few

paragraphs will discuss the following possibilities that emerge from the results obtained: a) there is a relationship between ToM and the ability to detect suspicious behaviour, however the full extent of the relationship was not detected in the present study, or b) ToM does not play a central role in the ability to detect suspicious behaviour, however may still play a role in vulnerability among this population.

Validity of the present study in relation to Hypothesis 1. Given the various factors that may influence the ability to detect suspicious activity, issues with trying to assess such an ability, and the novelty of the task used in the present study, it is possible that the ToM and latency association found in the present study provides an accurate picture of the extent of this relationship. However, it is also possible that the extent of the relationship between ToM and recognition ability was not found in the data due to factors which may have affected the validity of the study. These factors include participant variability and/or the ecological validity of the Crime Recognition task.

Participant variability. The recruited participants were of mixed sex and age, had received their diagnosis of ASD from various different professionals, and were recruited from a number of different suburbs and towns across two states, representing a range of socioeconomic backgrounds (although socioeconomic status was not assessed). Therefore there is no reason to suspect the participants were non-representative of the larger population of individuals with ASD. That being said, the average score of the A-ToM Social subscale in the current study fell at the upper end of the scale, with the average score for the ToM task above 75% of the total possible score for the measure.

Brewer et al. (2016) found that individuals with ASD performed similarly to those in the present study, and worse than a comparison sample of individuals without the disorder. Thus, while participants in this study performed reasonably well on the A-ToM Social subscale, they can be considered impaired comparative their non-ASD counterparts.

Further, as a part of a larger study, data for the Strange Stories (Happé, 1994) was also collected for participants in the current study. When the analyses were conducted using the Strange Stories rather than the A-ToM, the pattern of results was the same. Therefore, there is limited reason to suggest that the ToM scores of participants reported in the current study did not provide an accurate reflection of their ToM ability.

Ecological validity of the Crime Recognition task. The Crime Recognition task was created for use in the current study. While responses to this task were varied across participants (which may be interpreted to suggest that the task was neither too easy nor too hard), it is possible that the task may not have provided an accurate representation of the difficulty participants may have in detecting suspicious behaviour in their daily lives. This may have been due to somewhat limited ecological validity of the task. As the task was delivered as a series of audio scenarios which were read as a script, participants were unable to use environmental or verbal cues in order to assist in their decision regarding the behaviour in the scenario (as they might have been able to in an everyday setting). Participants were asked to imagine that the events were happening in real life, however, their responses may not be indicative of how quickly they would recognise suspicious behaviour if it was happening in front of them. It may be of benefit in future research to use a method more akin to a social environment, such

as scenarios where there is an interaction or conversation between individuals, or video (if the inclusion of unique RIs is not required).

Further, the ability to detect that other people are being manipulated unwittingly into assisting in a criminal act (as occurs to the protagonists in the scenarios) may not reflect one's ability to detect suspicious behaviour when involved personally in the situation. While this may be difficult to examine in an ethical manner, gaining further information about the ability of individuals with ASD to detect suspicious behaviour (in order to determine whether individuals may be vulnerable to negative outcomes such as naïve criminal involvement), may require research where an individual is involved in a situation or required to make a series of decisions about whether to pursue certain behaviour. For example, one possibility may be to present participants with videos where individuals were being asked to perform behaviour that might lead to criminal involvement and enquire as to how the participant would respond to such requests.

The role of theory of mind with regard to suspicious behaviour. If ToM deficits do not play a central role in the ability to recognise suspicious behaviour, ToM may still be important to consider regarding the vulnerability of persons with ASD. It is possible that individuals with ASD may be able to recognise suspicious behaviour given a number of cues; however, social and communicative deficits associated with poor ToM may influence an individual's ability to remove oneself from a situation after it has been perceived as suspicious. Consider the following cases described by Brewer and Young (2015).

Case 1. Garrison, aged 17, moved in with a parent of a female who attended his school after experiencing issues with his family. Since moving in

with this individual Garrison had become isolated, and as a result of the individual taking his government benefits, had limited means to contact others (Brewer & Young, 2015). While taking a walk with this individual, Garrison thought it was “a bit weird” (p. 145) that the individual had with them bolt cutters and a bag, however failed to question the individual when they began removing water meters from neighbouring properties. While the authors state that Garrison was aware that the behaviour was criminal, he complied with the requests of the other individual. Garrison is described as having poor ToM, and it is possible that as a result of this he was unsure of how to remove himself from the situation. This issue was further exacerbated by the fact that Garrison relied on the individual for shelter and food (Brewer & Young, 2015).

Case 2. As mentioned earlier, Frederick, aged 18, agreed to store the bag of someone he had met at a party, seemingly in an attempt to make a friend. Only after Frederick had taken the bag home did he discover that it contained weapons (Brewer & Young, 2015). By the time Frederick realised that something was awry, he was unsure of the appropriate course of action. Seemingly due to his poor ToM, Frederick failed to appreciate that if he had taken action upon finding the weapons, he could have explained his naïve role to police and the situation may have been resolved. Instead, Frederick took no action, hid the weapons, and when they were found he was charged with illegal possession and storage of fire arms (Brewer & Young, 2015).

The abovementioned cases describe two individuals who at some stage came to recognise that the nature of the behaviour in which they were involved was unlawful. However, possibly due to social and communicative difficulties associated with ToM deficits, these individuals were seemingly unsure of how to

a) remove themselves from the situation, and b) accurately portray to others their intentions when they performed the behaviour (thus failing to demonstrate their naivety to criminal justice system professionals). It may be of use in future studies that aim to assess recognition of criminal activity to include a measure of the steps a participant would take if they were involved in the presented situation (after it had been identified as including criminal activity). This kind of measure may assist in understanding whether individuals with ASD could identify an appropriate course of action if suspicious behaviour was identified.

Restricted Interest as a Moderator Between Theory of Mind and Response Latency

In the task designed to assess the participants' ability to detect suspicious behaviour, half of the scenarios each participant listened to included references to their unique RI. The information embedded in each of these unique scenarios included both information that had been provided by the participant, and additional information that had been sought on the topic by the researcher (e.g., another possible way to engage in or pursue the interest, a type of product related to the interest, an upcoming event concerning the interest, or a fact about the interest). Audio was chosen as the mode of presentation for the scenarios as it allowed for the inclusion of unique RI information, while keeping the timing of the remainder of each scenario consistent across participants.

While information pertaining to each participant's unique interest was embedded within a series of eight scenarios, the current study found no differences in response latency between the scenarios with and without the embedded information. Further, no evidence of moderation between ToM, RI intensity and the recognition of suspicious behaviour was found, with all models

showing nonsignificant results. Therefore the results did not support the second hypothesis; that RIs would moderate the relationship between ToM and the time taken to recognise suspicious behaviour, whereby those with more impaired ToM and more intense RIs would take longer to detect suspicious activity. The following section will include a discussion of whether the lack of evidence in support of the second hypothesis may have been due to the methodology employed in the current study, or whether the hypothesised relationship between ToM, RI intensity and the ability to recognise suspicious behaviour may not exist.

Validity of the present study in relation to Hypothesis 2. Both the measure used to assess RI intensity, and the measure used to assess the ability of participants to detect suspicious behaviour, were developed for the purpose of the current study. It is possible that these tools may not have been adequate to assess the hypothesised relationship between ToM, RIs, and recognition ability. Two possible reasons for this include a) the information collected regarding the participants' RIs did not accurately portray the intensity of the interests, or b) the inclusion of verbal references to RIs in the Crime Recognition task was not sufficient in order to provide a distraction to participants. These possibilities are discussed below.

Measurement of restricted interests. Limited research has been conducted regarding RIs among individuals with ASD, particularly among adults. As a result, few tools have been developed for the assessment of RIs among adults (e.g., Mercier et al., 2000; Woodbury-Smith et al., 2010). To my knowledge the current study was one of the largest to date that has collected information regarding RIs from a sample of adults with a formal diagnosis of ASD. Given the limited research regarding RIs among adults with ASD, an existing tool that

assessed both the content of an interest and included a measure of intensity that was appropriate for use among this sample could not be located for use in the current study. As a result, a questionnaire was created for this purpose. The created questionnaire enquired about the content of participants' interests and the method of pursuit. The questionnaire also enquired about the number of hours spent per week engaging in the interest, how absorbed individuals became when pursuing the interest, how individuals reacted when the pursuit of their interest was interrupted, and the importance of the interest (which formed for measures of intensity: Number of hours, Absorption, Interruption, and Importance, respectively).

The results of the questionnaire indicated that the majority of participants (89%) had at least one interest, and these interests changed for a number of participants between the phases of the study. The changing nature of interests found in the present study supports the results of a qualitative study conducted by Mercier et al. (2000). Further, with the exception of the Absorption and Interruption subscale, the intensity subscales were not correlated, supporting the notion that they may form different constructs. The two subscales which were correlated (Absorption and Interruption) both had low average scores (i.e., demonstrating a floor effect), which may indicate that they were poor measures of RI intensity. In order to be classified as a RI the interest must be unusually intense (APA, 2013). Further, a number of studies have reported that individuals with ASD become absorbed in their RI (e.g., Taylor, 1990), and become distressed if interrupted (e.g., Rispoli et al., 2014). Given that the questionnaire relied solely on self-reported behaviour, it is possible that some of the interests reported in the study would not have been classified as a RI if they had been

assessed using the diagnostic criterion for ASD in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; APA, 2013). While each individual had a diagnosis of ASD, participants were not asked, nor was it assessed, whether they had met Criterion B3 for ASD, which refers to having a RI. Another possible explanation for the low scores on the two subscales of the RI questionnaire is that the information reported on the questionnaire may not have captured an accurate representation of their behaviour. One possible reason for this may be that some of the questions required insight into one's own feelings (something with which individuals with ASD may experience difficulty; e.g., Hill, Berthoz, & Frith, 2004).

A more objective assessment of RIs in future studies (i.e., one that does not rely only on self-report) might provide more reliable data. Of the RI subscales, Number of hours provided the most variation between participants. Given this measure has been reported as difficult for individuals for ASD to recall (e.g., Woodbury-Smith et al., 2010), participants were asked to think about how many hours spent on their interest on weekdays, and on weekends. This information was then combined to create a weekly average. Participants may have found this subscale easier to recall as the questions did not enquire about their behaviour while engaging in the RI. Future studies attempting to assess the intensity of RIs among adults with ASD may find it beneficial to ask a significant other (e.g., a parent, spouse, or sibling) to also complete the same measure, which could be compared to that of the individual with ASD.

Inclusion of restricted interests in scenarios. Despite the mention of each participant's interest 12 times in each of the RI scenarios, there were no differences in response latency between the RI and Non-RI conditions. There are

a number of reasons for why this might have occurred. For example, the level of information included regarding each participant's RI may have been too superficial to draw the attention of the participants. Each interest was researched and additional information added to that which was provided by participants, including upcoming events regarding the RI. However, given that RIs are thought to be pursued with passion among individuals with ASD, often to the point where an individual may become an expert on the topic (Attwood, 2003), short verbal references regarding their RI may not have been adequate for participants to shift their focus from the scenario to the RI. Rather, as participants reported the scenarios with their RI embedded as less difficult to attend to than the scenarios including the non-RI, the inclusion of the unique information may have had the opposite effect to that which was desired- it may have caused the participant to attend more closely to the scenario. Indeed, among children with ASD, incorporating RIs into the classroom has been associated with increased learning and engagement (Gunn & Delafield-Butt, 2016), and among adults with ASD, several researchers have suggested that pursuit of work in the same area as the RI can lead to successful employment (e.g., Attwood, 2003; Hendriks, 2010; Olney, 2000). Therefore, the inclusion of RI information might have served to engage the participants while listening to the audio.

Alternatively, while the information regarding the RI may have been of sufficient detail, a number of references to the RI in a static environment (i.e., where the individual could not participate by sharing information about the RI as one might in a conversation), may not be enough to capture an individual's attention. In order to determine whether RI intensity (in combination with ToM deficits) might influence the detection of suspicious behaviour, the component of

the task referencing participants RI may need to be more engaging than listening to audio references. For example, the individual might need to be actively engaged in the pursuit of the interest, or at least involved in a more dynamic activity that required or allowed their input regarding their interest. Finally, as the information provided by participants regarding their RI was utilised in all eight scenarios, and the same additional RI information (added by the researcher) was utilised in two scenarios (i.e., crime, no crime); while the RI information may have provided distraction on first hearing, this may have worn off as the task progressed. Alternatively, participants may have remembered completing the RI questionnaire, and hypothesised about the purpose of the task (particularly given the high average ToM score in the sample). In the current study participants' knowledge of the study hypotheses was not assessed.

The role of restricted interests with regard to suspicious behaviour. Alternatively, the hypothesised relationship between RI intensity, ToM deficits, and the ability to recognise suspicious behaviour may not exist. While it has been suggested that individuals with ASD may have difficulty detecting suspicious behaviour of others due to deficits in ToM and the presence of RIs, (e.g., Birmingham City Council, 2012; Brewer & Young, 2015; Howlin, 2004; Murrie et al., 2002), to my knowledge this is the first study of an experimental nature to investigate this relationship. Whether or not ToM deficits and RIs influence the ability to detect suspicious activity, these features may still influence an individual in a manner that may heighten the vulnerability of individuals with ASD to naïve criminal involvement. For example, these two features may decrease the likelihood that an individual will recognise the impact of one's behaviour on oneself or others.

Given that ToM influences the ability to interpret and predict the mental states of others, predicting how others will feel in response to one's behaviour, or understanding the implications of one's behaviour, can be difficult for individuals with ASD who have impaired ToM (Frith et al., 1991; Gomez de la Cuesta, 2010; Murrie et al., 2002). In order to understand that behaviour is unacceptable, one must be able to understand the possible impact that behaviour may have on other people; something which individuals with ASD may have difficulty doing (Barry-Walsh & Mullen, 2004). A failure to recognise the potential implications of behaviour, both for themselves (e.g., legal implications) and for others (e.g., physically and psychologically) has been reported among offenders diagnosed with ASD (e.g., Barry-Walsh & Mullen, 2004; Chen et al., 2003; Katz & Zemishlany, 2006).

In a number of the cases where individuals with ASD have committed crime, the individual's interest is described as being somehow related to the offence, in addition to characteristics that would suggest poor ToM (e.g., Barry-Walsh & Mullen, 2004; Freckelton, 2011; Haskins & Silva, 2006; Murrie et al., 2002). That is, the commission of a crime seems to have been in response to interruption or interference of the RI, without consideration of the impact of their behaviour on others. One example includes the case of a man with an interest in road safety who believed that a path should run in front of his neighbour's property. This individual took it upon himself to remove his neighbour's garden so that the path could exist, seemingly without recognition of the distress this would cause his elderly neighbour (Freckelton, 2011).

Another possibility is that an individual with impaired ToM and a RI may recognise (at least to some extent) the impact of their behaviour, but the

individual's RI will be so intense that they will prioritise the pursuit of the RI. For example, consider the case of Darius McCollum. Darius is an individual with ASD who has had a love of public transport since he was a child (Woolf, 2015). By the age of eight Darius had memorised the train network of New York. At an older age he befriended employees in the metropolitan train service, who taught him how to drive trains, supplied him with a uniform, and allowed Darius to unofficially cover their shifts. While Darius has been arrested multiple times, he continues to assume the role as a public transport employee due to his intense passion for trains (Woolf, 2015).

Therefore, while there may be a relationship between ToM deficits, RI intensity and the ability to recognise suspicious behaviour, even if this relationship does not exist, further investigation into these features is warranted as ToM deficits and RI intensity may influence the vulnerability of individuals with the disorder in different ways.

Individuals who Performed Poorly in the Crime Recognition Task

A subset of the participants' over-reported suspicious behaviour (i.e., reported suspicious activity in scenarios where criminal activity did not occur and thus should not have been deemed suspicious). These groups of participants (i.e., those who were excluded[32], and those who were included but whom responded inconsistently[33] to the Crime Recognition task) appeared to be different than the remaining participants in that they had lower IQ scores (full scale IQ and verbal comprehension), and more impaired ToM (however, when accounting for verbal

[32] A group of participants was excluded for pressing 'Definitely suspicious' for more than one of the scenarios where criminal activity did not occur.

[33] The 'inconsistent' participants were those who were excluded, combined with participants who pressed 'Definitely suspicious' for at least one of the scenarios without criminal activity, and participants who pressed 'May be suspicious' without correcting for at least three of the scenarios without criminal activity.

comprehension ability, the ToM differences only remained when the groups were combined [*n* = 19]). Interestingly, in each of the scenarios that included criminal behaviour, this group of participants responded faster than the remaining participants, although in only some cases was this difference statistically significant. This was particularly the case for the response of 'Definitely suspicious', where the excluded participants responded faster than the included participants for six of the eight crime scenarios, and the inconsistent participants responded faster than the consistent participants for all of the eight crime scenarios.

Given the small size of this subgroup, these data should be interpreted with caution and the meaningfulness not overstated. It is plausible to suggest that some individuals respond more quickly to the task, and this be due to the demand characteristics of the task (see Orne, 1962). Prior to completing the task, participants were instructed to press the response buttons (i.e., 'May be suspicious', 'Definitely suspicious', 'No longer suspicious' or 'Nothing was suspicious') when they felt it was appropriate to do so throughout each scenario. For this reason, participants may have been primed to have expected suspicious behaviour, and as a result pressed a response button quickly (and sometimes inaccurately).

