ASSESSMENT OF SEXUAL INTEREST IN CHILD SEX OFFENDERS BY THE USE OF A COMPUTERIZED MEASURE.

By

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Abstract

This thesis investigates Rapid Serial Visual Presentation (RSVP) procedure as a tool to evaluate sexual interest in child sex offenders. Data examined derived from: convicted child sex offenders, convicted non-sexual offenders, released child sex offenders, men with children under the age of two and 'normal' males and females. Chapters 1 and 2 evaluate sexual interest in child sex offenders and explore the RSVP's attentional blink theories. Chapter 3 examines RSVP in child sex offenders and a group of offenders with no sexual offence history, showing child sex offenders did display enhanced attentional blink towards images of children. Chapter 4 examined released child sex offenders who did not show the hypothesised attentional blink effect. Chapter 5 looked into RSVP responses of fathers with children under two, and shows an opposite pattern of response to child sex offenders. Chapter 6 showed that RSVP, using male and female images, elicited heightened attentional blink in a normative sample of females, but not the male sample. Chapter 7 examined the RSVP using erotic images of males and females on a sample of heterosexual males and females with no significant effect. Chapter 8 tested the reliability and validity of the RSVP in a subsample using the procedure twice, with a lapse of 1-2 weeks in-between and shows significant improvement from Session 1 to Session 2, Condition 1. This shows practice effect can influence performance on the RSVP. The main discussion will evaluate the results in terms of implications for the utility of the RSVP.

To my beautiful boys, Tomas and Elias.

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Introduction

Evaluation of sexual interest in child sex offenders is an important issue with regards to assessment of the offender's sexual interest. Clinicians are often required to make quick and accurate assessment of child sex offenders, this is important particularly in terms of treatment needs. Reviews concerning the measurement of deviant sexual interest document three main categories of assessment: self report, attention-based methods and the penile plethysmograph (PPG; e.g. Kalmus & Beech, 2005; Marshall & Fernandez, 2000; Murphy & Barbaree, 1994). Various techniques have been developed to discriminate physiological responses to visual and auditory stimuli. However, whilst sexual arousal is recognised to encompass various autonomic responses (Singer, 1984), penile tumescence, measured by the PPG, has become the most well-established, scientifically accepted measure of sexual interest (Quinsey & Earls, 1990; Kalmus & Beech, 2005; Marshall, 1997). However, PPG suffer from various methodological faults and an effort is being made in trying to find a measure which avoids issues such as faking, suppression of penile erection and the use of nude child images. Recently, progress has been made in actively investigating the clinical utility of indirect, attention-based paradigms (Beech, Kalmus, Tipper, Baudouin, Flak & Humphreys, 2009; Kalmus & Beech, 2005; Flak, Beech & Fisher, 2007; Flak, Beech & Humphreys, 2009). It is important for those who are tasked with assessing offenders' risk and needs to understand the nature and extent of deviant sexual interests through reliable and valid measures.

Based on the methods currently used to evaluate sexual interest in child sex offenders this thesis attempted to investigate how sexual interest is associated with selectivity in attention to stimuli congruent with individuals' sexual interest. Theorists have suggested that an erotic response may primarily be driven by an emotional affective reaction to seeing such stimuli, resulting in increased attention (Singer, 1984). Current techniques have looked at measures using viewing time of images of their sexual preference, these measures are often termed attention based measures which will be looked at in detail in this thesis. The underlying assumption is that individuals will demonstrate longer viewing times to images congruent to their sexual interest, as opposed images that are incongruent or neutral. Specifically the aim was to investigate an attention based method termed the Rapid Serial Visual Presentation (RSVP) paradigm which is a well established and researched procedure used within Cognitive Psychology and it measures an attentional deficit within the human nature termed the Attentional Blink (AB; Shapiro, 2001). The AB becomes apparent within

the RSVP procedure when a stream of stimuli (e.g. word or images) are presented within or below 500ms of each other. An enhancement of the AB effect is particularly apparent if stimuli have some emotional significance to the participant (Anderson, 2005). The RSVP as a tool to measure sexual attraction in child sex offenders was looked at by Beech et al., (2008) where they did find child sex offenders to demonstrate a heightened AB towards child images. Therefore the overall aim of this thesis was to replicate and further the Beech et al., (2008) study and in detail examine the usefulness of the RSVP as a tool to measure sexual interest in child sex offenders. It is believed that the RSVP is very difficult to fake and manipulate by participants, it is very easy to use for both participant and experimenter and also highly cost effective. Most importantly, with the adaptations suggested in this thesis, this tool could be very useful for measuring treatment effectiveness in child sex offenders

Specifically, the thesis will:

- Evaluate and criticise various techniques and methods used to currently assess sexual interest in children
- Investigate the RSVP in child sex offenders
- Investigate the RSVP in normative samples
- Investigate the validity and reliability of the RSVP

Structure of the Thesis

Part I (Chapter 1 and Chapter 2)

The overall main issue addressed in this thesis is the use of the RSVP as a reliable and valid technique to measure sexual interest in child sex offenders. Chapter 1 reviews and critically evaluates techniques currently used to assess sexual interest in child sex offenders, such as the penile plethysmograph and other physiological and self-report measures. The chapter provides an insight into the literature and theoretical background of the term 'deviant sexual interest' in child sex offenders and current methods used evaluating sexual interest. The paper discuss theories such as '*the sexual preference hypothesis'* (Freud & Blanchard, 1989), and the Singer (1984) theory of '*sexual arousal'*. Chapter 2 looks at the RSVP in detail and theoretical assumptions behind this procedure, in particular it examines theories of the AB and how they relate to child sex offenders attraction towards child images.

Part II (Chapter 3 and Chapter 4)

This part examines the RSVP with incarcerated (Chapter 3) and released (Chapter 4) child sex offenders. Specifically, Chapter 3 looks at responses towards child images within the RSVP stream in a group of incarcerated child sex offenders compared with a group of incarcerated offenders with no sexual offending history. The findings suggest that based on their AB response towards child images, the RSVP has the ability to detect sexual interest in child images in extrafamilial child sex offenders but not in intrafamilial child sex offenders. Chapter 4 compared responses of released child sex offenders with incarcerated offenders with no sexual offending background. The analysis of the data did not demonstrate any significant findings, the child sex offenders responses towards child images were equal to that of the control group, where no heightened AB was found towards child images, suggesting that for this particular group, the RSVP did not have the ability to detect sexual interest,

Part III (Chapter 5, Chapter 6, Chapter 7 and Chapter 8)

This part examines the RSVP on various normative samples in order to further establish the validity and reliability of the RSVP. In Chapter 5, a sample of fathers with children under the age of 2 years old was tested on the RSVP. This looked into whether fathers, who also have a strong connection with children, would display the similar AB effect towards child images found in the extrafamilial child sex offenders in Chapter 3, therefore the 'new father' group's responses was compared with the same control group tested in Chapter 3. The analysis showed no such findings. The group displayed the reverse effect, similar to the control group, where a higher AB effect was displayed for animal images compared to child images, suggesting that fathers do not have the attentional deficit towards child images displayed by child sex offenders in Chapter 3. Chapter 6 examined a heterosexual sample of males and females on the RSVP procedure, investigating whether similar responses towards clothed male and female images, as seen in child sex offenders responses towards child images, could be detected. The only significant finding in this chapter was a slight enhanced AB in the female group towards images of males. Chapter 7 expanded on Chapter 6 by examining responses of a sample of heterosexual males and females towards nude images of males and females. It was hypothesised that nude images would provide a more potent cue of sexual arousal compared with clothed images, which would be apparent in a heightened AB effect. However, this did not occur, no enhanced AB effect towards images were detected in either groups. Chapter 8 looked at the RSVP's validity and reliability in a subsample of the males

and females who participated in Chapter 6. The participants did the experimental procedure on two separate occasions. This was conducted in order to investigate participants' performance on two separate occasions and whether their performance would change. Participants' performance improved significantly in Condition 1 but not in Condition 2. The findings suggest that practice effect is an issue with the RSVP which needs to be considered for future use of this procedure, particularly in relation to measuring treatment effectiveness in child sex offenders.

Part IV (Chapter 9)

This chapter is the concluding chapter and discusses the findings of this thesis, draws some overall conclusions, looks at methodological limitations and improvements, and suggests future areas of research.

Ethical Approval

The code of ethical practice of the British Psychological Society was adhered to in the design of the research projects. Ethical approval was gained from The School of Psychology Ethics Committee at the University of Birmingham and from Prison B and Prison B ethics committee.

STATEMENT OF AUTHORSHIP

Chapter 1 and Chapter 2 have been published[1]. Repetition of material has been avoided where possible however there may be some overlap in the background content of these papers. The authorship of each article indicates collaborative work, however, to clarify; I am the senior author on these two papers.

[1] Chapter 1: Flak, V., Beech, A., & Fisher, D. (2007). Forensic assessment of sexual interests: The current position. *Issues in Forensic Psychology*, *6*, 70-83.

Chapter 2: Flak, V., Beech, A. & Humphreys, G. W. (2009). The Rapid Serial Visual Presentation Test of Sexual Interest in Child Molesters. In D. Thornton & D.R. Laws (2009). *Cognitive approaches to the assessment of sexual interest in sexual offenders*. Chichester, UK: Wiley.

PART I:

INTRODUCTION

CHAPTER 1

FORENSIC ASSESSMENT OF DEVIANT SEXUAL INTERESTS: THE CURRENT POSITION

Chapter rationale

The aim of this chapter was to look into and critically evaluate the area of assessment of sexual interest in child sex offenders. This paper provides the literature and theoretical background of the term 'deviant sexual interest' in child sex offenders. The paper looks into theories such as '*the sexual preference hypothesis'* (Freud & Blanchard, 1989), and the Singer (1984) theory of '*sexual arousal'*. The paper further also critically evaluates and discusses various means used to measure sexual interest in child sex offenders, such as the penile plethysmograph and other physiological and self-report measures. The paper concludes with suggesting that a new method of measuring sexual interest which avoids confounding variables and other difficulties related to the above mentioned methods are strongly needed within this area.

The following chapter was published in Forensic Issues No.6, 2007.

[Not available in the digital version of this thesis]

CHAPTER 2

The Rapid Serial Visual Presentation Test of Sexual Interest in Child Molesters.

Chapter rationale

The purpose of this chapter was to examine in detail the rapid serial visual presentation procedure (RSVP) and the theory behind the attentional blink. The paper starts by looking at some of the main attentional blink theories, such as the Inhibition Model, the Interference Model and the Two-stage Model. It also looks at event related potentials and functional resonance imaging research. The main outcome of discussing these theories is that the attentional blink is an established way of measuring shortcomings in our processing of visual information and automatic attentional capture does occur during the RSVP, in particular if the visual stimuli has some emotional valence to the subjects. The paper further tries to link this into sexual offenders and their attraction to children by using child images as stimuli within the RSVP procedure.

The following chapter was published in D. Thornton & D.R. Laws (2009). *Cognitive approaches to the assessment of sexual interest in sexual offenders*. Chichester, UK: Wiley.

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The Rapid Serial Visual Presentation Test of Sexual Interest in Child Molesters

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Introduction

Sexual preference is an important predictor of sexual recidivism in child molesters (Hanson & Bussière, 1998; Hanson & Morton-Bourgon, 2004). Measuring sexual preference is considered an essential part of clinical evaluation (Fisher, 1994; Freund, 1978) with an important aspect of sexual interest being the erotic response (Kalmus & Beech, 2005). Rempel and Serafini's (1995) definition of the erotic response is that sexual desire is a psychological process and the physical response is 'sexual arousal'. Singer (1984) proposed a theory of sexual arousal separating the erotic response into three independent chronological stages which can be independently experienced. The first stage, the *aesthetic response*, is the emotional affective reaction aroused by seeing an attractive face or figure leading to increased attention towards the individual. The second stage, the *approach response*, is more of a physical reaction, such as approaching the object of interest. The final third stage, the *genital response*, is a physiological response reflected as genital tumescence in males and is often the result of close proximity to the object of attraction.

Singer (1984) notes that although a range of differing physiological responses arise in sexual arousal, the research literature argues that the most dependable, and most available to measure in males, is the genital response. As such, sexual offenders' sexual preferences have typically been measured by their penile response to visual stimuli using the penile plethysmograph (PPG; see Chapter 2, this volume). However, a number of reported problems associated with the use of phallometry have been observed in the literature such as: difficulty in its practical application, difficulty in interpretation, severe methodological problems, and the invasiveness of this instrument (Marshall & Fernandez, 2000).

The need for a measurement tool which does not have the problems mentioned above is therefore in demand, and thus researchers have started to focus on computer based measures such as viewing time and information processing procedures for assessing attentional allocation to stimuli (Flak, Beech & Fisher, 2007; Kalmus & Beech, 2005). Unfortunately there has been little research applying these procedures to sex offenders. Tasks that have been used are the Implicit Association Test (IAT), the Emotional Stroop task, choice reaction time tasks, and the Gress paradigm. The IAT (Gray, Brown, MacCulloch, Smith & Snowdon, 2005; Mihailides, Devilly & Ward, 2004) is a test

most often employed in social psychology to measure social beliefs (e.g., racism) implicitly and indirectly. Whether this can be used as a measure of sexual interest is discussed in Chapter 5 and Chapter 6 and Flak et al. (2007). The Emotional Stroop task (Smith & Waterman, 2004; see Chapter 8, this volume, and Flak et al. 2007) has been used to test information processing biases in sexual offenders. This is a measure of socio-affective responses to irrelevant stimuli. Whether it is capable of measuring true sexual interest has yet to be established. Choice reaction time measures (Giotakis, 2005; Santtila, Mokros & Viljanen, 2006; Wright & Adams, 1994; see Chapter 4, this volume) reflect the time taken to indicate which category out of two or more a stimulus belongs to. This paradigm has some promising findings and appears to be able to measure sexual interest (Santtila et al. 2006). Finally, the Gress paradigm (2001; 2006a; 2006b; see Chapter 4, this volume) employs both choice reaction time and viewing time combined and has been successfully applied to measure sexual interest in child sex offenders and other normative groups.

Viewing time is based on the simple assumption that individuals will look at images found attractive longer than images found unattractive. This is validated by Rosenzweig's (1942) observations that differential viewing times of sexual images correlate with sexual interest. Similarly, Zamansky (1956) observed that homosexual men viewed images of naked men longer than images of naked women, while heterosexual men viewed images of naked women for longer. Kalmus and Beech (2005) note that recent studies using explicit stimulus sets to combine phallometry with measurements of viewing time, found viewing time to correlate well with measurements of sexual arousal, and, in addition, there were strong test-retest reliabilities (e.g., Abel, Huffman, Warberg & Holland, 1998; Harris, Rice, Quinsey & Chaplin, 1996). Two assessments using viewing time procedures are the *Abel Assessment for Sexual Interest* (Abel et al. 1998) and *Affinity* (Glasgow, Osbourne & Croxen, 2003). For more details on these measures, and other methodologies of assessing sexual interest see Kalmus and Beech (2005) and Flak et al. (2007).

In information processing terms, enhanced attention towards attractive images may have a number of measurable consequences (Flak et al. 2007; Kalmus & Beech, 2005). For example, Kalmus and Beech (2005, p. 210) commented that the 'increase in viewing time was not only the amount of time it took the viewer to look at the pictures but also a product of the degree of interference that each

image produced on this easy reaction task'. Findings that measures viewing time and choice reaction time change across objects of differential sexual interest fits with Singer's (1984) first stage of sexual arousal. However, to understand the specific factors that might be influenced by sexual interest, and how such factors might differ in sexual offenders, we need to utilise cognitive tasks where the particular underlying factors can be decomposed and assessed.

One potential procedure that may be useful here is the rapid serial visual presentation (RSVP[3]) technique, which induces a so-called 'attentional blink' (AB) reflecting attentional limitations on the processing of rapidly presented images (Raymond, Shapiro & Arnell, 1992). By looking at whether stimuli that attract sexual interest may induce an AB in participants, it may be possible to measure the automatic capture of attention by the stimulus. Also, since the effect of the AB is on the report of a different, second stimulus (see below), the effect may not easily be contaminated by the demand characteristics of the task (e.g., deliberately slowing responses to a sexually arousing image). Here we review the RSVP procedure as a tool to assess sexual interest in child sex offenders.

In order to understand how the RSVP procedure can be utilised with sexual offenders it is important to understand some of the theoretical background concerning the AB and recent research using the paradigm.

Rapid Serial Visual Presentation and the 'Attentional Blink'

Our sensory system is at all times bombarded with information attempting to gain access to our consciousness. In order for us to make sense of the input we need to select information based on its level of importance. The consequences of selection, and particularly the time course over which selection may be influencing processing, can be examined through the AB. Typically the AB is revealed when participants make two or more predefined responses to stimuli in the rapid serial stream. If two images, target 1 and target 2 (T1 and T2), are presented within or below half a second (500ms) of each other, detection of the second image (T2) is often delayed such that the stimulus may not be reported at all (Shapiro, 2001). This is the AB. The effect is not due to low-level visual masking

[3] RSVP is also used as an abbreviation of a forensic risk assessment tool (Hart, Kropp, Laws, Klaver, Logan & Watt, 2003), however, it is also commonly used as the abbreviation for the rapid serial visual presentation procedure within cognitive psychology literature which is what we are referring to in this chapter.

of the second target. If participants are asked not to report T1 but simply to report T2, then T2's identification is greatly improved, indicating that the effect is induced when participants attend to T1 for perceptual identification.

Several theories of the AB have been developed. Here we review three of the major contenders, (see Shapiro, 2001, for a more extensive discussion), and consider their implications for developing the AB as a tool to assess sexual interest.

Theories of Attentional Blink

The inhibitory model

Broadbent and Broadbent (1987) were the first to report the AB using a RSVP procedure. In their task participants were instructed to detect a target and a probe word located at differing serial positions amongst a series of (not related) lower-case words. The number of items appearing between the target and the probe differed from trial to trial. Broadbent and Broadbent (1987) reported that if the target and the probe were presented consecutively, participants correctly responded to either the target or the probe but never to both. Interestingly, when time between target and probe decreased, the likelihood of identifying the probe-word accurately on target-correct trials substantially improved; in contrast, when probe was presented within 400ms post-target the participants frequently reported that they had not seen the probe at all. Similar findings were also reported by Reeves and Sperling (1986) and Weichselgartner and Sperling (1987). Broadbent and Broadbent (1987) concluded that this deficit in reporting both items was related to an inhibitory process operating at an initial stage when the targets were identified. This account lay at the heart of one of the first influential models of the AB, the *inhibition model* (Raymond et al. 1992). According to this model, identification of first target led to the inhibition of attentional and identification processes for some subsequent period, so that the second stimulus could not be identified (e.g., Shapiro & Raymond, 1994; Shapiro, Caldwell & Sørensen, 1997a; Shapiro, Driver, Ward & Sørensen, 1997b). In an attempt to test the inhibition model Shapiro, Raymond and Arnell (1994) conducted several experiments looking at the effects of a range of target manipulations where the difficulty of the first target varied whilst the second target did not vary. The

reasoning behind this was the difficulty of processing the first target should influence the degree of inhibition. The findings showed that task difficulty only correlated very slightly with the magnitude of the blink which was interpreted by the authors to not support the predictions of the inhibition model. Therefore the inhibition model was perceived as being an inadequate explanation of the AB effect. However, the research did give rise to a different 'inhibitory' model, the *interference model* which we will now briefly outline.

The interference model

Many models of human selective attention assume that there are two broad stages of processing. At the *first stage* sensory processing takes place in parallel. For example, in vision, features may be processed at various spatial scales, and these features may also be mapped onto stored representations. Subsequently, the stimuli may be consolidated into a representation in short-term memory, to enable the item to be reported (e.g., see Duncan & Humphreys, 1989). The process of consolidating an item into short-term memory may consume resources, and so is limited to just a few items at a time and also it may be limited across a given time period. Ward and colleagues (Ward, Duncan & Shapiro, 1996) termed this the *attentional dwell time*. In the RSVP procedure, a T2 item appearing shortly after T1 has been presented may suffer because of the attentional dwell time consumed by T1, and this may induce an AB because there are not sufficient resources available to consolidate the representation of T2. This account differs from the inhibition account on at least one critical point, which relates to the amount of processing conducted on T2. While the *inhibition account* assumes there should be minimal processing of stimuli subject to an AB, the account in terms of the *attentional dwell time* does allow stimuli subject to the blink to be processed, at least to the extent that stimuli can activate stored representations during the first stage of processing (see above).

Shapiro et al. (1997b) carried out a study providing evidence in favour of the *interference account* by the use of a priming measure. They proposed that 'If the attentional blink prevents processing of further stimuli at very early levels of the visual system, then targets missed during the attentional blink should be unable to prime subsequent targets. If, however, priming can be observed, some degree of processing must take place during the attentional blink' (Shapiro et al. 1997b, p. 95).

In line with their reasoning priming effects for missed target letters were observed. In further support of this finding Maki, Frigen and Paulson (1997) established that noncritical items in the RSVP did in fact prime a semantically associated T2 which were present either during or after the AB. Maki et al. (1997) concluded that word meaning does in fact survive the AB.

The two-stage model

A somewhat different model of the AB was offered by Chun and Potter (1995). Here, the identification of targets in the RSVP procedure are held to occur in two chronological stages. In *Stage 1* there is an immediate detection of the item, but the representation that is encoded can be easily forgotten or erased as subsequent RSVP stimuli are presented. In *Stage 2* (a capacity-limited operation) a complete report of the target must be processed and consolidated further. When Stage 2 is busy with a target, a second target cannot be consolidated (Chun & Potter, 1995; Jolicaeur, 1998). Consequently, the AB happens due to decay of T2 representation occurring while T1's processing is finished, so if an individual takes longer on T1 then the blink will increase resulting in a great delay imposed on T2. In contrast, the *inhibition* model suggests that there is a competition between the items in both perceptual and semantic processing resources, while the *interference model* proposes that the stimuli is processed and identified before selection, the theory suggests that participants select between possible targets from the succeeding presentation in the RSVP stream with the help of pre-set filters, where items presented during the AB are highly processed and compete in VSTM for identification (Shapiro et al. 1994). The AB reflects the competition of several items in the RSVP stream resulting in a delay in reporting T2 (Isaak, Shapiro & Martin, 1999).

Event related potentials and functional magnetic resonance imaging research

As mentioned above experiments have produced evidence that there is indeed a semantic processing of items presented during the AB (e.g., Luck, Vogel & Shapiro, 1996; Maki et al. 1997; Shapiro et al. 1997b). Recent research of the AB has now utilised more advanced electrophysiological techniques such as event related potentials (ERP's), and functional magnetic resonance imaging (fMRI). We will

briefly go through some of the most recent findings adding support to assumptions made by the *interference theory*.