Another possible interpretation of these results is that there may be a subgroup of individuals with impaired ToM who, due to being so poor at detecting suspicious behaviour, have difficulty differentiating behaviour that is suspicious from that which is not. Given that this group of participants was faster to report behaviour as suspicious (in the crime scenarios); these participants may represent a group of individuals with ASD who are more precautious, or overly

suspicious. Individuals with ASD have been reported as exhibiting heightened paranoia compared to individuals without the disorder (e.g., Blackshaw, Kinderman, Hare, & Hatton, 2001; Pinkham et al., 2012). Pinkham et al. (2012) found that the paranoia experienced by individuals with ASD differed from that of individuals with other disorders in that it was characterised by 'social cynicism': cynicism regarding the motivations of other people. The authors suggested that this may be due to difficulty understanding the rules surrounding appropriate social interaction (i.e., difficulties associated with ToM deficits). ToM was not, however, assessed by Pinkham et al. (2012). Maras and Bowler (2012) also found that individuals with ASD had higher paranoia scores than a non-ASD control group. However, the authors suggested that the difference between groups seemed to be the result of a subset of individuals had particularly high scores. While the current study did not assess paranoia, having included a paranoia measure may have provided further insight into the responses of this group of participants. This interpretation of the results, that some individuals with ToM deficits may have difficulty differentiating suspicious and non-suspicious behaviour, would support the first hypothesis, that there exists a relationship between poor ToM and difficulty recognising suspicious behaviour. However, this interpretation of the results may not be consistent with the suggestion from a number of researchers that impaired ToM may heighten vulnerability to naïve involvement in criminal activity (e.g., Howlin, 2004; Katz & Zemishlany, 2006; Murrie et al., 2002), if they indeed are overly suspicious.

Limitations

Crime Recognition task. The mode of delivery for the Crime Recognition task was audio. Audio allowed for consistent information to be

presented to participants, while also allowing for slight variation in content due to the inclusion of information about each participant's unique interest. However, as mentioned above, given that the audio was presented as a series of scripts responses for this task may not represent how individuals would respond to suspicious behaviour in an everyday setting given the absence of environmental cues. In the current study scripts were used to allow for the inclusion of information regarding to participants' interests, and as using scripts required only one researcher (this was convenient given that over 800 files were created over a series of months). Having a second individual assist in the creation of the audio files would have allowed for conversation style scenarios, which could have included verbal cues regarding behaviour of the individuals in the scenarios.

While using videos would allow for more realistic scenarios (which may include conversation rather than a series of scripts), and for the addition of environmental cues (e.g., body language, eye contact), over 800 videos would have needed to be made in order to include each participant's unique RI. Further, given the range of RIs that were reported in the current study (e.g., Mermaiding, Dressage, Italy, RuPaul's Drag Race[34] and Take That[35]), creating videos that included visuals of these interests (or someone in the pursuit of such interests), while keeping the remainder of the scenario consistent (e.g., context, time), would have been, while not impossible, certainly challenging. If the aim of future research was to investigate the role of ToM deficits only, and did not include RI information for each participant, another mode of assessment, such as video, may

[34] RuPaul's drag race is a reality television show filmed in the United States (http://www.logotv.com/shows/rupauls-drag-race).
[35] Take That were a pop music group from Manchester, England, that formed in 1990 (http://takethat.com/).

provide more accurate information regarding the ability of individuals with ASD to recognise suspicious behaviour.

Further, the measurement of the ability to recognise suspicious behaviour included only four different crimes. Therefore, assessment of this ability is limited by the number of scenarios, types of crimes, and the way in which the criminal activity was revealed to the listener. The responses of each participant were correlated between scenarios (which may be interpreted to suggest that they responded similarly to each scenario). However, as almost all participants recognised each of the scenarios with criminal activity as being 'Definitely suspicious', it is possible that scenarios with less obvious criminal behaviour may better allow assessment of any relationship between ToM ability and recognition skill.

It should also be noted that while ability to recognise suspicious behaviour was operationalised as time taken to press the response buttons 'May be suspicious' and 'Definitely suspicious', there is likely to be a degree of variability in the data as individuals may not have pressed the response button as soon as they detected suspicious behaviour (e.g., Fazio, 1990). For example, it is possible that participants may have noticed something was "going on", but waited for a more obvious cue to determine whether they were correct, and pressed a response button only at this time. Having the practice trials, however, may have reduced some of the variation in responses (e.g., Fazio, 1990). This issue could be addressed in future studies by asking participants for qualitative information regarding why they pressed the response button at a particular time. Asking participants to provide qualitative responses may assist in understanding the reasons for reporting suspicious behaviour. This kind of information would

clarify if the situation was accurately understood and what kind of cues the participant noticed that made clear to them that suspicious activity was taking place

Other Factors That Might Influence the Ability of Individuals with Autism Spectrum Disorder to Recognise Suspicious Activity

Another factor that may influence the ability of individuals with ASD to recognise suspicious activity is the presence of a co-morbid disorder. Co-morbid disorders are common among individuals with ASD (Croen et al., 2015; Warren, 2012), and have been found to be prevalent among individuals with ASD who have come into contact with the criminal justice system (e.g., Helverschou et al., 2015; Newman & Ghaziuddin, 2008). Disorders such as depression have been associated with impaired cognitive functioning (e.g., Snyder, 2013), and impaired ToM (e.g., Cusi, Nazarov, Holshausen, MacQueen, & McKinnon, 2012). It is possible that the presence of a co-morbid disorder such as depression may have influenced the response time of participants in the present study, and may influence the ability to detect suspicious behaviour. As a part of a larger study information regarding co-morbid disorders was investigated, and 16% of the individuals who participated in both phases of this study reported having a diagnosis of depression at some stage in their past. Whether co-morbid disorders such as depression may influence the ability of individuals with ASD to detect suspicious behaviour, or heighten vulnerability to naïve criminal involvement in some other way presents an avenue for further research. A larger sample than that in the current study would, however, be required in order to compare the influence of different co-morbid disorders.

Implications of Research Regarding the Ability of Adults with Autism Spectrum Disorder to Recognise Suspicious Activity

Previous cases of individuals with ASD who have come before the courts have had varied outcomes in terms of the crime being understood within the context of the disorder (e.g., Freckelton, 2011, 2013). In some cases information regarding the symptomatology of ASD has contributed to charges being dropped (e.g., Glover v Police, 2009; Parish v DPP, 2007 as cited in Freckelton, 2011) or to altered sentencing (but not culpability; R v Kagan, 2008 as cited in Freckelton, 2011). In other cases a diagnosis of ASD has been deemed insufficient for a reduction in culpability (e.g., Fewster, 2016), or the diagnosis of ASD has been rejected by the court and disregarded during sentencing (e.g., In Australia Legal Services Commissioner v PLP [Legal Practice], 2014). This variation in outcome for perpetrators with ASD is possibly due to the dearth of research evidence available regarding vulnerability among this population, but also the limited understanding of the presentation of ToM deficits and RIs in adulthood. If features associated with ASD such as impaired ToM and RIs do influence the ability of individuals with the disorder to recognise suspicious activity, this information may help to determine whether a defendant with ASD had intent to commit the crime (i.e., mens rea) at the time of an alleged offence.

With more knowledge regarding potential vulnerabilities some individuals with ASD may face (such as difficulties recognising suspicious behaviour), staff working within the criminal justice system would be better equipped to identify when an individual with whom they come into contact might have ASD. For many years the focus of autism research has been on children, and limited research has been conducted regarding adults with the disorder (Howlin &

Taylor, 2015). As a result, much is unknown about the presentation of ASD among adults, and it is possible that a large number of individuals in the population have ASD but do not have a formal diagnosis (Abrahamson, Enticott, & Tonge, 2010; Brugha et al., 2011). Therefore, it is possible that of individuals with ASD who come into contact with the criminal justice system, only a portion will have a formal diagnosis at the time of the alleged offence. This is supported by previous case studies where a number of the individuals received their diagnosis of ASD during the court process (e.g., Allen et al., 2008; Brewer & Young, 2015; Freckelton & List, 2009; Katz & Zemishlany, 2006). Therefore, further research in this area is important.

Conclusions

To my knowledge this study was a first attempt to experimentally investigate whether features associated with ASD (namely ToM deficits and the pursuit of RIs) influence the ability of individuals with the disorder to detect suspicious behaviour. The results of the study, while not as hypothesised, provide preliminary evidence to suggest that there may some kind of relationship between impaired ToM and the ability detect unfolding suspicious activity, where those who have more impaired ToM may have more difficulty detecting unfolding suspicious activity. Given the high ToM scores (with limited variability) in the current sample, the novel approach taken to measure detection ability, the variability in different scenarios, to find correlations in the same direction as the hypothesis is promising. This may suggest that there is some kind of relationship between ToM and the ability to detect suspicious behaviour. However, these results should be interpreted with caution, given a) the majority of analyses were not statistically significant, and b) the sample size was small. Further research is

required in order to determine whether ToM deficits are important to consider regarding the ability to detect criminal behaviour. Given the present study was the first to experimentally examine this relationship, the approach taken in the current study can offer some information as to further avenues for examining the ability of adults with ASD to detect suspicious behaviour.

The study found that the majority of participants (89%) reported having at least one interest. However, no support was found in the collected data for the second hypothesis regarding RI intensity as a moderator between ToM and the ability to recognise suspicious behaviour. As mentioned above, the measurement of the data; particularly with regard to the assessment of RI intensity and the inclusion of RI information into scenarios may have influenced the results. This study highlights the need for a better understanding of how to accurately assess the content and intensity of RIs among adults with ASD, and how to assess the impact the interest may have on an individual in a research setting (e.g., to determine whether the RI influenced the ability to detect suspicious behaviour). Further research would be of benefit to determine whether different measurement techniques found a pattern of results that supported this proposed relationship.

Whether or not ToM deficits and RIs hinder the recognition of suspicious activity, these features may heighten vulnerability of individuals with ASD in other ways, such as reducing the ability to remove oneself from a suspicious situation, or effectively communicate the intention behind ones behaviour (e.g., in the case that one is mistaken as intentionally committing or intending to commit an offence). Despite the limited statistical significance of the findings in the present study, the role of ToM in the detection of suspicious behaviour warrants further investigation.

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Appendix A

Adult Theory of Mind (A-ToM) Scripts and Scoring Criteria

Table A1

A-ToM Social Subscale Item 'Bunnies' and the Corresponding Scoring Criteria

Social story- Bunnies	
Script	Scoring criteria
Two women sit in their living room discussing their bunnies. Susie: "So you know there is a lady coming over today to take a look at the rabbits." Mrs Smith: "That's good, because you know we can't keep them all." Susie: "I know." She looks sad as she picks up one of the bunnies and cuddles it. Susie: "I just love them so much. I can't bear the thought of anything bad happening to them. They're just so beautiful and cuddly." A girl approaches the house and knocks on the front door. The door opens to reveal woman 1 and woman 2. Potential buyer: "Hi I'm here to look at the bunnies." Susie: "Of course, come inside." Mrs Smith, Susie and the potential buyer are sitting in the living room. The potential buyer is cuddling one of the bunnies. Potential buyer: "Oh they are all so cute. It's a shame they're all have males though, I was really looking for a female bunny." Susie: "Oh that is a shame. You know if I can't find a good home for them, I'm going to have to drown them." The potential buyer looks shocked and cuddles the bunny closer. Fade to black. Q: Why does she say she will have to drown the rabbits?	2 points- reference to persuasion, manipulating feelings, and <u>MUST</u> include reference to trying to induce pity/guilt/make her feel bad, encourage to buy etc. e.g., 'To persuade/convince the girl to take the rabbit', 'To make the girl feel guilty and take a rabbit', 'She is lying to try to guilt her into taking a rabbit', 'Trying to pressure her'. 1 point- reference to outcome (to sell them), or simple motivation (to make Jane sad). Or make clear statement wasn't true. e.g., 'To get the girl to buy/take one', 'To get rid of them', 'She couldn't keep them'. 0 points- reference to general knowledge or dilemma, without realisation that statement was not true. e.g., 'She couldn't keep them all. It's kinder to kill them', 'She's a horrible woman, she hates rabbits', 'She is evil, and the authorities should be called'.

Table A2

A-ToM Social Subscale Item 'Hat' and the Corresponding Scoring Criteria

Social story- Hat	
Script	Scoring criteria
Two girls are sitting at a table drinking coffee. Anna: "Have you seen Aunty Jane in that silly hat?" Joan: "I thought you loved Aunty Jane." Anna: "I do. It's just that hat is ridiculous." Aunty Jane approaches the girls. She is wearing the hat. Joan & Anna: "Oh hi Aunty Jane!" Aunty Jane: "Hi. How do you like my new hat?" Anna: "It's really nice, I love it!" Fade to black. Q: Why does she say she loves the hat?	2 points- reference to white lie or wanting to spare the aunt's feelings/cause offense/hurt aunt's feelings. (Answer MUST include reference to the feelings of the aunt). e.g., 'To make her aunt feel good', 'To please her aunt', 'To make her aunt happy' is suffice. 1 point- more general reference to trait (She's a nice person; politeness), relationship (She likes her aunt), or social rules (It's the socially appropriate thing to do). 0 points- reference to irrelevant or incorrect facts/feelings. e.g., 'She likes the hat', 'She wants to trick her'

Table A3

A-ToM Social Subscale Item 'Burglar' and the Corresponding Scoring Criteria

Social story- Burglar	
Script	Scoring criteria
A burglar is robbing a suburban house, and is seen taking valuables and money. He climbs out of the window of the house, and runs down the street. He runs past a policeman on his beat, and drops his glove. The policeman sees the burglar drop his glove, and picks it up and begins to run after the burglar. Policeman: "Stop, you dropped your…." Before the policeman can even finish his sentence, the burglar stops running, puts his hands up and interrupts him. Burglar: "Okay. You got me. I broke into the house." Fade to black. Q: Why does the burglar give himself up?	2 points- reference to burglar's ignorance of policeman's true intention/knowledge state (Answer MUST have some reference to the thoughts of the policeman – i.e., the policeman had some knowledge/assumption/thought of the burglar's wrong doing). 'He thought he had been caught' is not enough for 2 points without reference to the assumption being incorrect (1 point). 'Misunderstanding of policeman's intentions' is suffice for 2 points. e.g., 'He didn't know the policeman just wanted to return his glove', 'He thought the policeman had seen him rob the shop' 1 point- more general reference to burglar's state of mind (e.g., 'He thought he was being arrested' , 'He had a guilty conscience') or outcome (e.g., 'He thought the police might shoot otherwise'). Answer may reference thoughts of the policeman, but fail to link to policeman's knowledge/assumption/thought of the burglar's wrong doing. e.g., 'He thought he had been caught' 0 points- ref to irrelevant facts/mental states e.g., 'He just wanted to come clean', 'He was tired of running', 'The police had his glove'

Table A4

A-ToM Social Subscale Item 'Crying man' and the Corresponding Scoring Criteria

Social story- Crying man	
Script	Scoring criteria
A man is seen sobbing in on the couch. Sally and Drew are chatting across the room. Drew: "What's the matter with him?" Sally: "His wife just left him for a younger man." Drew: "Oh no, is he doing okay?" The man bursts into tears dramatically, as Sally and Drew are watching him. Sally: "Yeah, he's doing just fine." Fade to black. Q: Is this true? Why did she say this?	2 points- reference to the woman's use of sarcasm/irony/not being serious/being funny/ridicule/derision, the man is clearly not fine. (Answer MUST reference sarcasm/irony/not being serious/being funny/ridicule/derision). Simply 'sarcasm' is sufficient for 2 points. 1 point- reference to the fact that the man is clearly not fine but without reference to sarcasm/irony/not being serious/being funny/ridicule/derision. e.g., 'Because he is not fine', 'He is obviously not ok' 0 points- reference to incorrect/irrelevant facts. e.g., 'The man is fine, 'She doesn't want to get involved', 'Maybe she thinks he is actually ok'

Table A5

A-ToM Social Subscale Item 'Spaghetti' and the Corresponding Scoring Criteria

Social story- Spaghetti	
Script	Scoring criteria
A child and his mother are sitting at a table eating spaghetti. The boy is sitting with a full plate of food in front of him, pushing it around with his fork. His mother stands up after finishing her meal. She goes to take his plate. Mother: "Okay, have you finished that meal there Isaac?" Child: "Yes." A close up of the bowl reveals it is full of food. Mother: "Well. That meal must have really filled you up." Fade to black. Q: When the mother said 'that meal must have really filled you up', did she mean it? If not, why did she say it?	2 points- 'No' + reference to the mother's use of sarcasm/irony/humour/derision/ ridicule (Answer MUST reference sarcasm/irony/not being serious/being funny/ridicule/derision). 'No' + 'Sarcasm' is suffice for 2 points. 1 point- 'No' + no further explanation; No + reference to incorrect/irrelevant facts. e.g., the boy didn't eat much. 0 points- 'Yes'

Table A6

A-ToM Social Subscale Item 'Party' and the Corresponding Scoring Criteria

Social story- Party	
Script	Scoring criteria
Simon and Dave are standing in the corner of a party. Simon: "So my brother knows the guy who owns this place." Dave: "That's funny, my brother is the guy who owns this place." They laugh together. Simon: "Nice. I know this might be a bit forward, but I was wondering if I could grab your number?" Dave: "Sure, but if you don't mind, can you not tell anyone about it, as my father doesn't know I'm gay. Only my brother knows." Simon: "Yeah that's cool, I know it's hard. My family knows but they seem pretty chill with it." On the other side of the room Rob and Pete, are chatting to Dave's Dad. Rob: "So, Mr Jones it looks like my brother and your son are really hitting it off. They make a cute couple." Pete (trying to cover it up): "Ah... Rob did you watch that footy game last night?" Dave's dad ignores what Pete says. Dad (To Rob): "Sorry, 'hitting it off'? What are you implying?" Rob (Realising what he has said) "Uh, nothing." He turns and faces Pete. Rob: "Yeah, I saw the game! It was epic." Fade to black. Q: Was there anything awkward or uncomfortable in this interaction? If so, what was it?	2 points- 'Yes' + reference to the man making the situation awkward by assuming the man knew his son was gay and bringing it up in conversation. Some acknowledgment that one father was unaware and was now made aware. 1 point- 'Yes' + no further explanation; 'Yes' + reference to incorrect facts/intentions, or reference to attraction blooming/developing but no clear reference to the fact that the man let slip the young men were gay. 0 points- 'No'

Table A7

A-ToM Physical Subscale Item 'Swimming competition' and the Corresponding Scoring Criteria

Physical story- Swimming competition	
Script	Scoring criteria
A boy and girl sit on the beach looking at the ocean. Harry: "Oi, wanna have a swimming race?" Hannah: "Uh, yeah, sure." Harry: "I'm definitely going to win." Hannah: "Uh no you're not, I'm a much better swimmer." Harry: "You're a better than me in the pool, but I always win in the ocean." Hannah: "Okay then, I'll race you to the jetty and back." Harry: "Ready, set, go!" They jump up off the sand and run out into the ocean. Fade to black. Both children are running out of the water, with Harry in front. Harry throws his arms into the air. Harry: "And Harry wins! See? I told you I could beat you." Fade to black. Q: Why did Harry win?	2 points- reference to the race being in the ocean/waves/surf/beach not a swimming pool/that Harry is faster in the ocean/waves/surf/beach (Answer MUST reference ocean/waves/beach/surf). e.g., 'He is better in the ocean', 'He has more experience in the surf/ocean' (no score of 1 point) 0 points- Reference to irrelevant or incorrect information. e.g., Harry is a better swimmer, older, male, psychologically strong/he tricked her/had a head start/can run faster).