ERP's (for more detail on ERP, see Luck & Vogel, 2001) are a useful tool when looking at processing of stimuli in the RSVP paradigm. Resent research have been interested in looking at ERP waves in paradigms where stimuli is processed but not overtly reported by the participant (see Hillyard & Picton, 1987; Luck & Girelli, 1998 for more details). In these types of paradigms (RSVP) a comparison is made between ERP waveforms of stimuli detection versus no detection of stimuli. ERP waveforms are measured in positive and negative deflections termed 'peaks' 'waves' or 'components', they are often abbreviated with an 'N' or a 'P' (as a sign of positive or negative) followed by a number (signifying timing, for example 'P1' for the first positive peak or 'P110' signifying exact timed latency of 100ms; Vogel, Luck & Shapiro, 1998). Vogel et al. (1998) conducted multiple experiments employing ERP providing additional weight to the *interference theory*. In one experiment they looked at whether AB is a result of 'suppression of sensory processing' (Vogel et al. 1998. p. 1659). The findings suggested the AB is a reflection of a late processing procedure of the stimuli (i.e. that AB occurs after identification of a stimulus has been accomplished). Further experiments by Vogel et al. (1998) looked at the N400[4] component, as this has the ability to look at whether a word presented during the AB is in fact identified although not overtly reported (Besson, Kutan & Van Petten, 1992) which is precisely what they found. The results suggest T2 words presented for the duration of the AB was 'identified to the point of meaning extraction' (Vogel et al. 1998. p. 1664). In light of their findings mentioned above suggesting that stimuli is fully identified during the AB and that it is processed at least to a stage of word recognition during the AB, a final experiment looking at the P3[5] component (suggested to indicate whether a stimulus is processed in working memory; Doncin, 1981; Donchin & Coles, 1988) was conducted. The aim of this experiment was to investigate whether there is a specified time within the processing of stimuli where processing seizes during the

[4] N400 is used to determine whether a stimulus has been identified even though it is not reported (Vogel et al. 1998). N400 is extremely sensitive to the level of mismatch between, for example, a word and a previously already established semantic context (e.g., Besson, Kutan & Van Petten, 1992).

[5] P3 component is believed to be related to updating of working memory (Donchin, 1981; Donchin & Coles, 1988). If P3 wave is high it indicates that working memory is active if it is low or non-existents it indicates that working memory is not active.

AB interval. The result confirmed their hypothesis where the P3 component was fully suppressed throughout the AB interval. Vogel et al. (1998) suggest this indicates the AB defect arises at the stage of working memory. They concluded ’our experiments provide strong evidence that the AB reflects an impairment that arises after stimulus processing has been completed, probably at the stage of working memory’ (Vogel et al. 1998. p. 1668).

The notion of working memory has also been suggested in previous RSVP research by Potter (1976) using pictures as stimuli. Potter (1976) reported that if participants had to both perceive images and store them in working memory when presented at high speed an elevated rate of inaccuracy was observed. Potter (1976) suggested this may be due to overload in working memory during the RSVP which might be an indication attentional selection is important in relation to deciding which information is encoded or consolidated in working memory.

Resent research by Kranczioch, Debener and Engel (2003) confirm Vogel et al’s (1998) findings. They compared ERP pattern of detected and missed T2’s presented within the AB interval. The result showed that detected T2 produced a P3 component while missed T2 did not. Similarly to Vogel et al. (1998) this indicates that detected T2 does enter ‘awareness’ (Vogel et al. 1998).

As mentioned fMRI studies have also been conducted investigating the AB. Marois, Yi and Chun (2004) examined the AB by looking at consciously versus non-consciously perceived T2 items. Stimuli used included faces (T1), scenes (T2) and scrambled scenes (distractors). One of their findings suggested that dependent on whether T2 was overtly reported or not elicited differential activation in lateral frontal cortex where correctly detected T2 compared with missed T2 and control (T2 not present) increased the hemodynamic response. Another recent fMRI study by Kranczioch, Debener, Schwarzbach, Goebel and Engel (2005), produced slightly differential results than the Marois et al. (2004) study. Kranczioch et al. (2005) looked at letters presented successively where T2 was either presented within the AB span, outside the AB span, or not at all. The results revealed a substantial activation within the frontal and parietal cortices when T2 was detected relative to when it is missed. In contrast, when T2 was missed, a substantial increase in occipitotemporal regions was found compared to detected T2. Furthermore, increased activity was also found in several frontal and parietal areas when T2 was missed as opposed to when no target was presented. Interestingly, when T2 was

detected there was a decrease in areas known to be involved in emotional processing. These findings were interpreted to reflect the predominant role of the frontal cortex in selecting consciously perceived items. Similar finding were also reported by Marois, Chun, and Gore (2000).

Attentional capture and the AB

Whichever account is put forward for the AB, the procedure provides a means of examining attentional limitations on visual information processing, either on the processing of T1 or on T2. Interestingly, there is some work indicating that an AB can be induced when T1 stimuli capture attention and are processed automatically. If there is capture of a T1 stimulus based on its sexual interest to a participant, then it is possible that a sexually interesting stimulus can induce an AB, and this might provide a measure of sexual interest. If this is truly an attentional capture effect, then an AB may be induced by a critical stimulus even when that item does not have to be reported – providing a way of examining attentional capture unmediated by demand characteristics of having to respond to T1.

There is evidence that automatic attentional capture can occur in a variety of experimental paradigms, and under these conditions an irrelevant stimulus can affect report of stimuli relevant for the actual response. Many studies have examined effects of bottom-up salience – e.g., when a distractor is unique colour in a display (Theeuwes, 1992). However, capture effects may not only be based on bottom-up stimulus salience but on other factors such as the emotional context of the stimulus, whether the stimulus is part of the observer's 'set' and whether people have been used to responding to that stimulus. For example, Harris and Pashler (2004) showed that emotional words, when occasionally presented in visual displays, attracted attention and prevented participants from reporting other target stimuli. Folk, Leber and Egeth (2002) examined the effects of attentional set on the AB. They had participants reported a red letter in an RSVP stream of grey letters. A grey letter preceding the red target could be surrounded by 4 small dots, which were either red or green in colour. Folk et al. (2002) found that report of the red target decreased if the dots appearing earlier were red compared with when they were green (these results reversed for green target letters, indicating that it was not the bottom-up saliency of either the red or green dots that captures attention). These results

suggest that an AB was induced by a first stimulus capturing attention, and this occurred when the first stimulus matched the 'set' the participants had for the task (attend to red or attend to green). Kyllingsbæk, Schneider and Bundesen (2001) also showed similar capture effects from stimuli that people had frequently responded to as targets in a search task. If, as these results suggest, attention can be captured by stimuli that are emotionally salient, part of an attentional set, or frequently responded to as target, then it is possible that attentional capture in an AB procedure may provide one way to examine abnormal sexual interest in individuals. For example, people with an abnormal sexual interest in a particular type of person (e.g., young children) might find pictures of such individuals emotionally charged, and so allocate attention to such stimuli even if they are irrelevant to a given task. Similarly, the strong sexual interest may form part of an individual's long term 'set' for attending to the world, tuning in the individual to attend to these stimuli rather than others. Or, the strong sexual interest may lead to particular stimuli being viewed regularly, and, due to this, the stimuli may then capture attention. Whichever is the case, it can be predicted that a stimulus linked to abnormal sexual interest may trigger a relatively strong AB in individuals. Also, judging from the study of Folk et al. (2002), this may even occur when the stimulus itself does not have to be responded to, though the effects might be enhanced when responses to the stimulus are required (e.g., when the stimulus of sexual interest is T1 in an AB procedure).

On the other hand, Shapiro et al. (1997a) failed to find strong effects from an emotionally salient stimulus as T1 (the participant's own name) in an AB procedure, but they did when that stimulus appeared as T2. In the latter case, there was a reduced AB (i.e., better report of T2) when participants saw their own names relative to when they saw the name of another person. This suggests that an alternative way to use the blink paradigm to examine sexual interest would be to examine recovery from the blink as a function of whether T2 is of sexual interest or not – though this might be affected by demand characteristics of reporting T2. Anderson (2005) conducted an experiment employing the RSVP with sexually arousing words as T2. He found sexually arousing words elicited a smaller AB effect compared to neutral T2 words (i.e. higher accuracy reporting sexually arousing words compared to neutral words).

The converse of the idea that stimuli that capture attention induce a large AB is that stimuli that require minimal resources to process should generate only a weak AB (Anderson, 2005). Results consistent with this have been reported by Olivers and Nieuwenhuis (2005). These authors demonstrated that the AB was reduced when participants were encouraged into a relaxed mood state, for example by listening to music that they liked. They suggest that being in a relaxed state enabled participants to adopt a broader span of attention, so that more resources were available for stimulus processing. According to this idea a stimulus of sexual interest could have a different effect on a participant, with a reduced AB being generated if a sexually interesting picture induces a good mood. Nevertheless, the task may still provide an indirect index of sexual interest. This effect of mood may reflect a modulation at a neural level by activity in the locus correleus, as suggested by Niewenhuis, Gilzenrat, Holmes, and Cohen (2005) and simulated in recent computational models of the blink (e.g., Bowman & Wyble, 2007; Nieuwenhuis et al. 2005; Dehane, Sergent & Changeux, 2003).

Assessing sexual offenders using the RSVP paradigm

Can the blink be applied to measure abnormal sexual interest? Beech, Kalmus, Tipper, Baudouin, Humphreys and Flak (submitted) examined the AB with sexual offenders, contrasting pictures of children with pictures of animals as T1. If there was sexual interest to the picture of the child, then an AB may be induced, due to greater attentional engagement on the child T1 than the animal T1. The data matched this proposal. When T1 was a picture of a child, a greater deficit in reporting of T2 was detected for the sexual offenders. This effect was not found in a normal control group of non-sexual offenders.

In order to further establish the RSVP procedure as being sensitive to sexual interest, a few other unpublished studies have been conducted using normative samples of heterosexual males and females comparing whether images of males and females induce a larger AB compared with animals. For example, if males have stronger attraction to images of females compared with images of males

and animals, then male participants should show a greater AB when images of the females are T1 as opposed to males and animals; the opposite may apply for female participants.

Grace (2005) examined the RSVP procedure with T1 images of clothed and unclothed males/females on a sample of heterosexual male and female college students. There was an overall significant difference in the AB induced by clothed and unclothed images, with images of nude females eliciting a particularly large blink in males (in contrast, images of nude males did not elicit a greater AB than images of nude females in female participants). Hudson (2005), in contrast, failed to establish differences between images of clothed males and females as T1, on male and female participants, suggesting that the images need to be potent cues for sexual interest to be effective.

Problems with the RSVP paradigm

Anxiety

One concern raised with the RSVP paradigm is the potential issue of anxiety that child molesters may exhibit while viewing images of children – perhaps because for these individuals sexual interest is associated with punishment and imprisonment. Anxiety, cued by the pictures, may even have an effect independent of the individual's direct sexual interest in a particular image, making interpretation of any positive result difficult (is a given individual showing increased sexual interest or increased anxiety, associated with the images?). To test this, we are currently measuring anxiety alongside measuring the AB in offenders. We will ask whether anxiety levels predict any enhancement of the AB to pictures of children, in these individuals.

Faking

Another important issue in relation to assessment tools for child sex offenders is the problem of faking. For example, it has been argued that faking can affect the PPG measures of sexual interest (e.g., Henson & Rubin, 1971; Laws & Rubin, 1969; Laws & Gress, 2004; Laws & Holmen, 1978), and

an important question is whether the same may hold for the AB. The AB is revealed by worse identification of the T2 stimulus after a T1 that draws sexual interest. To fake the effect of the test, participants would have to realise this and not report the T2 after the 'control' T1 stimulus (the animal). This is possible. However, we are also interested in whether an AB could be induced by a sexually interesting T1 stimulus even when only T2 has to be reported (see Beech et al. submitted). Here participants do not have to make a response to T1, reducing the possibility that they could alter their responses to T2 based on noticing consciously what T1 was. Further work is needed to verify this. It would also be interesting to examine whether sexually arousing T1 images could induce an AB even when they are not correctly/consciously identified – it is possible that the image could draw attention to itself unconsciously, even if it is not then available for perceptual report (e.g., when participants miss-classify the T1 item). This should be tested under conditions in which T1 report is made difficult.