Table A8

A-ToM Physical Subscale Item 'Librarian' and the Corresponding Scoring Criteria

Physical story- Librarian	
Script	Scoring criteria
Mrs Simpson, a librarian sits at her desk, using the computer. A boy approaches her holding a book. Boy: "Hi Mrs. Simpson, I have a book here you may want to put in your library. Which section would you like to put it in?" Mrs Simpson: "Well our library has a lot of different sections, what's the book about?" Boy: "It's about plants and their medical uses. It's heavily illustrated." Mrs Simpson: "Ah I know the perfect place for it." Boy: "Are you going to put it with the rest of the books on botany or medicine?" Mrs Simpson: "No, I have a special room for this book, where all the books are kept in special cases at a constant temperature. I think I'll put it in that room." Fade to black. Q: Why Mrs Simpson put the book in a special room?	2 points- reference to delicate condition of the book due to age or value; Any reference to preservation/protection/keeping it safe is suffice; May reference temperature control in the room. e.g., 'It may be old and requires special handling', 'To protect it' 1 point- general reference to special status of the book, not further explained. e.g., 'The book is old', 'It is special' 0 points- reference to other motivations not warranted by the story. e.g., 'So she would always know where to find it/for her own convenience', 'The book contains plant specimens'

Table A9

A-ToM Physical Subscale Item 'Car' and the Corresponding Scoring Criteria

Physical story- Car	
Script	Scoring criteria
A man is at a car dealership looking at a new car for sale. He is wearing an expensive suit, suggesting he is well off. Dealer: "So have you decided?" Man: "I'll take the car, I really like it. I've got enough money, so I'll go down to the bank and get it." Dealer: "You can pay the car off over a 12 month period with monthly instalments." The man completely disregards the offer, knowing it will just end up costing him more. Man: "Oh no that's fine, I'll pay in full. I'm sure you guys charge interest." Dealer: "Well we do charge interested, but it's only 5%." Man: "Oh good. I get 8% in the bank, so in that case, I'll pay in monthly instalments." Dealer: "Does this mean you'll take the car? Man: I'll take the car." Dealer: "Congratulations." Man: "Thank you very much." Dealer: "It is a very beautiful car." The men shake hands. Fade to black. Q: Why does he accept the dealer's offer to pay in monthly instalments?	2 points- reference to relative gain from leaving money in the bank due to greater interest gained on savings than spent on monthly instalment payments (exact figures not necessary, but must suggest interest is better/different/more etc.). e.g., 'Because his bank pays better interest than the dealer charges', '8-5 = 3% profit interest' 1 point- general reference to saving money that way, or it being the sensible thing to do. General reference to interest rates but without specific reference to saving money based on interest rates. e.g., 'Because of the interest rates', 'He thought it was the smart thing to do' 0 points- reference to irrelevant or incorrect factors. e.g., 'He can't afford the whole thing', 'He wants to keep some money in the bank to pay bills'.

Table A10

A-ToM Physical Subscale Item 'Leg injury' and the Corresponding Scoring Criteria

Physical story- Leg injury	
Script	Scoring criteria
An older lady steps into the doctor's office. Doctor "Hi, hello, how are you?" Lady: "Hi." Doctor: "Have a seat. What can I do for you today?" Lady: "Well yesterday I fell over on my icy door step. I did get up straight away, although I did feel quite shaken and bruised. And when I woke up this morning I could scarcely walk. And my leg feels really stiff." Doctor: "Hmm, let me take a look, and let me know if you feel any pain." She analyses the swollen leg, looking quite concerned. Doctor: "It looks quite swollen. I'm going to have to send you to the casualty department at the hospital, and they're going to need to take an x-ray." Fade to black. Q: Why does she need an x-ray?	2 points- reference to the possibility that she has fractured/broken/cracked/split her leg. Seems to have understood that she may have caused further injury to her leg and there is a need to assess this damage. e.g., 'They want to see if she has broken anything', 'She may have fractured her hip' 'The possibility of a fracture', 'She may have damaged her bone', 'To check for internal damage' 1 point- reference to general aim. Is not specific to checking the leg for further injury. e.g., 'To see what's wrong', 'Because of her fall', 'Because her leg is swollen' 0 points- reference to irrelevant or incorrect factors. e.g., 'That's what doctors do', 'It's standard procedure'

Table A11

A-ToM Physical Subscale Item 'Lost glasses' and the Corresponding Scoring Criteria

Physical story- Lost glasses	
Script	Scoring criteria
Sarah is looking around for her glasses. Ted is sitting on the couch watching television. Sarah: "Ted, have you seen my reading glasses?" Ted: "When did you last have them?" Sarah: "I had them yesterday evening when I was looking at the TV programs. Can you help me find them please?" Ted picks up a piece of paper next to him, looks underneath, sees nothing, then looks straight back at the TV. Ted: "Can't find them." Sarah: "Seriously Ted. I need them." Ted gives in, switches off the TV and stands up. Ted: "Fine. Try retracing your steps. What did you do today?" Sarah thinks for a moment. Sarah: "Well I went to my early morning fitness class, then the post office, and the flower shop." Ted grabs his car keys and heads for the door, without wasting a second. Ted: "Come on then, we'll try the post office first." Fade to black. Q: Why is the post office the most likely place to look?	2 points- reference to post office being the place she would most likely use her glasses (to read/write/fill out forms); wouldn't need at gym/flower shop. Simply 'It was the most likely place she would have left them/would need to use them' is suffice for 2 points. 1 point- general reference to post office being where she left them. 0 points- reference to irrelevant or incorrect factors. e.g., 'That was the last or first place she went', 'He decided to go there first as it was the closest'

Table A12

A-ToM Physical Subscale Item 'Light bulbs' and the Corresponding Scoring Criteria

Physical story- Light bulbs	
Script	Scoring criteria
John is looking at light bulbs, a sales assistant approaches him. Assistant: "Excuse me sir, can I help you there?" John: "Yes, I've just bought a new lamp for my desk, and I need a new light bulb for it." Assistant: "Oh right, okay, well you can buy the Litebrite here, which comes in a single, or you can pay just a little bit more and get the Everbright, which comes in a pack of ten. John: Well I only need the one, but I think I will take the pack of ten. Thank you." Assistant: "Have a good day" Fade to black. Q: Why does he buy the pack of 10?	2 points- reference to saving money (since multipacks are cheaper). May also, but needn't mention convenience of having more or future need for more than one bulb. e.g., 'Better value', 'Cheaper in bulk', 'Saves money that way' 1 point- reference to convenience of having more, or future need for more than one bulb. No mention of saving money or better value. e.g., 'So he won't have to keep going out to the store', 'In case one blows', 'He will need more later' 0 points- reference to irrelevant or incorrect facts or references to characteristics of salesman. e.g., 'He likes that brand the best'. 'He needs a whole lot of bulbs', 'The salesman was charismatic', 'It was a good sales pitch', 'He was a con artist'

Appendix B

Restricted Interests Questionnaire

You will now be asked some questions about any special interests you have. You will have the opportunity to respond to these questions for up to three different interests[36].

1. In the last 12 months, have you had any strong interests?

☐ Yes
☐ No

If you answered 'Yes', please continue. If you answered 'No', please give this form back to the researcher.

Please list ***one* of these interests**

How do you (or did you if in the last 12 months) prefer to engage in or pursue this interest (e.g., looking it up on the internet, reading about it, collecting it)?

What is your favourite thing about this interest?

On **weekdays** (i.e., Monday to Friday), approximately how many hours do you spend pursuing or engaging in this interest **each day**? _____ hours/day

On the **weekend** (i.e., Saturday and Sunday), approximately how many hours do you spend pursuing or engaging in this interest **each day**? _____ hours/day

When you are pursuing or engaging in this interest, to what extent do you forget to:

	Never	Occasionally	Frequently	Almost every day
Eat?	☐	☐	☐	☐
Drink?	☐	☐	☐	☐
Shower/bathe?	☐	☐	☐	☐

If you are interrupted while you are pursuing or engaging in this interest, and have to stop, do you find it (please circle):

Difficult?	No	Yes, Sometimes	Yes, every time
Distressing?	No	Yes, Sometimes	Yes, every time

[36] This set of questions was repeated so that participants had the opportunity to respond for up to three interests.

If you are interrupted while you are pursuing or engaging in the interest, and have to stop, do you behave (please circle):

Aggressively? No Yes, Sometimes Yes, every time

If you are interrupted while you are pursuing or engaging in the interest, and have to stop, how do you feel?

	Not at all	Somewhat	Very much so
I feel tense	☐	☐	☐
I feel upset	☐	☐	☐
I feel nervous	☐	☐	☐
I feel worried	☐	☐	☐
I feel angry	☐	☐	☐

When I am pursuing or engaging in this interest:

	Not at all	Somewhat	Very much so
I feel relaxed	☐	☐	☐
I feel calm	☐	☐	☐
I feel happy	☐	☐	☐
I feel excited	☐	☐	☐

Appendix C

Templates for the Crime and No Crime Scenarios

Crime Scenario 1

Cherie is a young woman in her 20s who is studying social work at university. Cherie really enjoys (**RI data**). She spends many hours each day (**engaging in RI**), as she just loves (**favourite data**). Cherie currently lives on her own, but is finding it hard to pay rent while working on a casual basis. Therefore, she is looking to rent a room in a share house. While at university one day Cherie saw an advertisement for a very cheap room, and called the number to arrange a meeting and walk through the house.

A few days later, Cherie arrived at the house she had enquired about, and met the two other tenants. She found out that they were also students at her university. She was impressed when she found out that the other tenants liked (**engaging in RI**) too. Cherie was really passionate about (**RI**) and thought she would enjoy living with others with similar interests to herself. She wondered (***something about the others engaging in RI***). Cherie had a good discussion with the students, and thought it sounded like a good house for her, particularly given the cheap rent and free internet.

The students mentioned that they were looking for someone who was home most of the time. That suited Cherie as some of her subjects were to be completed online, meaning she could study at home. She also liked to (**engage in RI)** often, which she usually did at home. She liked (***looking up/doing something to do with RI*)**. They also mentioned that they were completing a report for the landlord regarding how many police cars drove past. They asked Cherie to keep a

diary in the front room of the house, and write down if she saw any police cars in their street. She was happy to do this and agreed to move in to the house.

Cherie moved in the following week. Her house mates weren't home a lot, which suited her as she could study in silence most of the time. She did enjoy discussing (**RI**) with them occasionally, in particular (***something about RI***). They did have some disagreements about (***something more specific about RI)*** though. They seemed to come home, spend a little time in their room, and then leave. Often they would be holding some kind of tool Cherie didn't recognise, or large containers. She would often hear them using a lot of water. She also noticed that they usually left the lights on in their room, as she could see the bright light coming from underneath their doors even when they weren't home. When she questioned them about the power bill, they told her they would pay it all, and not to worry.

One day while Cherie was **(engaging in RI)** the police knocked on the front door. It took her a few minutes to get to the door; she was so involved in **(*specific way of engaging in RI*)** that she missed the first few knocks. She had just found out something new, and found it really interesting. When she answered the door, two police officers asked Cherie if she was growing anything in the house and if they could look inside. Confused, she informed them that she was not growing anything and let the officers in. On opening the other tenants' rooms, the police officers saw tables of plants growing under lights. They were green with long spiky looking leaves, and had buds growing on them. There was also a fridge in one of the rooms that was filled with what looked like green herbs.

Crime Scenario 2 (538 words without RI info)

Aaron is a 40 year old man who works a casual job in retail. When he isn't working, Aaron can be found **(engaging in RI).** His favourite thing about **(RI)** is **(favourite data)**. Recently, the store where Aaron works has been quieter than usual, and he hasn't been offered many shifts. As a result Aaron is struggling to pay for rent and the household bills, and thinks he may need to find a second job to support himself.

Not being able to pay his bills really worried Aaron. He spent many hours each day (**engaging in RI**), and would often use the internet to (**look up RI**). If the internet was cut off due to unpaid bills, he wouldn't know what to do with his time and would be quite stressed. Aaron didn't really want to find a second job. He dreamt of spending all day (***thinking about pursuing RI***). But he started looking for a new job as he knew he needed the money.

One day while Aaron was looking at job advertisements, his friend Jim made him an offer. He said that if Aaron would keep some files on his computer for him, then he would give Aaron cash each month to pay for his internet and electricity bills so he could still (**engage in RI**). Jim explained that he had run out of space on his hard drive and if Aaron stored some of his files, it would free up his computer without him needing to purchase more storage. Aaron was relieved! He explained to Jim that this would mean he could continue learning (***something about RI***). Jim said that Aaron would be doing him a favour. The only conditions were that Aaron could not open the files, share the files, or tell anyone anything about the files. Aaron agreed, and thanked Jim.

That night, Jim brought the files he wanted stored to Aarons house on a USB drive. Aaron started transferring the files to his own computer, and saved

them using cloud storage. Jim knew that Aaron used the internet often and said he was happy he could help him by swapping the private storage of these photos for his internet and electricity bill costs. As Aaron was transferring the photos onto his computer, he started telling Jim about (**RI**). He wondered if Jim knew (***fact about RI***), and if he might enjoy (***using RI***) with him? While Aaron didn't open the files, he could see the images as thumbnails due to the settings on his computer. He noticed that all of the files seemed to be photos of young children. Jim noticed Aaron looking at the thumbnails of the photos, and said that he had been studying photography, and these were his models for an assignment. Jim said he wanted to surprise his wife with his new photography skills, and asked Aaron not to tell her about the course. Jim paid Aaron cash for his bills and left.

While Aaron was (**engaging in RI**) the following week using the internet, he heard a knock at the door. Aaron had been reading about/watching/listening to (***something about RI***), and was annoyed that he had been interrupted. When he answered the door, Aaron saw two police officers. After confirming Aaron's name, the officers stated that they required access to Aarons computer. Confused, Aaron handed the computer over to them. He was later interrogated about the possession of child pornography.

Crime Scenario 3 (578 words without RI info)

Lisa and Frankie have been best friends since they were 5 years old. They have often had similar interests, and for the past couple of years they have both been interested in (**RI**). When the girls spend time together, they usually end up (**engaging in RI**), as they just love (**favourite data**). Both girls are now 20 years old, and as they both work full time, they aren't able to spend as much time

together as they used to. Lisa works in retail, and Frankie works in hospitality. This means they both work a range of shifts, which are often in the evening and on weekends.

Recently, Frankie went to Lisa's house, and they spent the whole morning (**engaging in RI**). It was the first time they had (**engaged in RI**) for a few months and after a couple of hours they had started arguing about (***something about RI).*** Around lunch time, Lisa asked Frankie if she would like to go to some bars with her that evening. Frankie didn't have plans for that evening, and agreed to go. That afternoon while the girls were drinking tea, Lisa received a phone call. She spoke very quietly, but Frankie could hear her agree to something. Soon after, Lisa asked Frankie to leave her house, and said she would meet her at the train station at 8.30 that evening. When she asked Lisa why she needed to leave so early, she just said that she had some work to do.

Frankie arrived early at the train station, and thought about (**RI**) while she was waiting for Lisa. She thought about their argument and how she still thought Lisa was wrong- (***Frankie's point about RI argument earlier***). Lisa arrived at the station ten minutes later. Frankie noticed that Lisa had a large bag, and asked her what was in the bag. Lisa replied that she had packed some extra clothes in case the evening became cold. Lisa then told Frankie that she had a list of bars she needed to visit that night. Frankie hadn't been to many bars, so she was happy to do that.

While they were waiting in line to enter one of the larger bars in the city, they talked about how they had (**engaged in RI**) that day. Frankie mentioned that when she had gone home she had done some research and found out (***fact about RI or upcoming event***), and wondered if Lisa had knew about it. Lisa didn't, but

she did know that (***another fact about RI or upcoming event*)** and she had been meaning to tell Frankie about it. Lisa then mentioned that she was looking forward to making some money. Just as she was finishing her sentence, a police car parked close to the entrance, and two officers and a dog got out of the car. Before Frankie could ask her what she meant about making money, Lisa said she needed to go to the toilet, and asked Frankie to hold her bag for her. Lisa removed her phone and wallet from the bag, and then gave the bag to Frankie. She then walked quickly into a nearby café.

Frankie hoped no one would mind Lisa pushing back in line when she came back from the toilets! She started daydreaming about (**RI**) while she was waiting for Lisa, and pictured herself (***daydream about RI*)**. A few minutes after Lisa had left to go to the toilet, the police dog walked up to Frankie, started sniffing her, and then sniffing Lisa's bag. The dog then sat down at Frankie's feet. A police officer asked to look inside the bag. When Frankie opened it, she saw what looked like at least 50 small bags with coloured tablets in them.

Crime Scenario 4 (572 words without RI info)

Jonah is a middle aged man looking for a full time job so he can have a stable income. While he isn't working, Jonah spends a lot of time (**engaging in RI**). Jonah enjoys (**RI**), and thinks (**engaging in RI**) is a good way to spend his free time when he isn't looking for a job. One day while he was doing his grocery shopping, Jonah saw an advertisement for a door to door interviewer position. Jonah thought this would be a job that he might be good at. He called the number straight away to register his interest for the job.

Jonah was really interested in (**RI**), and without stable income, he was spending a lot of his time looking for a job when he would rather be spending time on his interest. If he had a fulltime job it meant he would have more money, and could spend time (**engaging in RI**) without stressing about looking for a job. He might also be able to buy/pay for (***something related to RI***).

A few days after his phone call, Jonah had an interview with the company about the interviewer position. He was instructed to meet the owner of the company at his house. When he arrived, he was shown to an office inside a garage. Jonah had with him a copy of his resume, and the job advertisement he had taken from a pin board at the grocery store after he had called. Jonah was excited. He hoped to get the job so that he could (**engage in RI**) more often in his spare time. He thought about how he could now spend his weekends (***engaging in RI***) without stressing about a job.

At the interview Jonah was informed that the job required someone to go to people's houses and conduct 20 minute surveys. Jonah would need to write the customers responses on a note pad. On a separate note pad, he would need to write down how many people lived in the house, if any dogs lived at the house, if the house had a security system, and if he could see any valuables in the house. At the end of each shift, Jonah would need to drop the note pads to his boss's house, and he would be paid in cash. The cash would cover Jonah's bills, and he would have some left over to spend on (**RI**). He might even be able to afford (***something for RI***). He had been recently dreaming of (***something related to RI***), but didn't have the money. Jonah agreed to take the job, and started the next day. He liked talking to people, and found the job to be easy. After each shift he took the notepads to his boss and was paid in cash.

During Jonah's third week working his new job, a customer asked why he was looking into their backyard. Jonah explained that he was looking to see if they had any dogs, or a security system. When the customer asked why he needed this information, Jonah replied that he was told to do this by his boss. Jonah took the job advertisement out of his pocket to show the customer the name of the company. Jonah explained that his job helped him pay for bills so he could (**engage in RI**) more often without worrying about money, and how he really liked the job. He started telling the customer (***fact about RI***). The customer reached for their phone and then stated that they were calling the police. When the police arrived, Jonah was interrogated about his job, and a series of thefts that had occurred in the surrounding neighbourhood.

No crime Scenario 1 (486 words without RI info)

Oscar is a young man in his 20s who is studying medicine at university. Oscar really enjoys (**interest**). He spends many hours each day (**engaging in interest**), as he just loves (**favourite data**). Oscar currently lives with his parents, but is hoping to move into a share house with some other students. While studying in the library one day Oscar saw an advertisement for a cheap room on a notice board. He called the number to arrange a meeting and walk through the house.

A few days later Oscar arrived at the house he had enquired about, and met the two other tenants. He found out that they were also students at the university he attended. He was impressed when he found out that the other tenants liked (**engaging in RI**) too. Oscar was really passionate about (**RI**) and thought he would enjoy living with others with similar interests to himself. He wondered (***something about the others engaging in RI***). Oscar had a good

discussion with the students, and thought the rent was reasonable for the size of the house.

The students mentioned that they were looking for someone who was home most of the time. They had a dog, and neither of them was home often to spend time with it. That suited Oscar as some of his subjects were to be completed online, meaning he could study at home. He also liked to (**engage in RI)** often, which he usually did at home. He liked (***looking up/doing something related to RI)***. They also mentioned that the landlord had requested that prior to moving in the new tenant complete an inspection sheet, and keep the room that was available in good condition. He was happy to do this and agreed to move into the house.

Oscar moved in the following week. His house mates weren't home a lot as they were either at uni classes or work. This suited Oscar as he could study in silence most of the time. He did enjoy discussing (**RI**) with them occasionally, in particular (***something about RI*)**. They did have some disagreements about (***something more specific about RI***) though. They seemed to come home, shower, and go to work. They were very busy. Given how much he was home and using the electricity, Oscar thought he should pay more than a third of the electricity bill. When he questioned them about the electricity bill, they told him they would all split it evenly, and not to worry.

One day while Oscar was (**engaging in RI**) he heard a knock on the front door. It took him a few minutes to get to the door; he was so involved in **(*a specific way of engaging in RI*)** that he missed the first few knocks. When he answered the door, the neighbour complained that the dog had been barking, and asked if Oscar could keep it inside while he was at home. Oscar agreed, and said

he would let the dog inside the house. He apologised to the neighbour, and brought the dog inside. The dog sat by his feet wagging its tail while Oscar was studying.

No crime Scenario 2 (485 words without RI info)

Angus is a 40 year old man who works a casual job in manufacturing. When he isn't working, Angus can be found **(engaging in RI).** His favourite thing about **(RI)** is **(favourite data)**. Recently, the factory where Angus works has been quieter than usual, and he hasn't been offered many shifts. As a result Angus is struggling to pay for rent and the household bills, and thinks he may need to find a second job to support himself.

Not being able to pay his bills really worried Angus. He spent many hours each day (**engaging in RI**), and would often use the internet to (**look up RI**). If the internet was cut off due to unpaid bills, he wouldn't know what to do with his time and would be quite stressed. Angus didn't really want to find a second job. He dreamt of spending all day (***pursuing interest as dream***). But he started looking for a new job anyway as he knew he needed the money.

One day while Angus was looking at job advertisements, his friend Owen offered to loan him some money. He said that if Angus was really that worried about his bills being paid, then he would loan him money to pay for his internet and electricity bills so he could still (**engage in RI**). Owen explained that he had recently been promoted at work, so he could spare the money to loan in the short term. Angus was relieved! He explained to Owen that this would mean he could continue learning (***insert fact about RI***). The only conditions were that Angus

needed to commit to finding a second job, and pay him back when he had one. Angus agreed to this deal, and thanked Owen.

That night, Owen brought some cash around for Angus to pay his bills with. Owen knew that Angus used the internet often and said he was happy he could help him by loaning him some money. As Angus was putting the money in a safe place, he started telling Owen about (**RI**). He wondered if Owen knew (***fact/interesting thing about RI***), and if he might enjoy (***using RI***) with him? Angus asked Owen about his promotion. He said that it had been recent, but he had been hoping for a promotion for a while. The new role involved more responsibility, but he was ready for it. Owen said he wanted to surprise his wife with his good news by taking her on a holiday, and asked Angus not to talk to her about the promotion yet. Shortly after, Owen said goodbye and left.

While Angus was (**engaging in RI**) the following week using the internet, he heard a knock at the door. Angus had been reading about/watching/listening to (***something new or interesting about RI***), and was annoyed that he had been interrupted. When he answered the door, Angus saw two men wearing lanyards and holding clipboards. They said they were from a national gas company, and wanted to ask him some questions about the company currently supplying gas to the house. They said they may be able to save him some money on his gas bill if he listened to what they had to say.

No crime Scenario 3 (576 words without RI info)

Sadie and Violet have been friends since they were 10 years old. They have often had similar interests, and for the past couple of years they have both been interested in (**RI**). When the girls spend time together, they usually end up

(**engaging in RI**), as they just love (**favourite data**). Both girls are now 20 years old, and as they both work full time, they aren't able to spend as much time together as they used to. Sadie works in manufacturing, and Violet works in human resources. This means they often work different hours to each other, which may include evening and weekends.

Recently, Sadie went to Violets house, and they spent the whole morning (**engaging in RI**). It was the first time they had (**engaged in RI**) for a few months and after a couple of hours they had started arguing about (***something about RI***). Around lunch time, Violet asked Sadie if she would like to go to some bars with her that evening. Sadie didn't have plans for that evening, and agreed to go. That afternoon while the girls were drinking tea, Violet received a phone call. After the call had ended, Violet told Sadie that it was their mutual friend Zoe, and she had invited her to come with them that evening. Soon after, Sadie left Violets house, and said she would meet her at the train station at 8.30 that evening.

Sadie arrived early at the train station, and thought about (**RI**) while she was waiting for Violet. She thought about their argument and how she still thought Violet was wrong- (***insert Sadies point about RI argument earlier***). Violet arrived at the station ten minutes later. Sadie noticed that Violet had a large bag, and asked her what was in her bag. Violet replied that she had packed some extra clothes in case the evening became cold, and pulled a jumper out of her bag to show Sadie. Violet then told Sadie there were a few bars in particular she wanted to go to. There were great drink specials at a couple, and a good DJ was playing at the other. Sadie hadn't been to many bars recently, so she was happy to go wherever Violet wanted to go.

While they were waiting in line to enter one of the larger bars in the city, they talked about how they had (**engaged in RI**) that day. Sadie mentioned that when she had gone home she had done some research and found out (***fact about RI or upcoming event***), and wondered if Violet knew about it. Violet didn't, but she did know that (***fact about RI or upcoming event***) and she had been meaning to tell Sadie about it. Violet then mentioned that she was looking forward to seeing Zoe. Just as she was finishing her sentence, a police car parked close to the entrance, and two officers and a dog got out of the car. Before Sadie could respond, Violet said she saw Zoe across the street and started calling her name. Zoe didn't respond, so Violet ran across the street to greet her.

Sadie hoped no one would mind Violet pushing back in line when she came back with Zoe! She started daydreaming about (**RI**) while she was waiting for the girls, and pictured herself (***daydream about RI***). A few minutes later Violet returned with Zoe. They asked the person next to Sadie in the queue if they minded if Violet got back in line and Zoe joined them. They said they were Ok with that, so the girls stood in line next to Sadie. The girls were excited to be going in to the bar, and chatted while waiting in the queue.

No crime Scenario 4 (562 words without RI info)

Henry is a middle aged man looking for a full time job so he can have a stable income. While he isn't working, Henry spends a lot of time (**engaging in RI**). Henry enjoys (**RI**), and thinks (**engaging in RI**) is a good way to spend all of his free time when he isn't looking for a job. One day while looking for a job online, Henry saw an advertisement for a door to door interviewer position. Henry

thought this would be a job that he might be good at. He called the number straight away to register his interest for the job.

Henry was really interested in (**RI**), and without stable income, he was spending a lot of his time looking for a job when he would rather be spending time on his interest. If he had a fulltime job it meant he would have more money, and could spend time (**engaging in RI**) without stressing about looking for a job. He might also be able to buy/pay for (***something related to RI***).

A few days after his phone call, Henry had an interview with the company about the interviewer position. He was instructed to meet the owner of the company at his office. When he arrived, he was shown to an office inside a large building with the business name on a large sign out the front. Henry had with him a copy of his resume, and a copy of the job advertisement he had printed. Henry was excited. He hoped to get the job so that he could (**engage in RI**) more often in his spare time. He thought about how he could now spend his weekends (***imagery of engaging in RI***) without stressing about a job.

At the interview Henry was informed that the job required someone to go to people's houses and conduct 20 minute surveys. Henry would need to write the customers responses on a note pad. On a separate note pad, he would need to write down which suburbs he had travelled to, and how many kilometres he had travelled each shift. At the end of each shift, Henry would need to log in as a staff member to the business web page, and complete a time sheet stating how many interviews he had conducted, the suburbs he had travelled to, and the kilometres he had travelled. Once a week he would be required to drop the note pads with the customer responses to the business headquarters for entry onto their database. The salary would cover Henry's bills, and he would have some left over to spend

on (**RI**). He might even be able to afford (***something for RI***). He had been recently dreaming of (***something related to RI***), but didn't have the money. Henry agreed to take the job, and started the next week. He liked talking to people, and found the job to be easy. After each shift he completed the online forms as he was asked.

During Henry's third week working his new job, a customer asked why he was looking into their lounge room. Henry apologised, and stated that he was simply looking as he thought they had decorated it well. Embarrassed and trying to change the subject of conversation, Henry then asked the customer if they liked to (**engage in RI**). He started telling the customer (***fact about RI***). The customer agreed, and they had a great discussion. Henry looked at his watch and realised he shouldn't talk for too long while he was working. He thanked the customer for completing the interview, and moved on to the next house.

Appendix D

List of Reported Interests and Assigned Categories

Table D1

Reported Interests (Phase 1, Between Phases, and Phase 2) and Assigned Categories

Interest	Category
Architecture in Minecraft	Games/Gaming
Collecting artefacts and achievements within an online game	Games/Gaming
Completing uncompleted games on Steam (e.g., Half-life, Rift)	Games/Gaming
Computer games	Games/Gaming
Computer gaming	Games/Gaming
Computers and gaming	Games/Gaming
Dungeons and dragons	Games/Gaming
Dungeon Hunter 5	Games/Gaming
Europa Universalis (game)	Games/Gaming
Games	Games/Gaming
Games- all types (e.g., Rocket League and Spy Craft)	Games/Gaming
Gaming	Games/Gaming
Gaming	Games/Gaming
Gaming	Games/Gaming
Gaming	Games/Gaming
Gaming	Games/Gaming
Grand theft auto	Games/Gaming
Ingress (game)	Games/Gaming
Jigsaws on my computer	Games/Gaming
Kerbal space program (online game)	Games/Gaming
Online co-op video games	Games/Gaming
Online Games	Games/Gaming
PlayStation	Games/Gaming
Pokémon video games	Games/Gaming

Puzzles	Games/Gaming
Solitaire	Games/Gaming
Sword fighting- Myths and Legends	Games/Gaming
Video/computer games	Games/Gaming
Video games	Games/Gaming
Video games	Games/Gaming
Video games	Games/Gaming
Video games	Games/Gaming
Video games	Games/Gaming
Video game playing benefits	Games/Gaming
Video gaming	Games/Gaming
Video gaming (Nintendo Wii-V)	Games/Gaming
Video games- in particular Border heads and Halo	Games/Gaming
Warhammer	Games/Gaming
Warhammer	Games/Gaming
Wii-V- Splatoon	Games/Gaming
Word games online	Games/Gaming
World of Warcraft	Games/Gaming
Archaeology	Factual Information/Knowledge attainment
Art history and lecturing on same	Factual Information/Knowledge attainment
Autism spectrum disorders	Factual Information/Knowledge attainment
Chemistry, genetics	Factual Information/Knowledge attainment
Criminal history and psychology	Factual Information/Knowledge attainment
Family history	Factual Information/Knowledge attainment
Family research- family tree	Factual Information/Knowledge attainment
Fish tanks	Factual Information/Knowledge attainment
Genealogy- family history	Factual Information/Knowledge attainment
Greek mythology	Factual Information/Knowledge attainment
Historical research	Factual Information/Knowledge attainment
History	Factual Information/Knowledge attainment
Intelligence	Factual Information/Knowledge attainment
Learning- study	Factual Information/Knowledge attainment
Learn a second language	Factual Information/Knowledge attainment
Mathematics	Factual Information/Knowledge attainment

Period costume	Factual Information/Knowledge attainment
Pharmacology	Factual Information/Knowledge attainment
Philosophy	Factual Information/Knowledge attainment
Research and reading neuroscience	Factual Information/Knowledge attainment
Russian language	Factual Information/Knowledge attainment
Science	Factual Information/Knowledge attainment
Solving unsolved crimes (real life)	Factual Information/Knowledge attainment
Buying new car	Vehicles and Machines/Mechanics
Cars	Vehicles and Machines/Mechanics
Cars- AIS falcon	Vehicles and Machines/Mechanics
Cars, Subaru and other AWD vehicles	Vehicles and Machines/Mechanics
Driving, car	Vehicles and Machines/Mechanics
Looking at Cars on Car Sales	Vehicles and Machines/Mechanics
Mechanics	Vehicles and Machines/Mechanics
Mechatronics	Vehicles and Machines/Mechanics
Model railways	Vehicles and Machines/Mechanics
Model railways	Vehicles and Machines/Mechanics
Motor bike riding	Vehicles and Machines/Mechanics
Motorbikes	Vehicles and Machines/Mechanics
Motorcycle riding	Vehicles and Machines/Mechanics
My car	Vehicles and Machines/Mechanics
Railways	Vehicles and Machines/Mechanics
Railways	Vehicles and Machines/Mechanics
Robotics	Vehicles and Machines/Mechanics
Trains (building a steam locomotive)	Vehicles and Machines/Mechanics
Transport material (e.g., trains, trams, uniforms, paraphernalia)	Vehicles and Machines/Mechanics
Vintage radio restoration	Vehicles and Machines/Mechanics
Welding, becoming a welder	Vehicles and Machines/Mechanics
Riding my new motorcycle	Vehicles and Machines/Mechanics
4 X 4 cars	Vehicles and Machines/Mechanics
Cameras	Computers and Technology
Computers	Computers and Technology
Computers	Computers and Technology
Computing	Computers and Technology