Procedural problems

One other concern in relation to the RSVP procedure is the problem of fatigue and tiredness associated with conducting the experiment. The rapid visual presentation conditions make the task quite demanding on an individual's attentional span. This could add noise to any measurement, making it less diagnostic of abnormal sexual interest. Work here is required to examine whether the effect of sexual images on the AB are found with the stimuli presented in short blocks of trials, to maximise the participant's attention throughout.

Clinical Implications

The preliminary research conducted to date indicates that the RSVP procedure could potentially be a useful tool in assessing sexual preference in child molesters. It is also possible that this paradigm could be used as an alternative to PPG due to the problems inherent in the latter procedure. The benefit of the RSVP procedure is that it can be implemented in any setting with access to a computer and it is very easy for the researcher to comprehend and use. This makes it very useful, particularly as it is

relatively simple for the participant to complete and may cause less stress or upset than the PPG, whilst at the same time being more difficult to fake.

Conclusions

Previous research has looked into benefits and downfalls of the PPG, and researchers have identified a need for an easy accessible assessment tool without the problems inherent in the PPG. The RSVP procedure is a new way of assessing deviant sexual interest in child sex offenders, linked to the consolidation of information in short-term memory (Beech et al. submitted) and/or to interference from the time taken for attention to be disengaged from T1 (the attentional dwell time). Thus, if there is an effect of sexual interest in relation to the image shown as the T1 stimulus, then it becomes possible to link it to an explicit theory of visual selection. Further work is now required both to establish the robustness of the effect and to evaluate the conditions under which it occurs.

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PART II:

EMPIRICAL RESEARCH ON SEX OFFENDERS

CHAPTER 3
RAPID SERIAL VISUAL PRESENTATION PROCEDURE: A MEASURE OF SEXUAL INTEREST IN INCARCERATED CHILD SEX OFFENDERS?

Chapter rationale

This chapter investigates the RSVP and the ability this cognitive procedure has to detect sexual interest in Child images with a sample of 12 intrafamilial child sex offenders, 14 extrafamilial child sex offenders, and 17 non-sexual offenders (i.e., convicted offenders with no previous sexual offence history). The findings suggest that the RSVP procedure does have the ability to detect sexual interest in the sample of extrafamilial child sex offenders, where a heightened error rate following child images was found. The intrafamilial child sex offenders and the control group produced similar results where they did not show a heightened error rate towards Child images.

Rapid Serial Visual Presentation Procedure: A Measure of Sexual Interest in incarcerated Child Sex Offenders?

Introduction

The study reported in this chapter investigated the responses acquired within the rapid serial visual presentation procedure (RSVP) in a child sex offender sample compared to an offending sample control group with no sexual offending history. In addition, this study also looked at the potential bias of anxiety and social desirability related to performance on the RSVP. Cognitive models looking at anxiety emphasises the attentional bias and vigilance anxiety can have to threat related stimuli and the aetiology and maintenance of anxiety (e.g., Beck, Emery & Greenberg, 1985; Beck & Clark, 1988; Bower, 1981). For reviews and more information see Williams, Watts, McLeod and Mathews (1997); Mathews and MacLeod (1994). Attentional capture by threat related stimuli have been consistently shown in clinically anxious individuals (e.g. MacLeod, Mathews & Tata, 1986) as well as individuals displaying high trait anxiety (MacLeod & Mathews, 1988; Mogg, Bradley, De Bono & Painter, 1997). Sex offenders may experience a certain level of state anxiety when images of children are displayed due to the nature of their offending where they have been punished by imprisonment for their offences. Based on their potential anxiety related heightened awareness to these Child images it is possible that level of anxiety may induce a heightened AB when T1 Child images are presented. Social desirability is also an issue when participants take part in these types of experiments (Gannon & Polaschek, 2005), where a desire to please the experimenter may reflect their performance in the experimental task.

Therefore, the aim of this chapter was to investigate whether the RSVP would have the ability to detect sexual interest in Child images compared to Animal images by looking at their response towards Child images, replicating Beech, Kalmus, Tipper, Flak and Humphreys (2008) study which found that sex offenders displayed a heightened AB towards T2 images (chair/train) when T1 images were children compared to images of animals. In addition, this chapter also wanted to look at the potential relationship and/or mediating effect anxiety and social desirability could possibly have on a potential heightened AB effect towards Child images.

The specific hypotheses were:

Hypothesis 1: Child sex offenders compared to offending controls will display more errors detecting T2 following detection of T1 images of children compared to images of animals

Hypothesis 2: Extrafamilial child sex offenders will display poorer performance on detection of T2 images following T1 images of children compared to intrafamilial child sex offenders due to a hypothesised stronger sexual attraction towards children (PPG studies have found strong evidence for this, Beech et. al., 2008; Flak, Beech & Fisher, 2007).

Hypothesis 3: Level of Anxiety may influence T2 accuracy to T1 images of children in child sex offenders in comparison with images of animals, in both conditions.

Hypothesis 4: Based on previous literature stating that attention based measures such as the RSVP are susceptible to be resistant to desirable responding (Beech et. al., 2008; Flak, et. al.,2009), it is hypothesised that no significant interaction will be observed between measures of Social Desirability and T2 accuracy, irrespective of whether T2 follows T1 Animal or Child images, for both conditions.

Method

Participants

Participants who took part were male prisoners from Prison A and Prison B service. In total, 238 convicted child sex offenders were approached to participate in this research, 12 intrafamilial (mean age 51.17; SD, 15.58), 14 extrafamilial (mean age 28.28; SD, 20.03) child sex offenders took part. In the control group, 249 convicted offenders with no previous sexual offending history were approached to participate, 17 took part (mean age, 40.41; SD, 14.38). Age range for all participants was between 23 and 86 (mean age, 45.98; SD, 16.99). Two participants were excluded, one participant had already been involved in previous treatment, whilst the other one had been wrongly classified as a child sex offender. All sex offenders taking part had not received any previous treatment.

Within the control group 10 (59%) had convictions of drug offences and 7 (41%) for deception/fraud/conspiracy offences. The sex offender group were classified (Intrafamilial versus Extrafamilial) by victim type and the relationship to the perpetrator. Sex offenders

were classified as intrafamilial offenders if they had a parental/family relationship of some sort to the victim/s. This therefore included fathers, step-fathers, grandfathers and uncles. Sex offenders were classified as extrafamilial if they had no parental or family tie to the victim/s, this included teachers, neighbours, strangers, babysitters and acquaintances. See Table 1 for demographic information of the three groups. Statistical analysis showed there were no significant differences between the groups on any of the demographic variables.

Table 1. Demographic Information

	Extra-familial Offenders	**Intra-familial Offenders**	**Controls**	*** Sign <.05 ** Sign < .01**
Mean age (SD)	48.28 (20.03)	51.17 (15.58)	40.41 (14.38)	Ns
Mean age when convicted of first sexual offence (SD)	39.50 (18.32)	45.00 (16.10)	n/a	Ns
Ethnicity ***Caucasian*** ***African Caribbean***	 14 (100%)	 12 (100%)	 14 (82.40%) 3 (17.60%)	Ns
Previous sexual convictions	4 (28.60%)	2 (16.70%)		Ns
Previous other convictions (non sexual)	8 (57.10%)	7 (58.30%)		Ns
Denial of sexual conviction	1 (7.10%)	2 (16.70)		Ns
Admitting sexual conviction	13 (92.90%)	10 (83.30%)		Ns
Victim mean number (SD)	5.79 (8.64)	1.83 (0.94)		Ns
Victim gender ***Female*** ***Male/Male + Female***	 8 (57.10%) 6 (42.90%)	 8 (66.70%) 6 (42.90%)		 Ns Ns
Victim age ***0-5*** ***6-11*** ***12-16***	 - 8 (57.10%) 6 (42.90%)	 2 (16.70%) 7 (58.30%) 3 (25%)		 Ns Ns
IQ	105.21 (11.20)	106.66 (12.99)	98.06 (15.13)	Ns

Design

The design was a repeat from the design used in the Beech et. al., (2008) study. There were two conditions, these were counterbalanced to control for order effects. In Condition 1 the

participants had to report T1 and T2, this investigated whether an increase in error rate was detected in T2 when T1 was accurately reported. In Condition 2 the participants had to report T2 only, this was to measure and control for difficulty in reporting T2 when T1 did not have to be reported. In total, there were 11 images in each trial, divided into 4 blocks (short break in between each block), with 216 trials in total. All images in each sequence were sequentially presented for 100 milliseconds and to reduce primacy and recency effect the first and last image was neutral in every sequence. T1 image was always positioned between the second and seventh position. T2 was always positioned between the third and ninth position, and it followed either immediately (stimulus onset asynchrony [SOA] = 100 ms), immediately but one (SOA = 200 ms), or immediately but two (SOA = 300 ms) images after the presentation of T1. The pictures assigned to the particular interval were counter-balanced across participants within each group. The analysis used T2 detection accuracy as a dependent variable for both conditions when T1 was also accurately identified in Condition 1. T2 stimuli had one of four separate responses (chair left, chair right, train left, train right), therefore level of chance of accurate detection was at 25%.

Stimuli

The images were all drawn from 610 commercially available images, 216 were used as T1 stimulus divided into 178 images were neutral images, 108 animals and 108 child images (all clothed). 216 were used as T2 stimulus, with 108 trains and 108 chairs (half facing left/ half facing right). T1 child images were all in natural settings, either full body or facial length images of either a single child or children in groups. Age ranged between 6-11 years old. The T1 animal images included domestic and wild mammals, birds and reptiles. Images were again facial, half-length or full-length pictures of single or groups of animals in natural settings.

Procedure

Each experimental procedure followed standardized scripted instructions (Appendix A). Prior to performing the experimental task the participants were requested to do the Ammons Quick Test (Ammons & Ammons, 1962**.** Appendix B**)** and the Balanced Inventory of Desirable Responding/Paulhus Deception Scale (BIDR/PDS, 1998**.** Appendix D). The anxiety questionnaires (State-Trait Anxiety Inventory**;** STAI: Spielberger, 1983. Appendix C**)** were completed immediately prior to and following the experimental task. On arrival the participants were given a brief description on what the experiment would entail. On

completion of the experiment, the participants were debriefed briefly on the purpose of the study and were also informed that they could withdraw from the study at any point prior to write up of the study. They were also informed that they would have the possibility to be debriefed on the purpose of the experiment once the study had been completed. This was done in order to ensure the RSVP measures validity. Each participant completed the experiment in a standardized testing suite, before completing the experiment all participants signed a consent form. All participants completed Condition 1 and Condition 2. The approximate time for each session lasted between 20 to 40 minutes. All responses were made on a computer keyboard adapted to the experimental conditions. In Condition 1, participants were instructed to press the corresponding key of whether they had seen a child or an animal, and then whether they had seen a chair or a train and whether it was facing towards the left or the right direction. In Condition 2, the participant only responded to whether they had seen a chair or a train and which way it was facing (left/right). The participants were instructed to respond every time even if they were uncertain (make a guess). A break was integrated into the conditions between each block, and a further break was allowed between Condition 1 and Condition 2. It was up to the participant whether to use these breaks or continue with the experiment.

Measures used

Ammons Quick Test (Ammons & Ammons, 1962**.** Appendix B**).** The Ammons Quick Test (Ammons & Ammons, 1962) was used in order to obtain a reliable Intelligent Quotient (I.Q.) for each participant. This test involves picture-vocabulary assessment, the administrator reads up a list of words where the participant is required to point to the picture (1 out of 4) that depicts the word best. The test correlates well with the WAIS I.Q. (Mortimer & Bowen, 1999). The test was perceived to be sufficient enough to evaluate if the participants intellectual functioning were appropriate to complete the RSVP task.

State-Trait Anxiety Inventory (STAI: Spielberger, 1983. Appendix C**).** To obtain a reliable measure of level of state and trait anxiety the STAI (Spielberger, 1983) was administered. The measure consists of 40 items with a four-point likert scale. The STAI measure Trait-Anxiety and State-Anxiety. In this context Trait-Anxiety represents a trait-like inclination with an overly tense and anxious appearance and stressful situations are perceived dangerous or threatening (Spielberger, 1983). State-Anxiety refers to an unstable momentary emotional state of tension, apprehension and worry. State-Anxiety is affected more by the situation of

testing compared to Trait-Anxiety (Spielberger, 1983). State-Anxiety scale (20 items) assess how the participant feels 'right now, at this moment', whilst Trait-Anxiety (20 items) assess how the participants feel 'generally'.

The Balanced Inventory of Desirable Responding/Paulhus Deception Scale (BIDR/PDS, 1998**.** Appendix D). The inventory PDS is often used in evaluating honesty of responses as research have shown the impression management sub-scale can distinguish between 'fakers' and 'non fakers' (Paulhus, 1998). The inventory consists of 40 items with likert scale responses measuring two components of desirable responding; Self-Deceptive Enhancement (SDE) and Impression Management (IM). SDE looks at the participants' ability to give honest but inflated self-descriptions, likened to narcissism (Paulhus & John, 1998; Paulhus, 1998). This scale measures a stable trait-like predisposition towards an overly self-favourable disposition as opposed to an intentional attempt to mislead others (Paulhus, 1998). The IM measures an individual's conscious attempt to show themselves in a positive way to others through over-endorsement of positive self referent statements. This is reinforced by the situation of testing as opposed to being a trait-like tendency. High scores on this measure suggest the participant may be exaggerating and with intention trying to impress others (Paulhus, 1998).

Equipment

The experiment was conducted on an Intel Celron 1.7 GHz tower computer connected to a 15inch CRT monitor. A standard QWERTY keyboard was used for responses, with keys being labelled with the appropriate response (Insert- CHAIR LEFT, Delete TRAIN LEFT, Page up – CHAIR RIGHT, Page down – TRAIN RIGHT, End– ANIMAL, Home – CHILD). To prevent wrong keys being pressed, all surrounding keys were removed. The experiment was presented using E-prime for Windows.

Ethical Approval and Consent

Ethical approval was obtained from the University of Birmingham's Ethics Committee at the University of Birmingham, Birmingham, United Kingdom (Appendix E) and from Prison B and Prison A (Appendix F)

Data Analysis

A Four Way Repeated Measures ANOVA was performed on the RSVP data. The Independent variable was Group (Intrafamilial, Extrafamilial and Control), within subject factors were Condition (Condition 1: reporting of T1 and T1. Condition 2: reporting of T2 only), T1 Category (child/animal) and Interval were the three repeated measures variables (SOA of 100 ms, 200ms and 300ms). The dependent variable was T2 accuracy. The analysis was performed using SPSS Version 16.0.

Results

Result of the overall multivariate analysis are displayed in Table 2. It can be seen from the analysis that a significant main effect of Condition was found, $F\ (1, 40), =283.705, p < .000$, a significant main effect of Interval, $F\ (2,80), = 4.421, p < .05$, a significant interaction between Interval and Group, $F\ (4,80), = 3.155, p < .05$, a significant interaction between Condition, Category and Group, $F\ (2,40), = 6.824, p < .005$, and a significant interaction between Condition and Interval, $F\ (2,80), = 5.039, p < .01$. The significant effect of Condition indicates AB improvement across the two conditions, participants were less accurate in Condition 1, where both T1 and T2 had to be reported (44.82%) compared to Condition 2 where T2 only had to be reported (71.57%). The significant main effect of Interval indicates that participants improved their accuracy across the Intervals, with lowest performance at Interval 1 and highest performance at Interval 2, see Table 3 for an overview of these scores. Further, a significant between subjects effect was found, $F\ (2, 40), = 3.195, p < .05$. suggesting overall, between the two conditions, the groups differed significantly to each other in performance.

Table 2

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects Group Error	**2** **40**	**3.19**	**.05**
Within Subjects Condition Category Interval Group*Condition Group*Category Group*Interval Condition*Category Condition*Interval Category*Interval Group*Condition*Category Group*Condition*Interval Condition*Category*Interval Group*Condition*Category*Interval	 **1/40** **1/40** **2/80** **2/40** **2/40** **4/80** **1/40** **2/80** **2/80** **2/40** **4/80** **2/80** **4/80**	 **283.75** **.03** **4.42** **1.28** **2.68** **3.15** **.29** **5.04** **1.50** **6.82** **2.18** **1.37** **.23**	 **.000** **.05** **.05** **.01** **.01**

[a] ***Only p values of .05 or less are reported***

Table 3

Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**	**Interval 3 (M/SE)**
Condition 1	**42.78% /2.77**	**43.77%/2.80**	**47.72%/3.12**
Condition 2	**71.46%/2.54**	**71.73%/2.59**	**71.53%/65.76**

Testing of Hypothesis 1: Child sex offenders compared to offending controls will display more errors detecting T2 following detection of T1 images of children compared to images of animals.

Condition 1 = report of T1 and T2
Condition 2 = report of T2 only

Hypothesis 1 suggested that child molesters, compared with the control group of non-sexual offenders, would produce more errors detecting T2 following T1 images of children. The data was subjected to a four-way repeated measures ANOVA, independent variables were Group

(Between: Extra-familial, Intra-familial and Control), and within subjects factors were Interval (0, 1, 2) and Category (T1: child/animal). The Dependent variable was percentage (percentage was calculated as Raw Scores x 100/36) of T2 accuracy (chair/train and direction) when T1 was also accurately reported. Responses where the participant inaccurately identified T1 were excluded from the analysis as T2 reporting would in this case not be a function of the image identified in T1. Accuracy of T2 scores were obtained by the participant's ability to accurately identify whether they saw a chair or a train and which way it was facing (left of right) and therefore level of chance was 25%. In both conditions all participants were observed to perform above levels of chance.

See Table 4 for a complete overview of the Multivariate ANOVA, and Table 5 for an overview of the accuracy percentage scores for Condition 1 and Condition 2 across the groups for Animal and Child stimuli. The analysis showed a significant interaction between Category and Group $F\ (2, 40) = 7.329, p < .01$ suggesting Category had a differing effect across the three groups, this was mainly due to the difference in performance of the groups where Extra-familial offenders displayed lower accuracy of T2 when T1 was a child (*42.45%)* compared to animal (*48.53%)* whereas the opposite pattern emerged for both the Intra-familial group (child: *51.92%;* animal: *49.83%)* and the Control group (child: *39.76%;* animal: 36.43%). Further a highly significant main effect of Interval, $F\ (2, 80), = 9.018, p < .001$ was found. The total average overall accuracy for T1-T2 Interval for all groups was *42.78%* for Interval 0, *43.97%* for Interval 1, *47.72%* for Interval 2 confirming that the conditions demonstrates the desired AB (See Table 2).

Further, repeated measures t-tests were performed on total score of animal and child where T2 accuracy score was condensed into total animal and child scores across T1 and T2 interval. This analysis was conducted to look at whether there were any significant differences in responses in the individual groups. All three groups displayed significant differences, Extra-familial $t = 2.976, p<.05$, Intra-familial $t = -.870, p>.05$ and Control $t= -2.335, p<.05$.

Table 4

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects Group Error	**1** **40**	**1.78**	

Within Subjects	**1/40**		
Category	**2/80**	**.040**	
Interval	**2/40**	**9.08**	**.0001**
Group*Category	**4/80**	**7.33**	**.01**
Group*Interval	**2/80**	**1.80**	
Category*Interval	**4/80**	**1.60**	
Category*Interval*Group		**1.19**	

[a] ***Only p values of .05 or less are reported***

Table 5

Percentage Accuracy, Mean and Standard Deviation T2 Accuracy Scores by T1 Child and Animal Categories in Condition 1 and Condition 2

Category	**Control Group**	**Intrafamilial Group**	**Extrafamilial Group**
Condition 1			
Animal			
M	**36.44 %**	**49.84 %**	**48.53 %**
SD	**4.51**	**5.37**	**4.97**
Child			
M	**39.76 %**	**51.92 %**	**42.45 %**
SD	**4.53**	**5.39**	**4.99**
Total Score			
M	**38.09 %**	**50.88 %**	**45.49 %**
SD	**4.43**	**5.28**	**4.88**
Condition 2			
Animal			
M	**61.00%**	**80.01 %**	**72.94 %**
SD	**4.24**	**5.05**	**4.67**
Child			
M	**61.82 %**	**79.01 %**	**74.66 %**
SD	**4.01 %**	**4.78**	**4.43**
Total Score			
M	**61.41 %**	**79.51 %**	**73.80 %**
SD	**4.06**	**4.83**	**4.47**

Testing of Hypothesis 2: Extrafamilial child sex offenders will display poorer performance on detection of T2 images following T1 images of children compared to intrafamilial child sex offenders due to a hypothesised stronger sexual attraction towards children.

Hypothesis 2 suggested that performance in detection of T2 following T1 image of a child would be more prevalent in extrafamilial offenders compared to Intrafamilial offenders.

Therefore to further explore the above significant interaction result between Group and Category an outcome score was formed by creating a score derived by calculating the total accurate T1 Animal scores subtracting the total T1 Child accuracy score for each individual participant. This gives a number where a positive value indicate poorer performance when T2 images followed T1 Child images, whilst scores with a negative value indicated poorer performance when T2 images followed T1 Animal images. For an overview of scores see Table 6 of T1 performance across Groups in Condition 1.

To look at between group differences in Condition 1 a One-Way ANOVA was conducted on outcome score for the three groups, this showed a significant difference between Groups, $F(2,40) = 7.329$, $p < .01$. Mean outcome score showed Extrafamilial group had lower accuracy on Child images than Animal images (*18.25, SD: 22.95*), whereas the opposite was shown in the Intrafamilial group (*-6.25, SD: 24.97*) and the Control group (*-9.97, SD: 17.60*). Post hoc analysis showed a significant difference between Extrafamilial and Intrafamilial ($t = p < .05$) and Extrafamilial and Control ($t = p < .01$). These results suggest that Extrafamilial offenders performance was lower when T1 images of children were displayed, whereas the opposite effect was found for Intrafamilial and control groups, their performance was lower when T1 image was of animals. This confirms hypothesis 2 suggesting that there would be a difference in performance between Intrafamilial and Extrafamilial offenders based on PPG related findings.

ROC analysis

To further look at Condition 1's discriminative ability between Groups a receiver Operating Characteristic (ROC) analysis of Outcome score was conducted to measure sensitivity and specificity. Sex offender groups (Extrafamilial and Intrafamilial) were collapsed into one group. Figure 1 displays the ROC analysis of Condition 1's discrimination of the collapsed sex offender group versus the Control group. Figure 2 displays the ROC analysis of Condition 1's discrimination of Extrafamilial offenders versus Control group. The sensitivity axis represents the hit rate, therefore it represents offenders correctly discriminated by the measure. The specificity axis represents the false alarm rate, which represents falsely discriminated non sex-offenders. A larger area under the curve (AUC) indicates greater accuracy of discrimination. Therefore a measure with a perfectly accurate discrimination (AUC of 1.0) would generate a ROC curve plotted straight up the sensitivity axis and then, at the top of the graph along the specificity axis until it reaches the far right-hand corner (c.f.

Quinsey, Harris, Rice & Cormier, 1998 for a review). The diagonal line represents a line that would be produced if the experiments' discriminative effect was no better than chance (AUC of .5).