Computer programming	Computers and Technology
Ham radio	Computers and Technology
High quality sound reproduction	Computers and Technology
Internet	Computers and Technology
IPad programming	Computers and Technology
Server management	Computers and Technology
Virtual reality programming	Computers and Technology
Writing a ray tracer	Computers and Technology
3D printer	Computers and Technology
Anime/Manga	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Comics	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Comics	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Comics (books and collectables)	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Doctor Who	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Doctor Who	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Fanfiction	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Japanese animation	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Japanese media (anime, visual novels)	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Lego Harry Potter sets	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Movies	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Movie watching, and getting to the movies	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Otaku	Pop culture (e.g., TV shows/Movies & Anime/Comics)

RuPaul's Drag Race (TV show)	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Star wars	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Take that	Pop culture (e.g., TV shows/Movies & Anime/Comics)
The Closer (TV show)	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Trivia on TV shows	Pop culture (e.g., TV shows/Movies & Anime/Comics)
True Blood	Pop culture (e.g., TV shows/Movies & Anime/Comics)
TV shows	Pop culture (e.g., TV shows/Movies & Anime/Comics)
TV/DVD/video games	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Watching anime	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Zombies	Pop culture (e.g., TV shows/Movies & Anime/Comics)
Archery	Sport/Fitness
Archery	Sport/Fitness
Boxing	Sport/Fitness
Dressage	Sport/Fitness
Fitness	Sport/Fitness
Ice skating	Sport/Fitness
Ice skating	Sport/Fitness
Martial art	Sport/Fitness
Martial art	Sport/Fitness
Paralympic sport	Sport/Fitness
Sport	Sport/Fitness
Weight lifting	Sport/Fitness
Wrestling	Sport/Fitness
WWE	Sport/Fitness
Classical music	Music

DJ and mixing music	Music
Electronic music	Music
Guitars	Music
Music	Music
Music creating	Music
Music (playing guitar/singing)	Music
Music production	Music
Musical theatre	Music
Playing guitar	Music
Trance/progressive music	Music
Vocaloid (singing game)	Music
Art, games	The Arts/Crafts/ Creativity
Beauty therapy	The Arts/Crafts/ Creativity
Becoming a Maiko	The Arts/Crafts/Creativity
Becoming a YouTube sensation	The Arts/Crafts/Creativity
Ceramics	The Arts/Crafts/ Creativity
Crafts	The Arts/Crafts/ Creativity
Drawing	The Arts/Crafts/Creativity
Film making	The Arts/Crafts/ Creativity
Film making	The Arts/Crafts/ Creativity
Glass blowing/flame working/lamp working	The Arts/Crafts/Creativity
Loom bands	The Arts/Crafts/ Creativity
Loom bands	The Arts/Crafts/ Creativity
Lego	The Arts/Crafts/Creativity
Lego	The Arts/Crafts/Creativity
Media-based hobbies	The Arts/Crafts/ Creativity
Media/movie making	The Arts/Crafts/Creativity
Printmaking	The Arts/Crafts/ Creativity
Gardening	Nature and Animals
Gardening	Nature and Animals
Gardening	Nature and Animals
Gardening- my vegie patch	Nature and Animals
Horse training	Nature and Animals
Amish and Sabbatarian matters. Revelation	Religion/belief systems and Politics

and prophecy	
The Bible	Religion/belief systems and Politics
Books	Religion/belief systems and Politics
Fighting government injustices	Religion/belief systems and Politics
Politics	Religion/belief systems and Politics
Religion (lack thereof)	Religion/belief systems and Politics
Socialism	Religion/belief systems and Politics
Reading	Reading
Reading- A Song of Ice and Fire	Reading
Reading books- self help	Reading
A friend	People
Going out with friends more often	People
Business (my own)	Miscellaneous
Dentists	Miscellaneous
Dinosaurs	Miscellaneous
Home lotto website	Miscellaneous
Medals	Miscellaneous
Mermaiding	Miscellaneous
Planning my future	Miscellaneous
Tattooing	Miscellaneous
Tunnelling/urban exploration	Miscellaneous
Stamps	Miscellaneous
Weather	Miscellaneous

Appendix E

Multiple Choice Questions for the Crime and No Crime Scenarios

Crime Scenario 1

1. The scenario you just heard was about a young woman named Cherie. Why did Cherie move house?
   a) She wanted a bigger bedroom
   b) She wanted to buy her own house
   c) She wanted to find a house with cheaper rent*[37]

2. In the scenario Cherie moved into a house where two other people lived. Were Cherie's housemates at the house often?
   a) Yes, they studied from home like Cherie, so were home all day
   b) No, they weren't home a lot*
   c) Yes, they came home every night after their classes

3. Why was Cherie concerned about the electricity bill?
   a) She was worried she was using too much electricity
   b) Her house mates left their lights on all of the time*
   c) She did a lot of washing in the washing machine

Crime Scenario 2

1. The scenario you just heard was about a man called Aaron. Why was Aaron looking for a second job?
   a) He has always wanted to work night shifts
   b) He doesn't like his current job
   c) So he has enough money to pay his bills as he hasn't been offered many shifts*

2. Aaron is friends with a man named Jim. How did Jim give his photos to Aaron to store?
   a) He sent them via email
   b) He sent Aaron an invitation to join his cloud storage folder so he could save the photos from there
   c) He brought them to Aaron's house on a USB drive*

3. Jim said he had been studying a course. What course did Jim say he had been studying?
   a) Photography*
   b) Massage therapy
   c) Agriculture

[37] * indicates the correct answer

Crime Scenario 3

1. The scenario you just heard was about two girls named Frankie and Lisa. How long had Frankie and Lisa been best friends?
   a) Since they were 5 years old*
   b) Since they were 50 years old
   c) Since they were 18 years old

2. Why did Frankie leave Lisa's house in the afternoon?
   a) Lisa said she had visitors coming over
   b) Lisa said she had work to do*
   c) Frankie was late for work

3. What were Frankie and Lisa waiting in line for?
   a) A bar
   b) A restaurant
   c) A café

Crime Scenario 4

1. The scenario you just heard was about a man named Jonah. Where did Jonah see the advertisement for the job he applied for?
   a) At the grocery store*
   b) At the gym
   c) On an employment website

2. Where did Jonah meet the company owner for the job interview he attended?
   a) At his house*
   b) At a cafe
   c) At a large building in the city

3. What did the customer ask Jonah?
   a) Why he worked as an interviewer
   b) Why he was looking in to their backyard*
   c) How long he had been working for the company

No crime Scenario 1

1. The scenario you just heard was about a young man named Oscar. Why did Oscar move house?
   a) He was hoping to move into a share house with other students*
   b) He wanted to buy a home
   c) He wanted to move to somewhere with a pool

2. In the scenario Oscar moved into a house where two other people lived. Were Oscar's housemates at the house often?
   a) Yes, they studied and worked from home
   b) No, they were often at university or work*
   c) No, they were only home for one hour a week

3. Why was Oscar concerned about the electricity bill?
   a) He was worried he was using more electricity compared to his housemates*
   b) His house mates always forgot to turn the lights off
   c) His housemates scolded him for forgetting to turn the lights off in his room

No crime Scenario 2

1. The scenario you just heard was about a man named Angus. Why wasn't Angus getting offered many shifts at work?
   a) Owen told Angus' boss that he was a bad worker
   b) The factory had been quiet*
   c) He doesn't like the job

2. Angus had a friend named Owen, who loaned him some money. How did Owen pay Angus that money?
   a) Internet banking transfer
   b) Cheque
   c) Cash*

3. Owen mentioned wanting to surprise his wife. What did Owen want to surprise his wife about?
   a) His promotion and a holiday*
   b) A new car
   c) He quit his job

No crime Scenario 3

1. The scenario you just heard was about two girls named Sadie and Violet. In what industry does Sadie work?
   a) Education
   b) Manufacturing*
   c) Mining

2. What did Violet pull out of her bag to show Sadie?
   a) A jumper*
   b) A scarf
   c) A pair of sunglasses

3. Violet told Sadie there were a few bars in particular that she wanted to go to. Why did Violet say she wanted to go to the places she suggested?
   a) Her other friends were going to be there
   b) She knew the security guards working at those bars that night
   c) Drink specials and a good DJ*

No crime Scenario 4

1. The scenario you just heard was about a man named Henry. How did Henry find out about the job vacancy for the job he pursued?
   a) He saw the advertisement while looking for a job online*
   b) A friend mentioned the job to him
   c) He was sent an email with a list of job vacancies

2. Henry attended a job interview. Where did the job interview take place?
   a) Over skype- so Henry stayed at home
   b) At the company office*
   c) At a cafe

3. Where was Henry required to take the completed note pads once a week?
   a) To the business headquarters*
   b) To his supervisors house
   c) To a safe at the bank

Appendix F

Histograms of the Response Pattern for Buttons ‘May be Suspicious’ and ‘Definitely Suspicious’.

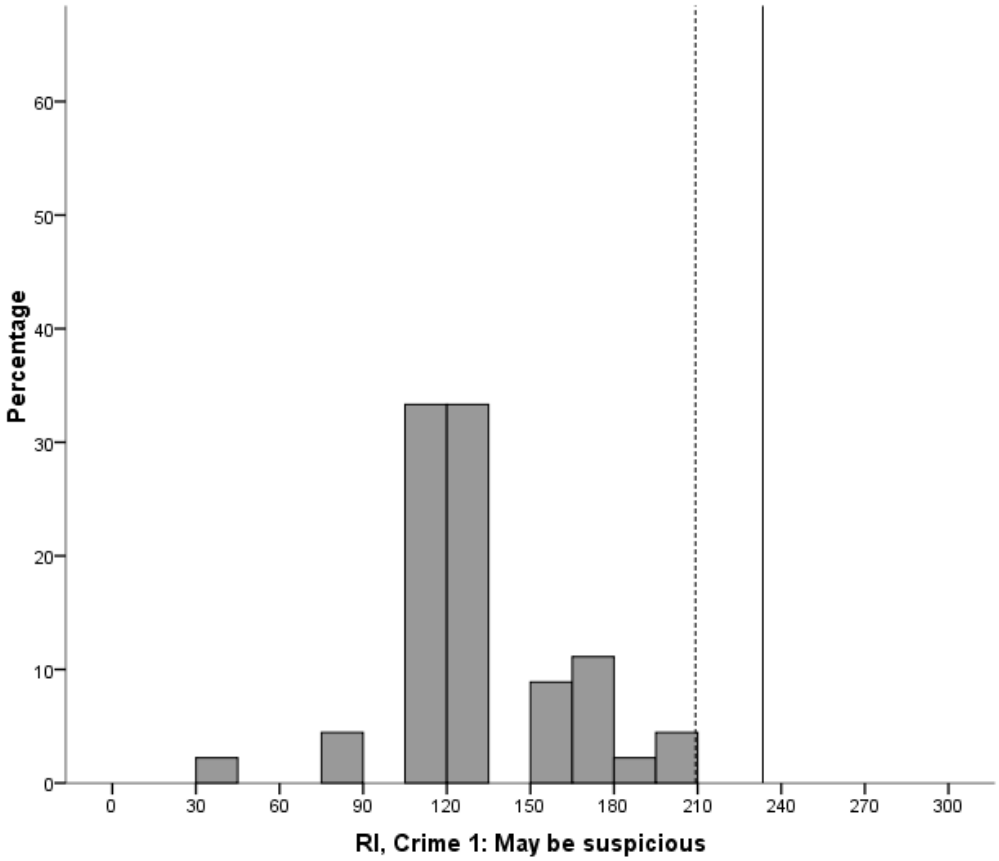

Figure F1. Response distribution of ‘May be suspicious’ button presses for Scenario 1 (crime, RI condition; n = 45). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

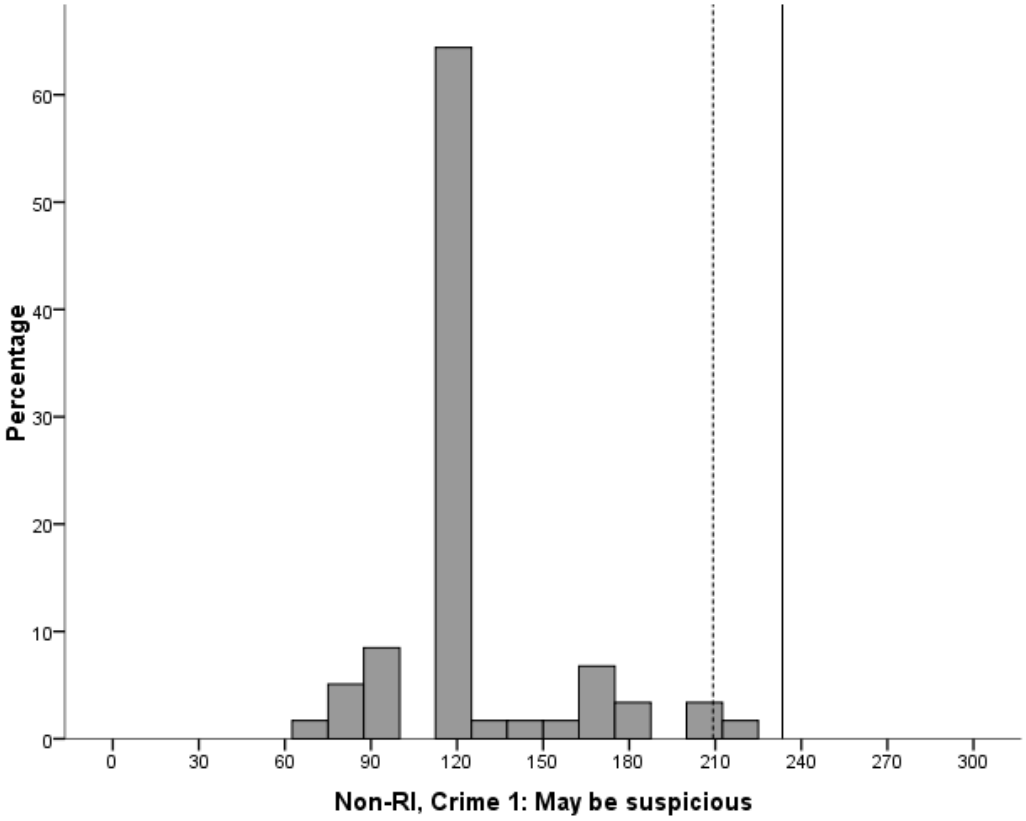

Figure F2. Response distribution of ‘May be suspicious’ button presses for Scenario 1 (crime, non-RI condition; n = 44). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

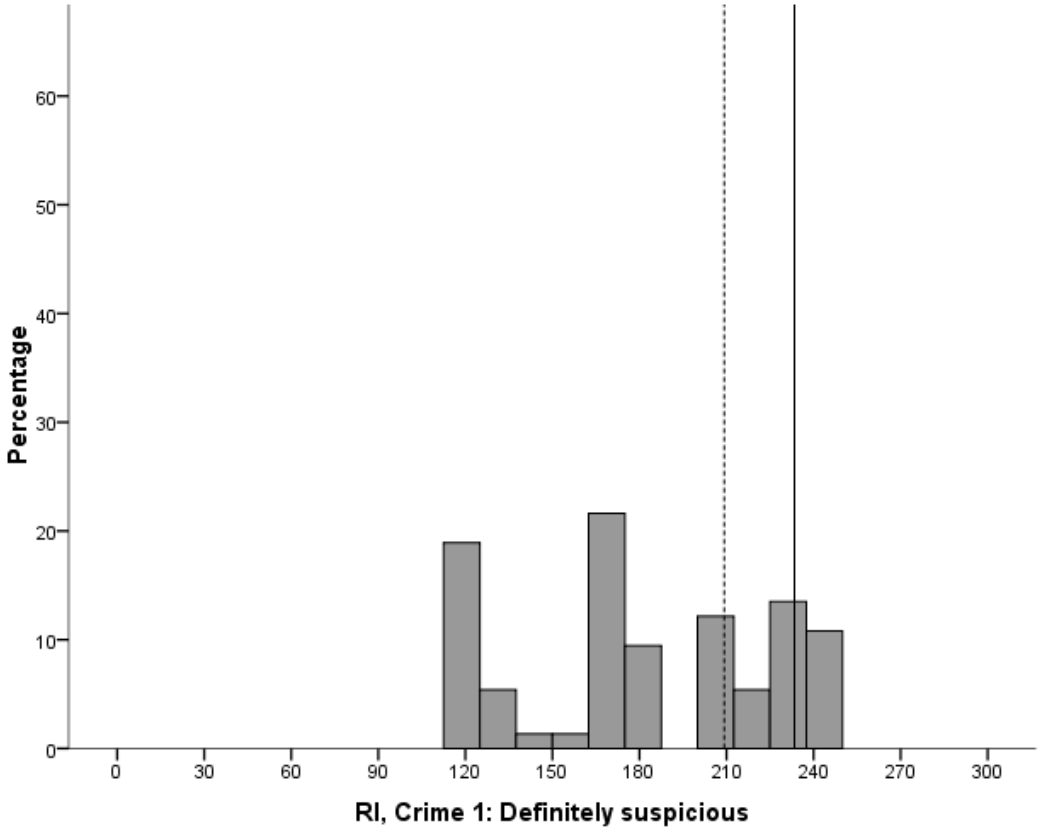

Figure F3. Response distribution of ‘Definitely suspicious’ button presses for Scenario 1 (crime, RI condition; n = 74). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

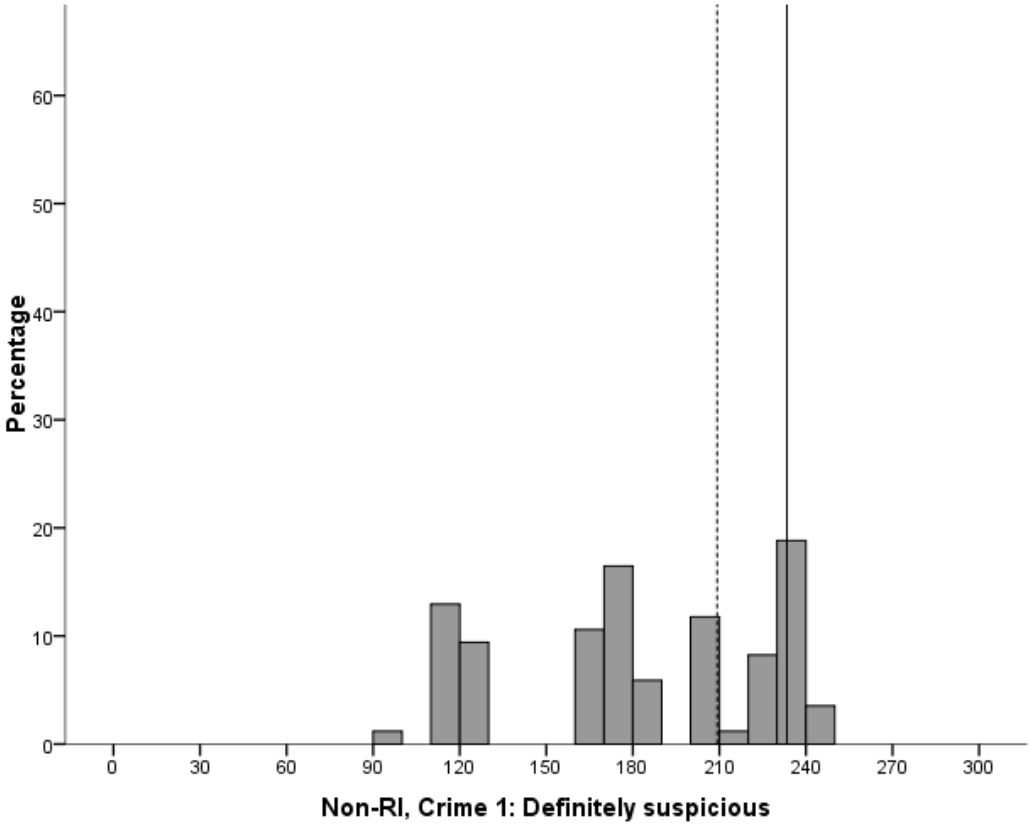

Figure F4. Response distribution of ‘Definitely suspicious’ button presses for Scenario 1 (crime, non-RI condition; n = 85). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

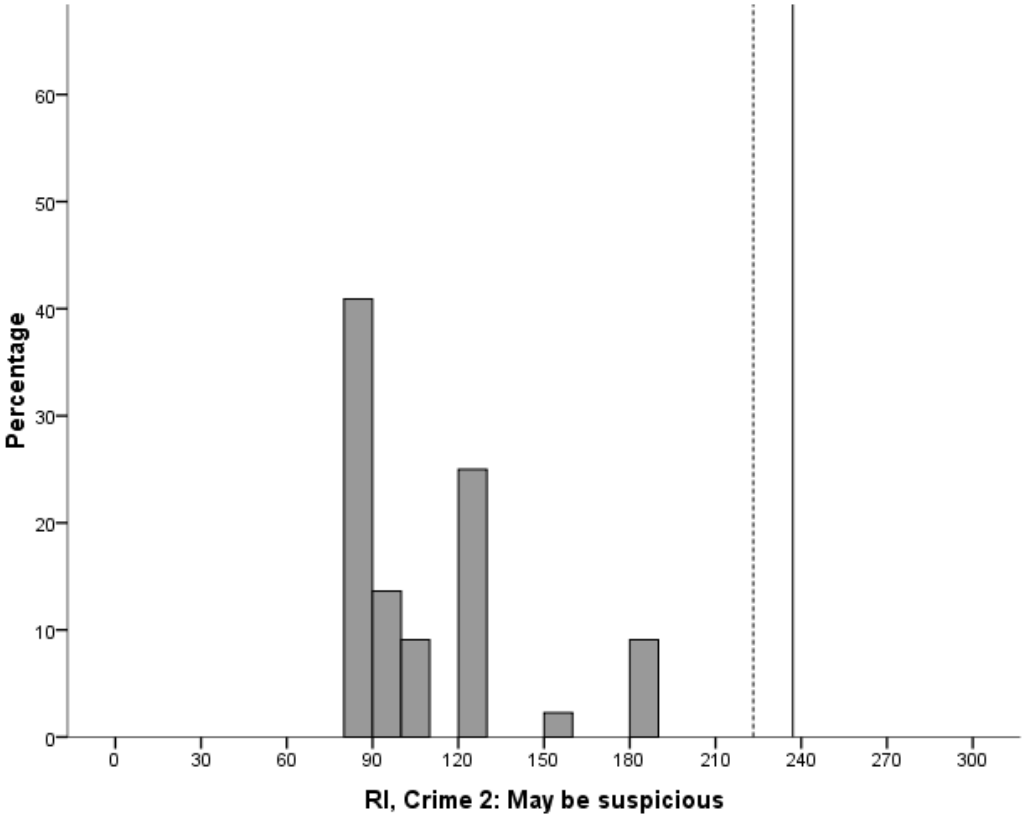

Figure F5. Response distribution of ‘May be suspicious’ button presses for Scenario 2 (crime, RI condition; n = 44). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

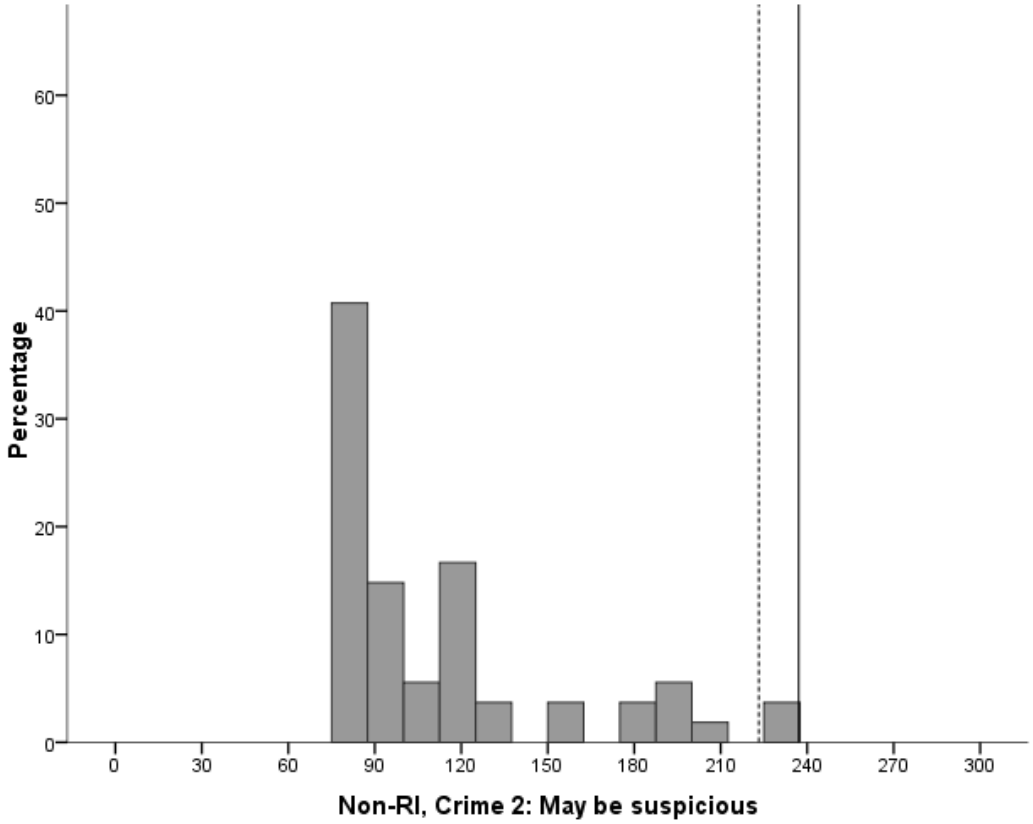

Figure F6. Response distribution of ‘May be suspicious’ button presses for Scenario 2 (crime, non-RI condition; n = 54). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

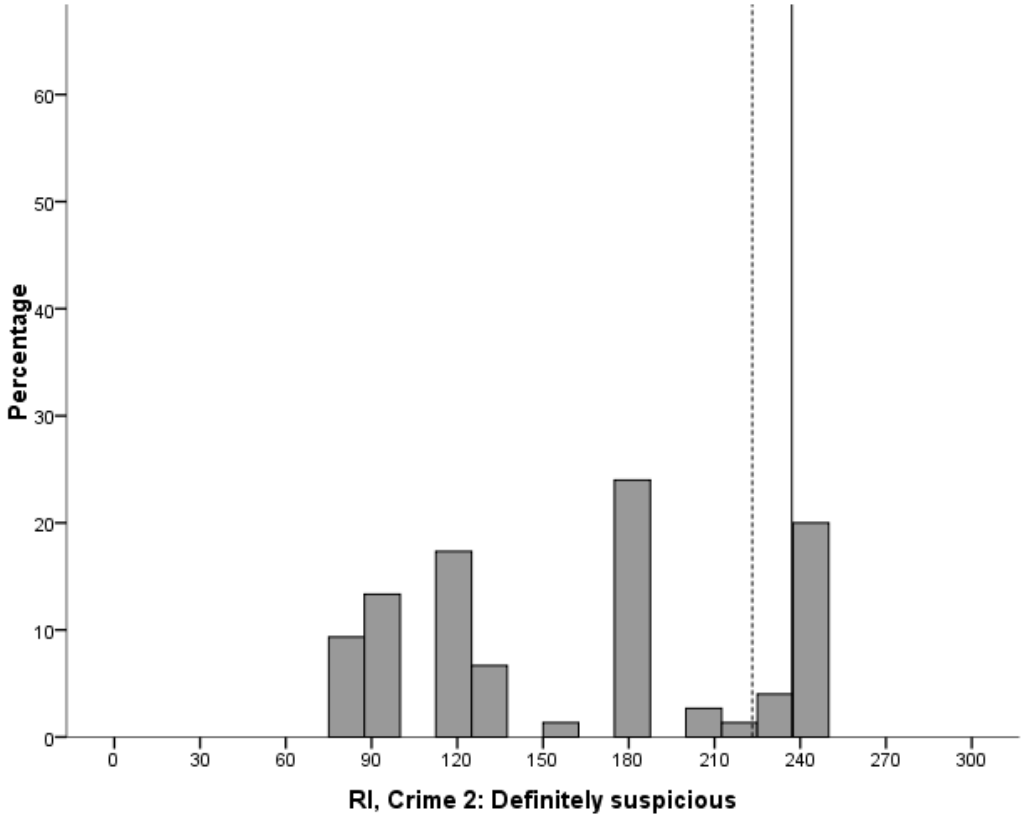

Figure F7. Response distribution of ‘Definitely suspicious’ button presses for Scenario 2 (crime, RI condition; n = 75). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

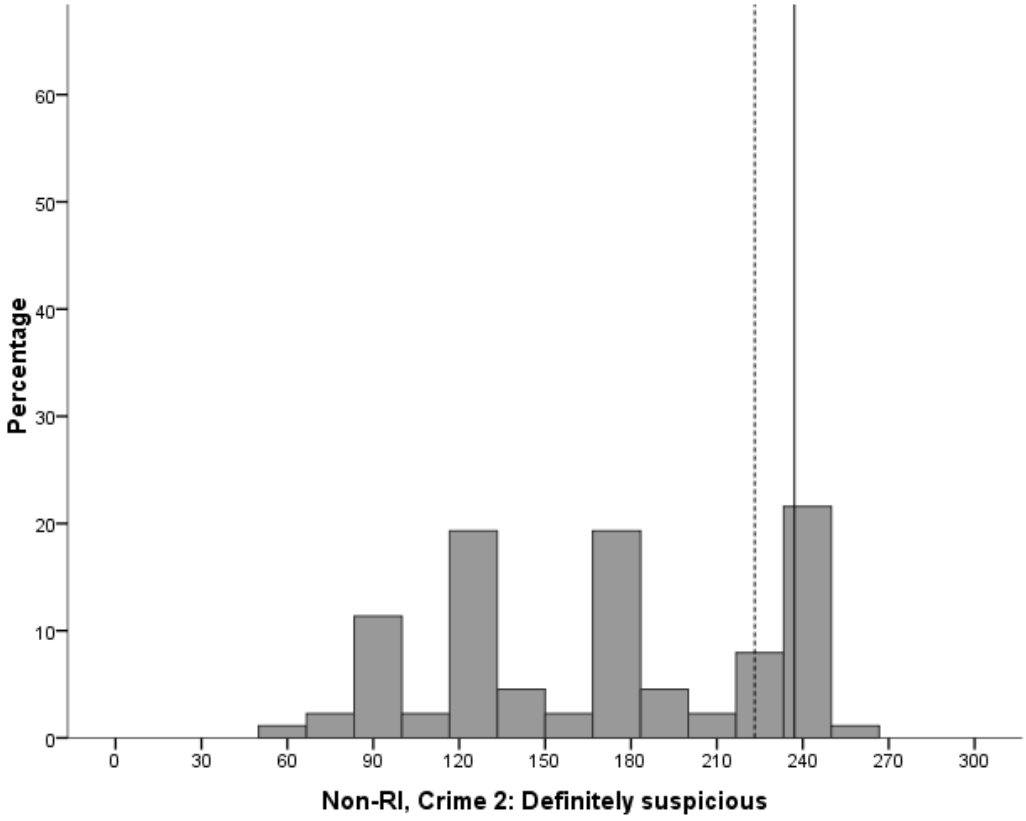

Figure F8. Response distribution of ‘Definitely suspicious’ button presses for Scenario 2 (crime, non-RI condition; n = 88). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

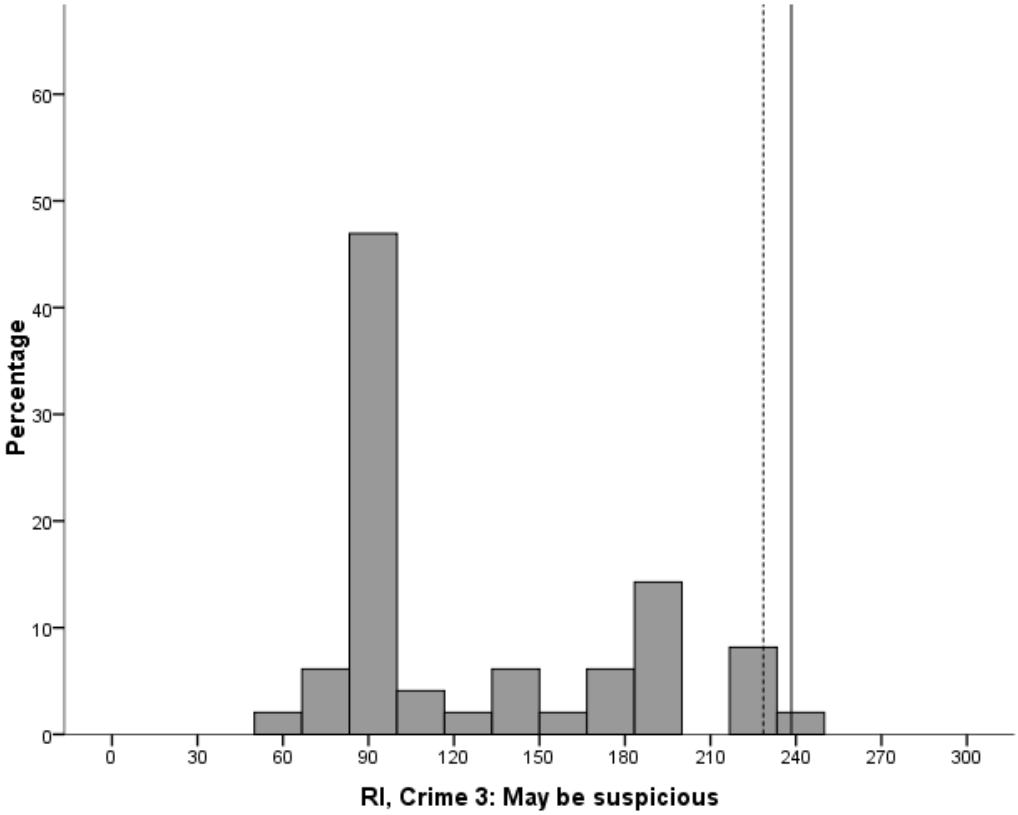

Figure F9. Response distribution of ‘May be suspicious’ button presses for Scenario 3 (crime, RI condition; n = 49). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