The ROC analysis of collapsed group of sex offenders (Extrafamilial and Intrafamilial) versus Control group produced significant ROC Curve *AUC of .71, 95% CI of .55-.86, p=.022, p<.05*, See Figure 1. This indicates that Condition 1 significantly discriminated between offenders and non-sex offenders. The discriminative effect between Extra-familial offenders and Control group produced an even stronger *AUC* of .79, 95% CI of .64-.95, with a significance level of $p = .005$, see Figure 2, suggesting Condition 1 has the ability to discriminate between child sex offenders and Controls as well as Extrafamilial child sex offender group on its own and Controls.

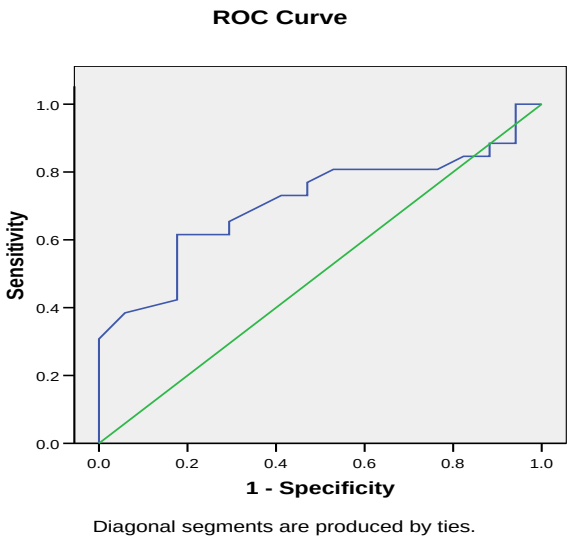

Figure 1: Collapsed Group of Intra and Extrafamilial Offenders versus Control Group

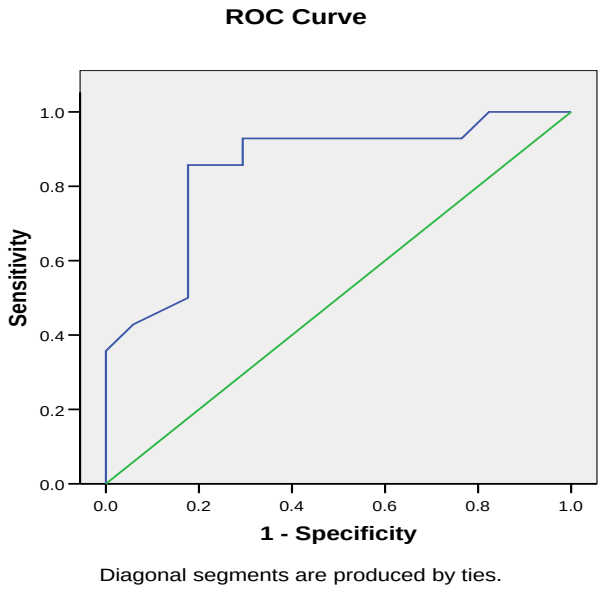

Figure 2: Extramilial Group versus Control Group

T1 Performance across groups and categories in Condition 1

For completeness of the data Table 6 report T1 performance across Groups and Categories within Condition 1. The result of this analysis showed that there was a significant main effect of Interval $F(2,80) = 5.46$ $p < .01$, and a significant interaction between Category and Interval was shown, $F(2,80) = 3.265$ $p < .05$. No other significant effect was found. However looking closely at Table 5 shows that both intrafamilial and extrafamilial scored lower on Child images compared to Animal images, this was particularly obvious for the extrafamilial group.

Table 6

T1 Performance Across Groups and Categories in Condition 1

Category	**Control Group**	**Intrafamilial Group**	**Extrafamilial Group**	**Total Score**
Animal				
M	**87.64 %**	**88.43 %**	**91.73 %**	**89.26 %**
SD	**2.88**	**3.43**	**3.17**	**1.82**
Child				
M	**87.90 %**	**84.64 %**	**85.84 %**	**86.13 %**
SD	**2.98**	**3.54%**	**3.28**	**1.89**

It is possible that fatigue may have impacted the participants' performance. To investigate this we examined whether their performance differed from the beginning of the experiment compared with the end of the experiment. The polynomial contrast analysis was performed comparing responses from Block 1 and Block 2 with Block 3 and Block 4. The analysis showed no significant difference between the groups performance between Block 1 and Block 2 compared with Block 3 and Block 4, $F(2,40), = 2.455, p > .05$. Mean for the Intrafamilial group was slightly lower in Block 1 and 2 (Mean, 4.76.44 (SD 4.76)) compared with Block 3 and 4 (Mean, 50.66 (SD, 5.11)). The same trend was seen in the Control group with a lower mean for Block 1 and 2 (Mean 36.43 (SD, 4.00)) compared with Block 3 and 4 (Mean 38.03 (SD 4.30). The extrafamilial group showed the reverse trend, with a slightly higher mean (36.43, SD, 4.00) in Block 1 and 2, compared with mean score of 38.03 (SD, 4.30) in Block 3 and Block 4.

Result Condition 2

Testing of Hypothesis 1

Hypothesis 1 suggested that child molesters, compared with the control group of non-sexual offenders, would produce more errors detecting T2 following T1 images of children, however in Condition 2 detection of T2 was only required, this was in order to see whether preceding T1 images (animal/child) would induce similar response as in Condition 1. As this Condition required report of T2 only, accuracy was therefore calculated as T2 accuracy when T2 was preceded by T1 (child/animal), therefore the level of chance remained at 25%. A four-way repeated measures design ANOVA was performed on the data, independent variables were Group (Between: Extrafamilial, Intrafamilial and Control), and within subjects factors were

Interval (0, 1, 2) and Category (T1: child/animal). The Dependent variable was T2 accuracy (chair/train and direction). See Table 7 for a complete overview of the findings. A significant between subjects effect was found, $F\ (2, 40) = 4.516, p < .05$, a significant interaction was found between Interval and Group $F\ (4, 80) = 3.30, p < .015$. The between subjects effect can be explained by looking at the post hoc analysis, showing a significant difference between Intra-familial offenders (79.51%) and controls (61.41%), $t = p < .05$. where the Control groups response is much lower than the two sex offender groups. No significant difference was found between extrafamilial (73.79%) and controls and extrafamilial and intrafamilial offenders. No further analysis was conducted for Condition 2.

Table 7

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects	**2**		
Group	**40**	**4.52**	**.05**
Error			
Within Subjects			
Category	**1/40**	**.28**	
Interval	**1/40**	**.03**	
Group*Category	**2/80**	**.62**	
Group*Interval	**2/80**	**3.31**	**.01**
Category*Interval	**2/40**	**1.15**	
Category*Interval*Group	**4/80**	**.88**	

[a] ***Only p values of .05 or less are reported***

Further analysis of Condition 1 relative to Participant variables (State/Trait Anxiety, Social desirability)

Testing of Hypothesis 3 and Hypothesis 4. Anxiety and Social Desirability

Hypothesis 3 stated that level of Anxiety may influence responses to T2 images following T1 images in all groups. Table 8 gives an overview of the mean scores on the Social Desirability Measure and the Anxiety Measure. Hypothesis 4 stated that based on previous literature suggesting that attention based measures, such as the RSVP, are susceptible to be resistant to desirable responding, it was therefore hypothesised that no significant interaction will be found between measures of Social Desirability and T2 accuracy, irrespective of whether T2 follows T1 Animal or Child images, for both Conditions.

Table 8

Mean group scores on Psychometric Measures of State and Trait Anxiety (S-Anxiety and T-Anxiety), and Social Desirability (Impression Management: IM, and Self Deceptive Enhancement: SDE).

Measure (Overall Mean, SD)	**Non-sexual/non violent offending controls (M/SD)**	**Intra familial**	**Extra familial**
S-Anxiety, Pre-testing. (31.63, 9.85)	26.35 (5.07)	35.50 (10.06)	34.71 (11.64)
S-Anxiety, Post-testing	31.65 (13.06)	36.25 (12.20)	37.57 (12.59)
T-Anxiety (33.47, 12.34)	31.12 (8.64)	31.92 (8.65)	37.64 (17.56)
IM (6.49, 4.54)	7.24 (4.59)	4.17 (2.69)	7.57 (5.26)
SDE (7.07, 4.09)	8.06 (4.08)	5.17 (3.35)	7.50 (4.38)

To look at whether State and Trait Anxiety measures were associated with each other, as the literature predicts (Spielberger, 1983), correlations were performed. Within the extrafamilial group significant correlations were found between Trait Anxiety and pre State Anxiety, $r = .792$, $p < .0001$, between Trait Anxiety and post State Anxiety, $r = .895$, $p < .0001$, and between pre State Anxiety and post State Anxiety, $r = .900$, $p < .0001$. Within the intrafamilial group there were no significant correlations between any of the anxiety measures. Finally, for the control group significant correlations were found between Trait Anxiety and pre State Anxiety, $r = .626$, $p < .01$, and between Trait Anxiety and post State Anxiety, $r = .824$. $p < .01$. The findings for the extrafamilial and control group confirm the prediction that Trait and State anxiety correlate with each other, this was not confirmed by the Intra-familial group. No significant correlations between State Anxiety pre and post were found.

To investigate differences between the groups on the Anxiety measures ANOVA's were performed. A One-Way ANOVA was conducted looking at Trait Anxiety, this showed no significant difference between the groups, post-hoc analysis showed no significant differences between any of the groups. In order to look at whether the groups differed on State Anxiety pre and post a One-Way ANOVA was performed on the data showing significant differences on the pre State Anxiety measure between Groups, $F(2,40) = 4.783$, $p < .014$, no significant

difference between groups on post State Anxiety measure. Post hoc analysis indicated that this was due to a significant difference between extrafamilial and controls on the measures of pre State Anxiety, *t = <.044,* and a significant difference between intrafamilial and controls on pre State Anxiety, *t = <.032.* The mean of the control group (*26.35, SD 5.07*) was much lower than the mean for both intrafamilial (*35.50, SD 10.06*) and extrafamilial (*34.71, SD 11.64*). See figure 3 for an illustration of State Anxiety pre and post experimental Condition for the three Groups.

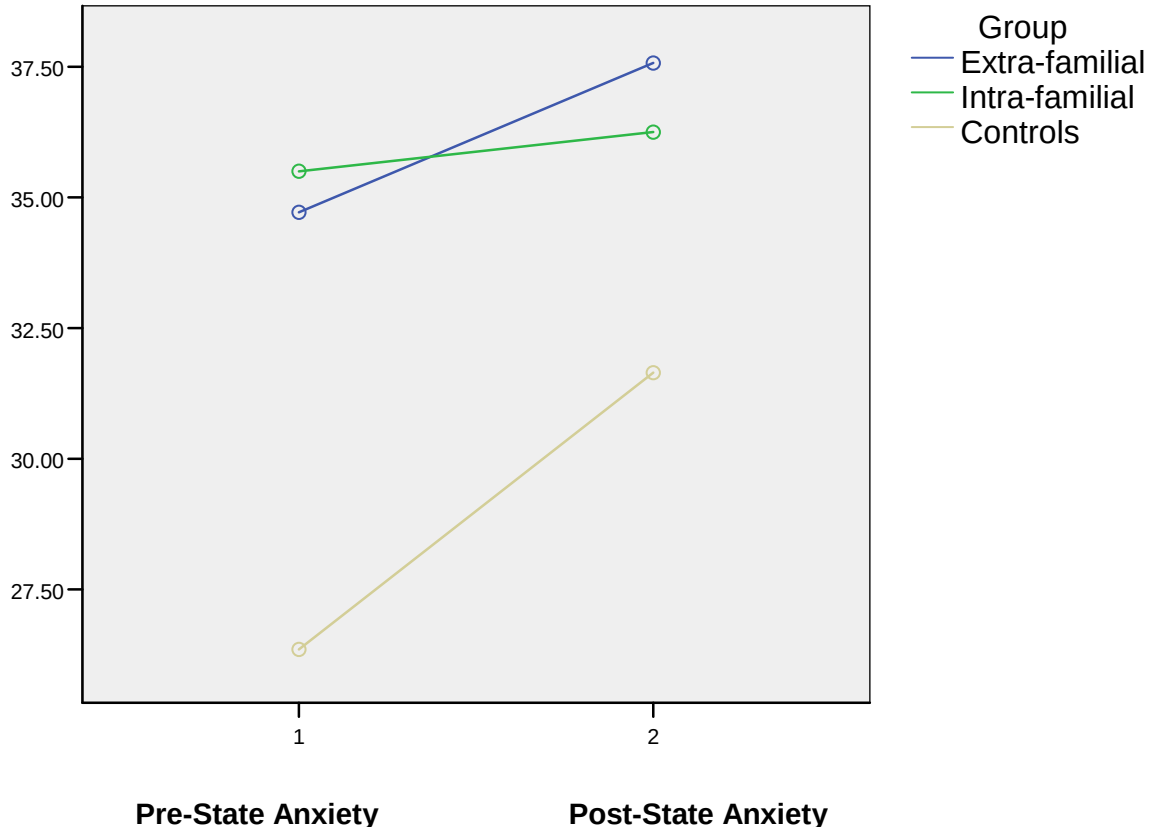

Figure 3: State-Anxiety Pre and Post Conditions

As can be seen from the graph, there is a large increase in state anxiety for the control group from pre and post experimental Condition and a slight increase in both the intrafamilial and extrafamilial group. Based on these findings we needed to explore whether state anxiety could have an influential effect on the findings reported above in Condition 1 where a significant interaction between Category and Group and a main effect of Interval. In order to do this an

ANCOVA was performed, covarying for State-Anxiety. The interaction between Category and Group remained, *F (2, 39) = 7.15 <.01,* however the significance level of Interval found in the three-way ANOVA reported above did not remain. This indicates state anxiety did not influence the interaction between Category and Group, however, State-Anxiety did influence main effect of Interval initially found which indicates anxiety removed the main effect of Interval. No other significance level was found.

Social Desirability

In order to look at Social Desirability and whether there were any differences between Groups on this measure (IM and SDE), a two-way mixed ANOVA was performed. The analysis showed a significant difference between groups, *F (2, 40), = 5.029, p <.01,* on the total Social Desirability score. A Post hoc analysis showed that the between group difference was due to a significant difference in scores between the extrafamilial group (*M, 15.07. SD, 5.97*) and the intrafamilial (*M, 9.33. SD, 4.58*), *t = <.05,* and a significant difference between intrafamilial and Controls (*M, 15.29. SD, 5.53*), *t = <.05,* showing that the intrafamilial group scored much lower than both the extrafamilial and the Control group. A further One-Way ANOVA looking at the subscales (IM and SDE) revealed no significant difference between groups. Finally, a two-way ANCOVA was performed to investigate the effects of social desirability (IM and SD) on T2 accuracy scores. This produced no significant interactions between Social Desirability and T2 accuracy scores, indicating that social desirability did not exert a significant effect on T2 accuracy across all groups.

Condition 2: Anxiety and Social Desirability and T2 Accuracy

As the significant findings for Condition 2 was only the interaction between Interval and Group, it was not perceived to be of importance for the present research to conduct any further analysis in relation to Anxiety and Social Desirability.

IQ and Condition 1

In order to look at whether IQ may have influenced level of accuracy in Condition 1, ANCOVA was conducted covarying for IQ. The significant interaction between Category and Group remained, *F (2, 39), = 6.66, p < .01,* indicating IQ did not affect level of performance on T2 accuracy. No other significant effect was observed in this analysis.

IQ and Condition 2

As the significant findings conducted above for Condition 2 was only the interaction between Interval and Group it was not found necessary to explore this any further in relation to IQ, as the interest of IQ was whether it would influence level of T2 accuracy.

Discussion

The present study examined the RSVP's ability to detect sexual interest towards Child images in a group of intrafamilial and extrafamilial child sex offenders. Their responses were compared with a group of offending controls. The statistical analysis of the study demonstrated that the RSVP does have the ability to detect sexual interest in extrafamilial child sex offenders.

Consistent with the Beech et. al., (2008) study all participants exhibited the AB effect in Condition 1. However, only the extrafamilial offenders produced the greatest discrepancy reporting T2 images (Chairs and trains) when images of children (T1) were presented compared to images of animals (T1). Intrafamilial and controls displayed the opposite pattern with a lower percentage accuracy on animal T1 images compared to Child T1 images. The findings suggest that extrafamilial child sex offenders' deviant sexual interest in children is manifested by displaying this heightened AB effect towards Child images, whereby the RSVP could be a way of measuring abnormal sexual interest in extrafamilial child sex offenders.

Beech et. al., (2008) reported that both intrafamilial and extrafamilial child sex offenders did display a heightened AB towards Child images, however, they also reported that the extrafamilial child sex offenders did display a slight higher AB towards Child images compared with intrafamilial child sex offenders. The effect found in the extrafamilial participants concurs with the general literature suggesting that extrafamilial offenders display a stronger sexual interest in children compared with intrafamilial child sex offenders (Abel, Becker, Murphy & Flanagan, 1981; Marshall, Barbaree & Christophe, 1986; Marshall, Barbaree & Butt 1988; Quinsey & Chaplin, 1988; Wormith, 1986).

The ROC analysis was also able to discriminate between the groups, where a significant AUC was found between the collapsed group of extrafamilial and intrafamilial offenders compared to the control group, and even stronger significant AUC was found between the extrafamilial and the control group. Suggesting that the RSVP is a sensitive measure able to distinguish between child sex offenders and controls.

The polynomial contrast analysis did not show any effect of fatigue in the participants, suggesting that fatigue did not impact on participants' performance.

In Condition 2, no significant findings were seen for the child sex offenders, contrasting findings from the Beech et. al., (2008) study, who reported that Child images caused interference in child sex offenders. Their findings indicate that although Child images do not need to be reported they still have an attention-capturing effect. A closer look at T1 performance within the groups and categories within Condition 1, although non-significant , the means did show a trend in the hypothesised direction with lower average accuracy score on Child images compared with Animal images, particularly in the extrafamilial group.

This paper also looked at whether anxiety and social desirability would have a mediating effect on performance within the RSVP. With regards to anxiety no significant interaction effect was found between anxiety and T2 accuracy, indicating that anxiety does not have any bearing on the performance of the extrafamilial offenders enhanced AB after T1 Child images was displayed. Further, no evidence was found supporting the notion that social desirability may affect these type of assessments (social desirability have been seen to have an effect on self-report data and to have a low correlation with PPG responses, Looman et. al, 1998). This supports the proposition that the RSVP is resilient to factors associated with social desirability (Kalmus & Beech, 2005, Flak et. al., 2007). A further potential threat to the validity may be in relation to faking, a very relevant issue with regards to PPG (e.g. Abel et. al., 1978; Avery-Clark & Laws, 1984; Farkas et. al., 1979; Golde et. al., 2000; Hall et. al., 1988). It is at present uncertain whether the responses within the RSVP are susceptible to faking, however due to how accuracy is calculated, unknown to the participants, (where T1 accuracy is calculated only if T2 is accurate), it would suggest that faking is very difficult to attempt. The study also looked at whether IQ would have an effect on the participants' performance, this did not appear to affect the responses in the experiment. This is likely due to the fact that the child-specific responses or enhancement of AB would be independent of an overall difference in performance as it provides a measure which is relative to overall performance measured when T1 is an animal picture.

These results are very promising although caution should be taken. Suggestions have been made that although the abnormal interest found in extrafamilial child sex offenders may be specific to this group, however, it is possible that it may characterize other groups as well who are in close contact with children, such as new parents, grandparents, kindergarten teachers and others who work or are in close contact with children. This will be investigated in Chapter 5.

Another potential bias may be the self-selection bias, where below a third of the sample agreed to take part of those who were approached. The offenders may have been driven by a motivation to see images of children, however, this is unlikely as the offenders were informed prior to the experiment that images would be non-nude.

A potential bias or a threat to the validity of the RSVP paradigm may be in relation to the load on the attentional span. Some of the participants reported fatigue, although frequent breaks were incorporated into the study. The polynomial contrast analysis did not show any significant difference between overall accuracy at the beginning of the experiment compared with the end of the experiment. However, for improvement of the RSVP paradigm it would be of benefit for future research to explore shortening the experimental conditions down into shorter blocks of trials where the attention span would be maximised.

Future research within this area would be beneficial, although the RSVP is a well researched area within cognitive psychology (See Shapiro, 2001; Flak et. al., 2007) it has not yet been researched at depth for the purpose of measuring sexual interest in child sex offenders. The reliability and validity of this measure needs to be firmly established, where differing child sex offender samples may be useful, such as pure internet sex offenders, sex offenders who are in denial, as well as looking at RSVP scores pre and post treatment where changes in AB could be measured, suggesting treatment effectiveness

The findings cannot be attributed to anxiety or social desirability and appears to be difficult to fake. To conclude, the RSVP appears to be sensitive in measuring sexual interest in extrafamilial offenders but not in intrafamilial offenders in the present study, supporting the Beech et. al., (2008) study.

CHAPTER 4

RAPID SERIAL VISUAL PRESENTATION PROCEDURE: A MEASURE OF SEXUAL INTEREST IN RELEASED CHILD SEX OFFENDERS?

Chapter rationale

This chapter was a follow up to Chapter 3, where a sample of 9 child sex offenders from the West Midlands Probation Service was tested on the RSVP. The same RSVP procedure used in Chapter 3 was applied to this study, hypothesizing that sex offenders would display a heightened AB towards child images compared with animal images. However, the analysis of the study did not produce any of the hypothesized predictions, no significant findings were detected. The child sex offenders compared to the control sample from Chapter 3 produced very similar results. The conclusion from this chapter was that the sample size was too small, and that the nature of the sexual offender sample differed in various aspects compared to the sample reported in Chapter 3. The main flaw of this study was that there was not enough information on the child sexual offenders, in that for most of the participants the exact offence history as well as previous treatment history was unknown.

Rapid Serial Visual Presentation Procedure: A Measure of Sexual Interest in released Child Sex Offenders

Introduction

Previous studies (Beech et. al., 2008; Kalmus & Beech, 2005; Chapter 3) have shown that the Rapid Serial Visual Presentation (RSVP; Shapiro & Raymond, 1994) procedure can be utilised as a tool to evaluate sexual interest in child sex offenders. These studies demonstrate that when child images versus animal images are presented using the RSVP procedure, this causes child sex offenders to produce more errors when having to respond to child images compared to control groups of non sexual offenders. This phenomenon is termed the attentional blink (AB; Shapiro & Raymond, 1994; Shapiro, 2001) effect and is a very well established phenomenon within the cognitive psychology literature. Therefore, the findings from previous studies suggest that the RSVP can be used as a tool to measure sexual interest in child sex offenders, where their abnormal sexual interest in children is apparent through their responses to the child images which is due to the emotional salience the child images produces in sex offenders (Flak et. al., 2009; Flak et. al., 2007; Chapter 3).

Chapter 3 demonstrated that sex offenders display a greater error rate when responding to images of children versus images of animals compared to the control group. The aim of the present chapter was to conduct a follow up in order to investigate whether the RSVP would produce similar results in the present community sex offender sample compared to the sex offender sample from Prison A. The control group from Chapter 3 was also used as a control group in the present study in order to compare the results from the sex offender samples only and avoid potential confounding effects a different control group may have had on the end result.