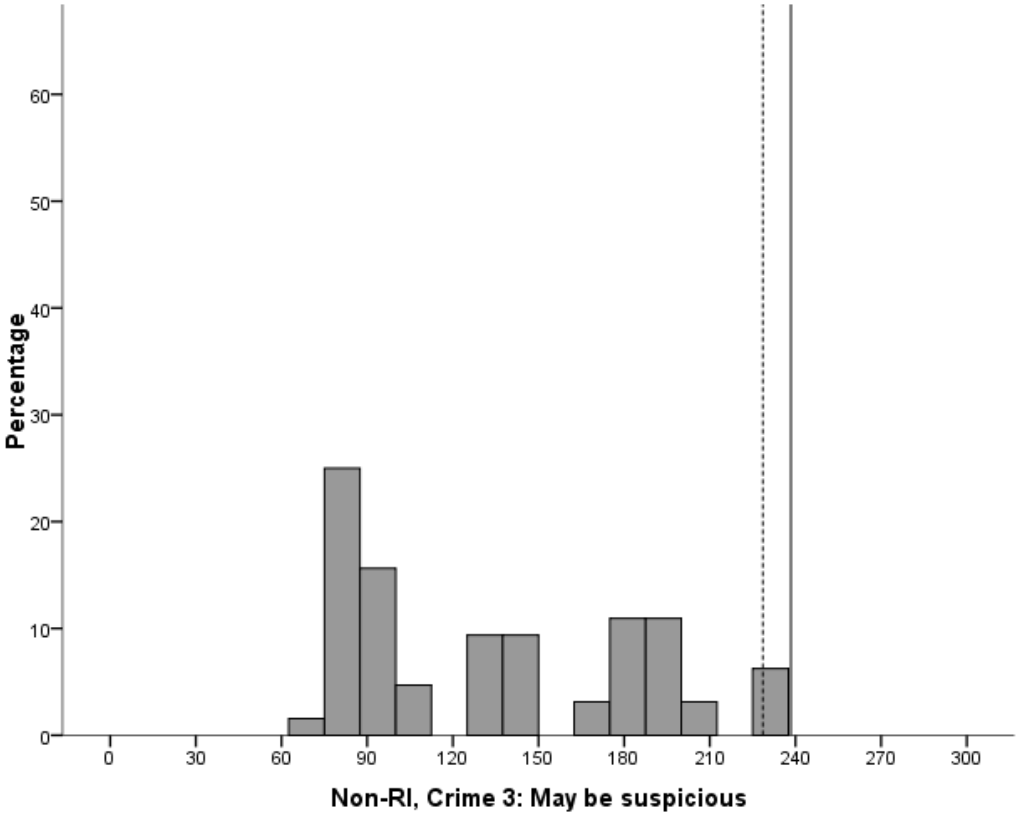

Figure F10. Response distribution of ‘May be suspicious’ button presses for Scenario 3 (crime, non-RI condition; *n* = 64). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

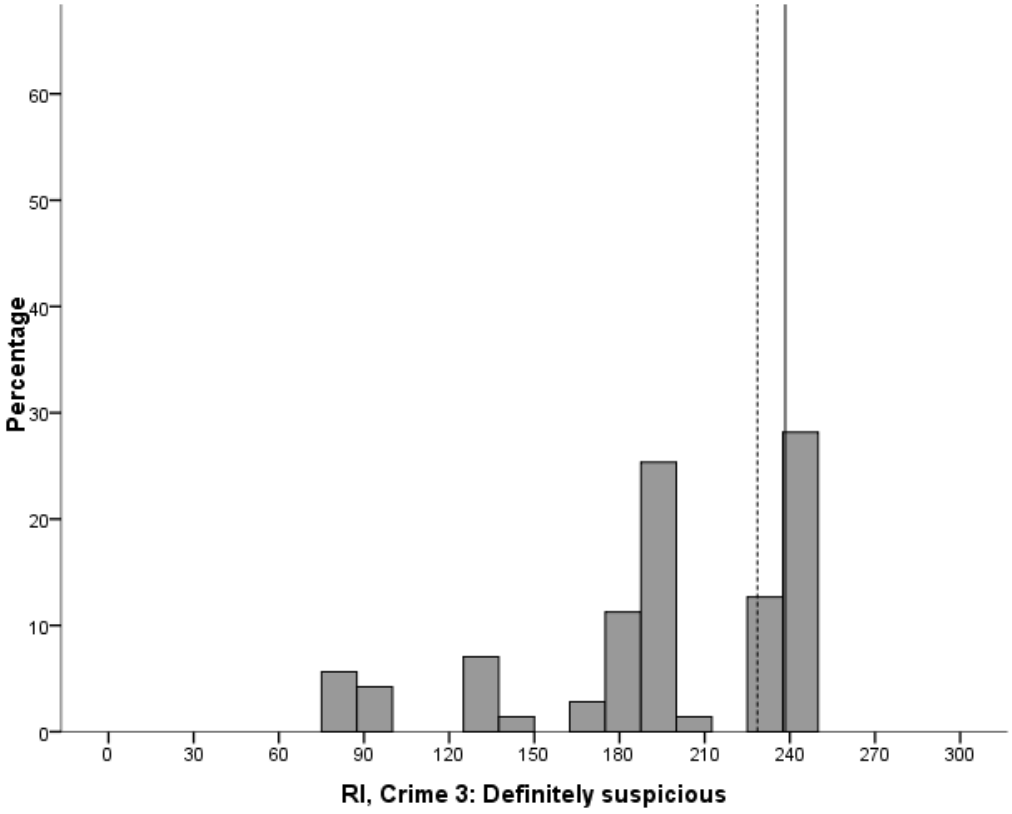

Figure F11. Response distribution of ‘Definitely suspicious’ button presses for Scenario 3 (crime, RI condition; n = 71). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

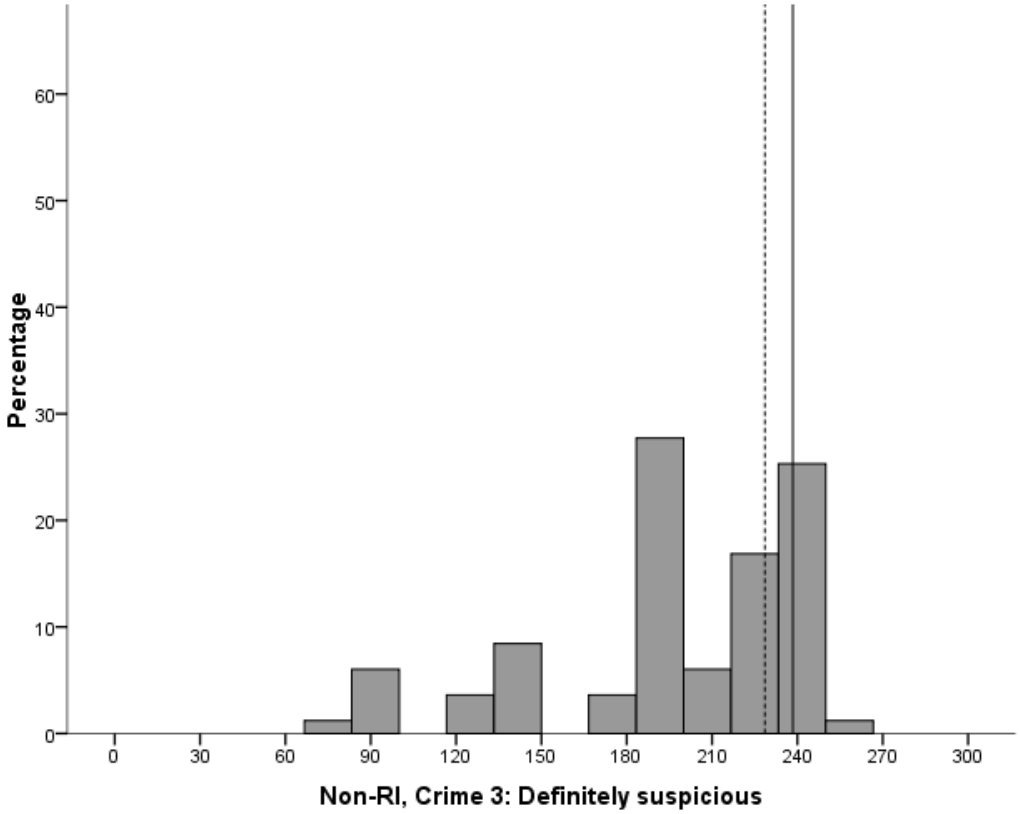

Figure F12. Response distribution of ‘Definitely suspicious’ button presses for Scenario 3 (crime, non-RI condition; n = 83). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

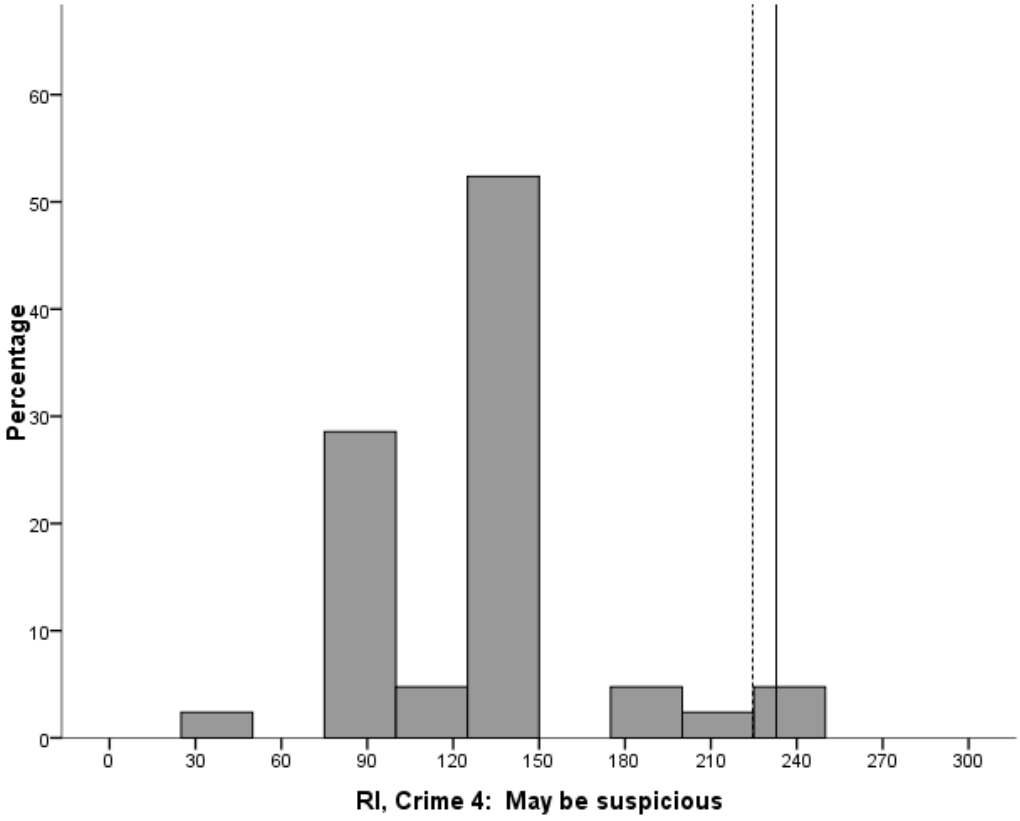

Figure F13. Response distribution of 'May be suspicious' button presses for Scenario 4 (crime, RI condition; n = 42). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

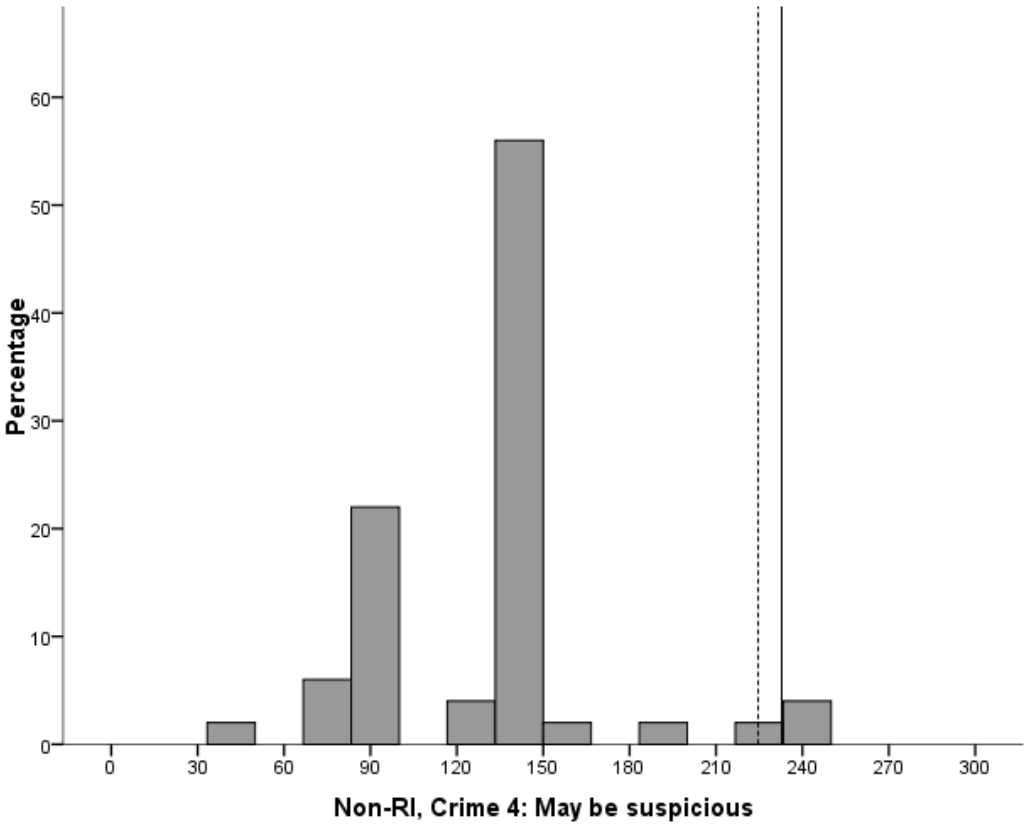

Figure F14. Response distribution of ‘May be suspicious’ button presses for Scenario 4 (crime, non-RI condition; n = 50). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

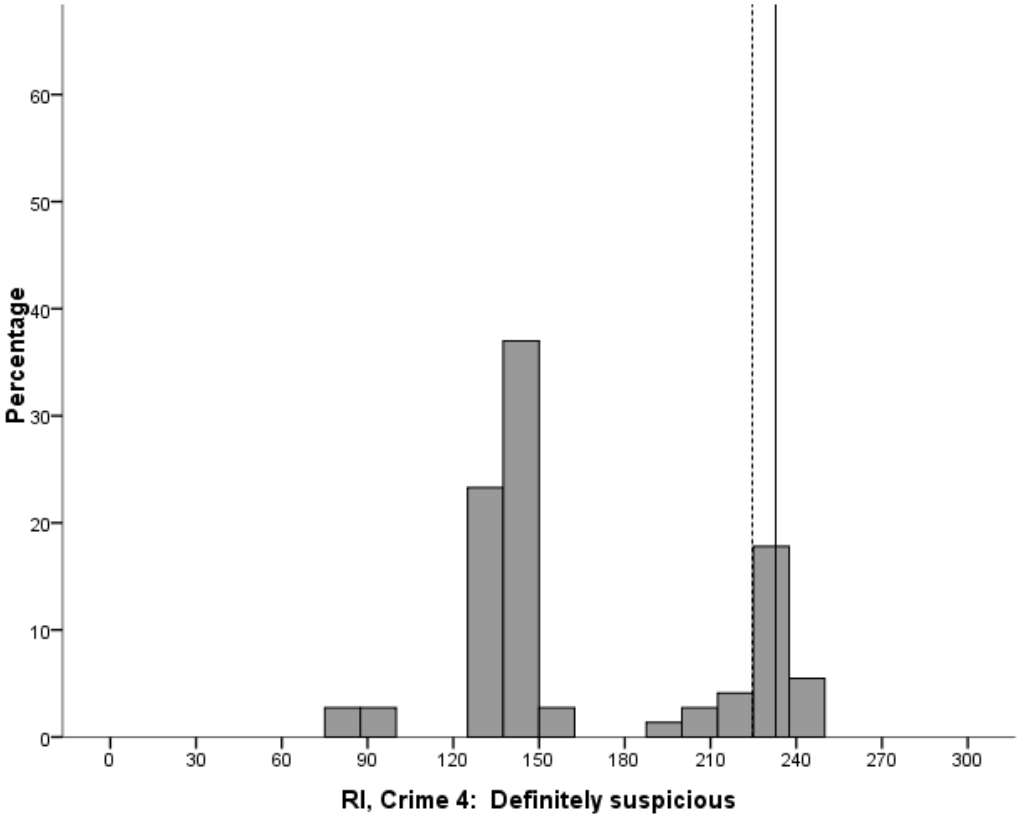

Figure F15. Response distribution of ‘Definitely suspicious’ button presses for Scenario 4 (crime, RI condition; n = 73). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

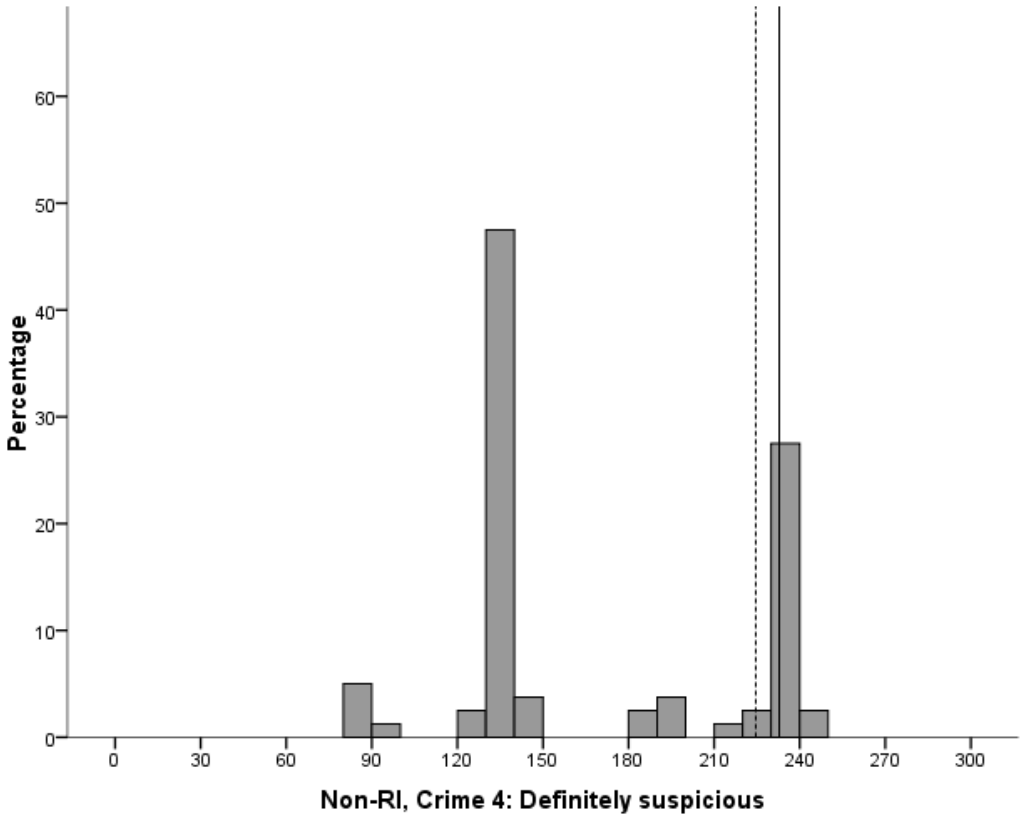

Figure F16. Response distribution of ‘Definitely suspicious’ button presses for Scenario 4 (crime, non-RI condition; n = 80). The straight line indicates the end of the scenario, and the dotted line indicates when police officers were explicitly mentioned.

Appendix G

Wilcoxon Signed-Rank Tests for Latency Between RI and Non-RI Conditions

Table G1

Wilcoxon Signed-Rank Test for Latency (Secs) of RI and Non-RI Scenarios for First Indication (n = 78)

Scenario	Condition	*Mdn*	*Z*	*r*
Scenario 1	RI	123.77	-2.05*	-.16
	Non-RI	120.81		
Scenario 2	RI	107.46	-0.44	-.04
	Non-RI	105.83		
Scenario 3	RI	153.50	-1.56	-.12
	Non-RI	139.94		
Scenario 4	RI	137.61	-0.28	-.02
	Non-RI	137.00		

* $p < .05$.

Table G2

Wilcoxon Signed-Rank Test for Latency (Secs) of RI and Non-RI Scenarios for Definitely Suspicious (Imputed; n = 78)

Scenario	Condition	*Mdn*	*Z*	*r*
Scenario 1	RI	179.58	-0.30	-.02
	Non-RI	178.66		
Scenario 2	RI	180.52	-0.29	-.02
	Non-RI	180.62		
Scenario 3	RI	196.34	-0.34	-.03
	Non-RI	201.41		
Scenario 4	RI	141.36	-0.28	-.02
	Non-RI	139.23		

Appendix H

Hierarchical Bootstrapped Regression Analyses of Mean *z* 'First Indication' and 'Definitely Suspicious'

Table H1

Bootstrapped Hierarchical Regressions for Mean z 'First Indication' and 'Definitely Suspicious' Among RI Scenarios

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.01	0.01		-0.01	0.01	
(1) PRI	0.01	0.01	.01	0.01	0.01	-.00
(2) VCI	-0.01	0.01		-0.00	0.01	
(2) PRI	0.00	0.01		0.01	0.01	
(2) A-ToM Social	-0.07	0.04	.03	-0.06	0.04	.01

Table H2

Bootstrapped Hierarchical Regressions for Mean z 'First Indication' and 'Definitely Suspicious' Among Non-RI Scenarios

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.02*	0.01		-0.02**	0.01	
(1) PRI	0.01	0.01	.04	0.01	0.01	.05
(2) VCI	-0.02*	0.01		-0.02*	0.01	
(2) PRI	0.01	0.01		0.01	0.01	
(2) A-ToM Social	-0.04	0.05	.03	-0.06	0.04	.07

* $p < .05$. ** $p < .01$

Appendix I

Hierarchical Bootstrapped Regression Analyses of Mean z 'First Indication' and 'Definitely Suspicious' with ToM and RI Moderators

Table I1

Bootstrapped Hierarchical Regressions with Moderator RI Number of Hours for Mean z 'First Indication' and 'Definitely Suspicious'

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.01	0.01		-0.01	0.01	
(1) PRI	0.01	0.01	.01	0.01	0.01	-.00
(2) VCI	-0.01	0.01		-0.00	0.09	
(2) PRI	0.00	0.01		0.01	0.01	
(2) A-ToM Social	-0.07	0.01		-0.06	0.01	
(2) RI Number of hours	0.00	0.05	.02	0.00	0.05	-.00
(3) VCI	-0.01	0.01		-0.00	0.01	
(3) PRI	0.00	0.01		-0.00	0.01	
(3) A-ToM Social	-0.07	0.04		0.01	0.04	
(3) RI- Number of hours	0.00	0.01		0.00	0.01	
(3) A-ToM Social X RI Number of hours	0.00	0.00	.03	0.01	0.00	.01

Table I2

Bootstrapped Hierarchical Regressions with Moderator RI Absorption for Mean z 'First Indication' and 'Definitely Suspicious'

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.01	0.01		-0.01	0.01	
(1) PRI	0.01	0.01	.01	-0.01	0.01	-.00
(2) VCI	-0.01	0.01		-0.00	0.01	
(2) PRI	0.00	0.05		0.01	0.01	
(2) A-ToM Social	-0.07	0.05		-0.06	0.05	
(2) RI Number of hours	0.02	0.06	.02	-0.02	0.05	-.00
(3) VCI	-0.01	0.01		-0.00	0.01	
(3) PRI	0.00	0.01		0.01	0.01	
(3) A-ToM Social	-0.07	0.05		-0.06	0.05	
(3) RI- Number of hours	0.02	0.06		-0.02	0.05	
(3) A-ToM Social X RI Absorption	0.00	0.03	.00	0.01	0.03	-.01

Table I3

Bootstrapped Hierarchical Regressions with Moderator RI Interruption for Mean z 'First Indication' and 'Definitely Suspicious'

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.01	0.01		-0.01	0.01	
(1) PRI	0.01	0.01	.01	0.01	0.01	-.00
(2) VCI	-0.01	0.01		-0.01	0.01	
(2) PRI	0.00	0.01		0.00	0.01	
(2) A-ToM Social	-0.07	0.05		-0.05	0.05	
(2) RI Number of hours	0.04	0.03	.03	0.06	0.03	.04
(3) VCI	-0.01	0.01		-0.01	0.01	
(3) PRI	0.00	0.01		0.00	0.01	
(3) A-ToM Social	-0.08	0.05		-0.08	0.05	
(3) RI- Number of hours	0.04	0.04		0.06	0.03	
(3) A-ToM Social X RI Absorption	0.01	0.02	.02	0.02	0.02	.05

Table I4

Bootstrapped Hierarchical Regressions with Moderator RI Importance for Mean z 'First Indication' and 'Definitely Suspicious'

	First indication			Definitely suspicious		
(Step) Scenario	*B*	*SE B*	adj. R^2	*B*	*SE B*	adj. R^2
(1) VCI	-0.01	0.01		-0.01	0.01	
(1) PRI	0.01	0.01	.01	0.01	0.01	-.00
(2) VCI	-0.01	0.01		-0.00	0.01	
(2) PRI	0.00	0.01		0.01	0.01	
(2) A-ToM Social	-0.07	0.04		-0.06	0.05	
(2) RI Number of hours	0.03	0.05	.02	0.02	0.04	-.00
(3) VCI	-0.01	0.01		0.01	0.01	
(3) PRI	0.00	0.01		-0.00	0.01	
(3) A-ToM Social	-0.08	0.05		-0.07	0.05	
(3) RI- Number of hours	0.02	0.05		0.02	0.04	
(3) A-ToM Social X RI Absorption	0.02	0.02	.01	0.01	0.02	-.01

Appendix J

Results of Moderation Analyses Between ToM and Restricted Interests Variables and Response Latency

Table J1

Bootstrapped Coefficients for A-ToM Social X RI Intensity Interaction Variable for Hierarchical Regressions at Scenario Level

	First indication		Definitely suspicious	
Scenario	*B*	*SE B*	*B*	*SE B*
A-ToM Social X RI No. of hours Scenario 1	106.15	180.39	-36.53	171.67
A-ToM Social X RI No. of hours Scenario 2	281.24	260.87	401.63	260.81
A-ToM Social X RI No. of hours Scenario 3	341.36	312.16	259.89	260.79
A-ToM Social X RI No. of hours Scenario 4	328.45	192.52	340.24	211.34
A-ToM Social X RI Absorption Scenario 1	-312.10	1421.77	-216.36	1261.14
A-ToM Social X RI Absorption Scenario 2	177.37	1936.35	1543.99	1832.14
A-ToM Social X RI Absorption Scenario 3	-443.68	2331.48	185.03	1566.05
A-ToM Social X RI Absorption Scenario 4	1160.86	1716.19	1111.24	1650.41
A-ToM Social X RI Interruption Scenario 1	367.88	1023.65	475.20	746.83
A-ToM Social X RI Interruption Scenario 2	554.45	1177.12	2127.75	1235.99
A-ToM Social X RI Interruption Scenario 3	792.90	1548.91	598.50	1063.63
A-ToM Social X RI Interruption Scenario 4	233.85	1108.50	1462.19	1113.96
A-ToM Social X RI Importance Scenario 1	567.52	1219.32	865.60	1117.55
A-ToM Social X RI Importance Scenario 2	897.26	1672.91	15.46	1497.45
A-ToM Social X RI Importance Scenario 3	129.59	2009.75	632.79	1301.13
A-ToM Social X RI Importance Scenario 4	1704.93	1428.16	788.13	1292.12

Appendix K

Exploratory Analyses: Excluded and Included Participants

Table K1

Mann-Whitney U Test for IQ, ToM, and RI Variables Between Included and Excluded Participants

Scenario	Condition	*n*	*Mdn*	*U*	*Z*	*r*
PRI	Included	92	109	311.50	-1.22	-.12
	Excluded	9	100			
VCI	Included	92	107	197.00	-2.59**	-.26
	Excluded	9	99			
FSIQ	Included	92	108	175.50	-2.85**	-.28
	Excluded	9	99			
A-ToM Social	Included	92	10	240.00	-2.11*	-.21
	Excluded	9	8			
A-ToM Physical	Included	92	8	306.50	-1.29	-.13
	Excluded	9	6			
RI- Number of hours	Included	79	17.50	249.50	-0.98	-.11
	Excluded	8	25.50			
RI- Absorption	Included	79	2.00	274.00	-0.63	-.07
	Excluded	8	1.50			
RI- Interruption	Included	79	4.00	291.50	-0.84	-.09
	Excluded	8	2.00			
RI- Importance	Included	79	6.00	236.00	-1.21	-.13
	Excluded	8	4.50			

* $p < .05$. ** $p < .01$

Table K2

Mann-Whitney U Test for Latency (secs) of 'May be Suspicious' Button Press Between Included and Excluded Participants

Scenario	Condition	*N*	*Mdn (s)*	*U*	*Z*	*r*
RI Scenario 1	Included	53	121.43	35.00	-2.22*	.29
	Excluded	4	91.11			
RI Scenario 2	Included	53	99.89	118.00	-0.40	.05
	Excluded	5	86.93			
RI Scenario 3	Included	56	100.29	182.00	-0.85	.11
	Excluded	8	99.10			
RI Scenario 4	Included	49	136.24	106.00	-0.49	.07
	Excluded	5	131.56			
Non-RI Scenario 1	Included	59	118.90	120.00	-0.69	.09
	Excluded	5	117.50			
Non-RI Scenario 2	Included	54	93.54	172.00	-0.39	.05
	Excluded	7	89.80			
Non-RI Scenario 3	Included	65	134.10	227.00	-0.01	.00
	Excluded	7	101.49			
Non-RI Scenario 4	Included	51	136.09	81.00	-1.34	.18
	Excluded	5	123.11			

* $p < .05$.

Table K3

Mann-Whitney U Test for Latency (secs) of 'Definitely Suspicious' Button Press Between Included and Excluded Participants

Scenario	Condition	*n*	*Mdn (s)*	*U*	*Z*	*r*
RI Scenario 1	Included	87	182.31	191.00	-2.10*	-.22
	Excluded	8	123.73			
RI Scenario 2	Included	87	180.55	131.00	-2.91**	-.30
	Excluded	8	109.07			
RI Scenario 3	Included	84	198.14	188.00	-1.58	-1.58
	Excluded	7	186.72			
RI Scenario 4	Included	82	140.50	97.00	-3.28**	-.35
	Excluded	8	132.65			
Non-RI Scenario 1	Included	86	179.96	152.00	-2.60**	-.27
	Excluded	8	125.58			
Non-RI Scenario 2	Included	89	180.72	230.00	-1.65	-.17
	Excluded	8	141.35			
Non-RI Scenario 3	Included	83	199.57	129.00	-2.85**	-.30
	Excluded	8	151.26			
Non-RI Scenario 4	Included	80	138.69	172.00	-2.15*	-.23
	Excluded	8	134.99			

* $p < .05$. ** $p < .01$

Appendix L

Exploratory Analyses: Consistent and Inconsistent Participants

Table L1

Mann-Whitney U Tests for IQ, ToM, and RI Variables Between Inconsistent and Consistent Participants

Scenario	Condition	*N*	*Mdn*	*U*	*Z*	*r*
PRI	Consistent	82	109.50	570.50	-1.81	-.18
	Inconsistent	19	100.00			
VCI	Consistent	82	108.00	424.00	-3.09**	-.31
	Inconsistent	19	99.00			
FSIQ	Consistent	82	109.00	410.00	-3.21**	-.32
	Inconsistent	19	100.00			
A-ToM Social	Consistent	82	10.00	387.00	-3.47**	-.35
	Inconsistent	19	8.00			
A-ToM Physical	Consistent	82	8.00	574.00	-1.80	-.18
	Inconsistent	19	8.00			
RI- Number of hours	Consistent	71	17.50	454.50	-1.24	-.12
	Inconsistent	16	26.25			
RI- Absorption	Consistent	71	2.00	491.50	-0.86	-.09
	Inconsistent	16	1.00			
RI- Interruption	Consistent	71	4.00	424.00	-1.59	-.16
	Inconsistent	16	2.00			
RI- Importance	Consistent	71	6.00	548.00	-0.23	-.02
	Inconsistent	16	6.00			

** $p < .01$

Table L2

Mann-Whitney U Test for Latency (Secs) of 'May be Suspicious' Button Press Between Consistent and Inconsistent Participants

Scenario	Condition	*n*	*Mdn (s)*	*U*	*Z*	*r*
RI Scenario 1	Consistent	47	121.43	161.00	-1.55	-.21
	Inconsistent	10	118.21			
RI Scenario 2	Consistent	46	100.17	196.00	-1.54	-.20
	Inconsistent	12	85.69			
RI Scenario 3	Consistent	48	133.70	227.00	-2.43*	-.30
	Inconsistent	16	94.86			
RI Scenario 4	Consistent	43	137.24	151.00	-1.84	-.25
	Inconsistent	11	129.73			
Non-RI Scenario 1	Consistent	52	119.08	219.00	-1.60	-.20
	Inconsistent	12	116.60			
Non-RI Scenario 2	Consistent	48	98.48	235.00	-1.36	-.17
	Inconsistent	13	87.11			
Non-RI Scenario 3	Consistent	57	139.56	238.00	-2.63**	-.31
	Inconsistent	15	86.85			
Non-RI Scenario 4	Consistent	44	136.79	182.00	-1.64	-.22
	Inconsistent	12	126.87			

* $p < .05$. ** $p < .01$

Table L3

Mann-Whitney U Test for Latency (Secs) of 'Definitely Suspicious' Button Press Between Consistent and Inconsistent Participants

Scenario	Condition	*n*	*Mdn (s)*	*U*	*Z*	*r*
RI Scenario 1	Consistent	77	185.80	434.00	-2.46*	-.25
	Inconsistent	18	153.71			
RI Scenario 2	Consistent	77	180.72	348.00	-3.28**	-.34
	Inconsistent	18	109.40			
RI Scenario 3	Consistent	74	224.89	409.00	-2.24*	-.23
	Inconsistent	17	186.72			
RI Scenario 4	Consistent	72	142.93	310.00	-3.41**	-.36
	Inconsistent	18	134.73			
Non-RI Scenario 1	Consistent	76	181.26	467.00	-2.09*	-.22
	Inconsistent	18	164.44			
Non-RI Scenario 2	Consistent	79	180.98	473.00	-2.21*	-.22
	Inconsistent	18	124.79			
Non-RI Scenario 3	Consistent	74	201.48	372.00	-2.62**	-.27
	Inconsistent	17	172.31			
Non-RI Scenario 4	Consistent	71	139.35	360.00	-2.57**	-.27
	Inconsistent	17	137.05			

* $p < .05$. ** $p < .01$