Chapter 3 looked at two conditions within the RSVP procedure, however, due to time restrictions put on by the probation service, not enough time with each participant was available in order to complete both conditions. Condition 1 was chosen, the reasoning behind choosing Condition 1 versus Condition 2, was based on that Chapter 3 and the Beech et. al., (2008) study only found the AB effect in sex offenders in Condition 1. Hence why it was predicted that Condition 1 has the ability to detect sexual interest in children in child sex offenders.

Hypothesis

Child sex offenders, will produce a higher error rate reporting T2 images following reporting of T1 images of children compared to T1 images of animals, hence showing a sexual interest in child images, compared with a control group of non-sexual offenders.

Method

Participants

In total 27 participants took part, age ranged for all participants between 23 and 69 (mean age, 45.98). Volunteers with any previous history of psychosis, a significant learning disability or a physical disability were excluded from the study. The participants were not given any financial award for participating in this study. There was no significant difference in mean age between the two groups. The child sex offender sample consisted of 10 volunteers from the West Midlands Probation Service who were due to take part in the sex offender treatment programme (SOTP). Approximately 100 participants were approached and verbally asked to participate in which 10 agreed to take part. None of the child sex offenders had taken part in any treatment programme after they had been released from prison, however, it is not known whether they had gone through any treatment programme when in prison or prior to prison. 2 participants had to be excluded, one participant due to inability to concentrate on the experimental task, and the other participant due to poor eyesight. Age ranged between 35-69 (mean age 43.5) years, all white British. The sex offenders specific offence data was only available on four participants. The four participants were extrafamilial offenders convicted of making indecent photographs of children. For three of the offenders the victims were girls, whilst for one offender victims were mixed sex children. The remaining six participants had been convicted of a child related sex offence, however, specific offence details were not available at the time of this research. The control group consisted of 17 participants (mean age, 40.41), age ranged between 23-62, for detailed information see Chapter 3, as this control group is the same control group employed in Chapter 3.

Design

Design of this study contained 1 condition, in this condition the participants had to report T1 and T2 which investigated whether an increase in error rate was detected in T2 when T1 as a child was accurately reported compared to when T1 was an animal. For further detailed information about the design of the RSVP procedure and the set up of images please see

Chapter 3 under the heading '*Design'*

Stimuli

Images used were the exact same images used in Chapter 3. Please see Chapter 3, under the '*Stimuli'* heading for detailed information.

Procedure

Each experimental procedure followed standardized scripted instructions (Appendix G). The procedure lasted for approximately 20-30 minutes and was conducted in a private testing suite at the West-Midlands Probation Service office. On completion of the experiment, participants were debriefed on the main purpose of this study, it was highlighted that they could withdraw from the study at any point prior to write up of the study. They were also informed that they had the opportunity to be debriefed on the purpose of the study once the study had been completed. This was done in order to ensure the RSVP measures validity. All responses had to be made on a keyboard which was modified to the experimental procedure by marking the keys with labels appropriate for the responses required. Participants were instructed to first press the corresponding key of whether they had seen a child or an animal, then secondly whether they had seen a chair or a train and whether it was facing towards the left or the right direction. Instructions were made for the participant to respond every time, even if they were uncertain about their responses, they were told to make a guess. A break was integrated into the condition between each block, 3 short breaks in total.

Equipment

The experiment was carried out on an Intel Celron 1.7 GHz tower computer connected to a 15" CRT monitor. A standard QWERTY keyboard was used for responses, with keys being labelled with the appropriate response (Insert- CHAIR LEFT, Delete TRAIN LEFT, Page up – CHAIR RIGHT, Page down – TRAIN RIGHT, End– ANIMAL, Home – CHILD). To minimize response errors when responding on the keyboard, the surrounding keys were removed. The experiment was presented using E-prime for Windows.

Data Analysis

A Repeated Measures ANOVA was performed on the data. The Independent variable was Group (Control versus Sex Offenders), within subject factors was Condition (reporting of T1; child/animal and T2; chair/train) and Interval, with three repeated measures variables (SOA of

100ms, 200ms and 300ms). The dependent variable was T2 accuracy. Data for 2 participants was lost and the analysis was subsequently performed on 25 participants. The analysis was conducted using SPSS Version 16.0.

Ethical Approval and Consent

Ethical approval was received from the School of Psychology's ethics committee at the University of Birmingham, United Kingdom, and from the West-Midlands Probation Service, United Kingdom. The anonymity and the participants right to withdrawal at any time was highlighted. All participants consented in writing.

Results

The result of the overall repeated measures ANOVA is displayed in Table 1. The analysis showed no significant main effects or any significant interactions between the variables and between the groups. Table 2 show mean and SD of the three separate intervals, and Table 3 displays means and SD of the T1 category (Animal and Child). The mean response of the 2 groups demonstrate that they followed a very similar trend, with lower mean scores on the animal images (sex offender group; mean 43.62, SD 4.77, Control group; mean 36.44, SD 3.3) compared to the child images (sex offender group; mean 45.02, SD 5.14. Control group; mean 39.76, SD 3.52). Inspecting Table 2 closer the means for the Intervals suggest that the AB effect was not demonstrated. The expected direction was not seen with the, highest score shown on Interval 1 (mean 42.60, SD 3.70), Interval 2 displayed a mean of 40.08 (SD 33.32) and similarly, Interval 3 displayed a mean of 40.96 (SD 2.92).

Table 1

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Group	**1/22**	**1.12**	
Category	**1/22**	**3.63**	
Interval	**2/44**	**1.09**	
Category*Group	**1/10**	**.61**	
Category*Interval	**2/44**	**.60**	
Interval*Group	**2/44**	**1.21**	

Category*Interval* Group	**2/44**	**.33**	

[a] ***Only p values of .05 or less are reported***

Table 2

Mean Percentage, Standard Error score T2 score by Interval

Condition	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**	**Interval 3 (M/SE)**
Condition 1	**42.60%/3.70**	**40.08%/33.32**	**40.96%/2.92**

Table 3

Mean Percentage Accuracy, Standard Deviation T2 Accuracy Scores by T1 Child and Animal Categories in Condition 1.

Category	**Sex Offenders**	**Control**
Condition 1		
Animal		
M	**43.63%**	**36.44%**
SD	**4.77**	**3.30**
Child		
M	**45.02%**	**39.76%**
SD	**5.14**	**3.52**
Total Score		
M	**44.33%**	**38.10%**
SD	**4.85**	**3.33**

Discussion

The present study showed no significant findings or difference between the 2 groups. The statistical analysis did not produce the expected AB effect. Looking closer at the mean score of Animal and Child images of the two groups, a similar trend is apparent between them, where they both displayed lower T1 accuracy with Animal images compared to accuracy scores with Child images. This is reverse to what the predicted hypothesis for this study stated. This study was based on Chapter 3 and the Beech et. al., (2008) study, hence based on their findings it was expected that the sex offender group would show lower accuracy score on the child images versus animal images, compared to the control group. The result from this study gave no indication that the child sex offenders had a differing response to the child images versus the animal images compared with the control group. This suggests that in the

present study the RSVP was unable to discriminate between the two groups based on their responses towards the images. These findings are similar to a study conducted by Crooks, Rosthill-Brookes, Beech and Bickley (2009), who looked at whether the RSVP could be utilised with a group of adolescent child sex offenders. The Crooks study found the reverse effect, where lower accuracy scores were made on the animal images compared to the child images in the adolescent sex offender group and the control group. They attributed their non-significant findings to various methodological and conceptual issues. The authors suggested that the cognitive ability in adolescents could be underdeveloped for the RSVP task and that perhaps the deviant sexual interest in adolescents may be at a differing degree to adult child sex offenders which is reflected in the RSVP task. In order to interpret the non significant findings in the present study it is important to look at the methodological issues and potential flaws.

Methodological Issues

The procedure used in this sample was identical to the procedure used in the Beech et. al., (2008) study and Chapter 3, suggesting that the RSVP procedure, design and images utilised in this research should not have had an impact on the non significant findings. However, the study may have been influenced by a selection bias, which is especially relevant in a child sex offender sample. The sex offenders who did not volunteer to take part may have had a stronger sexual interest in children which they did not want to expose, or they may have been deniers. It is also possible the study suffered from some level of treatment effect, where participants who volunteered had gone through a sex offender treatment programme in prison or at some earlier stage, which may have influenced their responses towards the child images and hence their AB. In Chapter 3 and the Beech et. al., (2008) study none of the sex offenders had gone through any previous sex offender treatment prior to taking part in the research.

Another issue which may have influenced responses could be type of offence in the sex offenders, 4 of the sex offenders were convicted of internet sex offences (e.g. making indecent photographs of children), this could suggest that the sex offenders response differ to a typical ‘contact’ sex offender (‘contact’ sex offender is someone who is typically in physical contact with the victim, whilst an ‘internet sex offender’ are typically someone who makes or download indecent and/or pornographic images of children from the internet). In Chapter 3 the sex offenders were predominantly ‘contact’ child sex offenders which may explain the difference between the two sex offender groups in Chapter 3 and Chapter 4. Finally, the small sample size for the sex offender sample could also explain the non-significant findings, where

the sample size for the control group was much larger and the sample sizes should ideally be larger and equal.

In conclusion, this study did not give support to the previous findings seen in Chapter 3 and the Beech et. al., (2008) study, however, the confounding variables in this study may have caused the non significant results. Future studies should include a much larger and equal sample size for both groups. It would also have been beneficial to have more background information on the sex offenders which was unavailable, such as previous treatment and specific offence details as this may have explained and/or given insight into the non significant findings.

PART III:

EMPIRICAL RESEACH ON NORMATIVE SAMPLES

CHAPTER 5
RAPID SERIAL VISUAL PRESENTATION PROCEDURE WITH FATHERS OF CHILDREN UNDER THE AGE OF TWO YEARS OLD

Chapter rationale

This chapter explored the attentional blink (AB) effect with a group of 'new fathers' who had children under the age of two. The reasoning behind this chapter was to investigate whether 'new fathers' would respond in a similar manner to stimulus as would child sex offenders. This was based on the belief that because fathers have a strong attachment (Bowlby, 1969, 1988) towards their own child and are in close contact with children, this may produce the AB effect found in the child sex offenders. New fathers data was compared with data from the control group in Chapter 3. The findings of this chapter demonstrated that 'new fathers' responses were, as predicted, very similar to the control group. This is the opposite to how the child sex offenders responded in Chapter 3 and the Beech et. al., (2008) study. As such, this finding adds further weight to the proposition that the RSVP paradigm can be used to accurately measure the level of sexual interest in children in child sexual offenders, and that the indicative response is exclusive to that same group.

Rapid serial visual presentation procedure with fathers of children under the age of two years old.

The previous chapters have employed sex offender samples as the main focus producing some encouraging findings, however, the underlying question of whether the attentional blink (AB) responses found in sex offenders can also be found in other populations has not been investigated. This type of research would increase the Rapid Serial Visual Presentation (RSVP) paradigms validity and reliability. An interesting group to explore would be parents who have children of their own due to their likely strong connection and interest in children. A lot of research has been conducted on the area of attachment between child and parent (Bowlby, 1969, 1988). Bowlby developed the 'theory of attachment' who suggests that infants develop attachment to individuals who remain as consistent caregivers for some months during the age of six months to two years of age. Attachment theory indicates that there is a unique bond between parent and child which may be displayed in responses towards child images presented within the RSVP.

A similar study to this chapter was conducted by Glasgow (2001). He looked into a sample of 25 women who were the parent of a pre-pubertal child. Viewing time of images of children of similar age and development as their own child ('own child category') was measured on the participants. The study's overall findings demonstrated no relationship between viewing time and their own child category, where mean rank viewing time of their own child category in most cases were lower than the mean rank viewing time of the other child categories (i.e. opposite sex child at the same age). Glasgow (2001) makes the tentative suggestion that some of the factors underlying sexual interest in child sex offenders is not present in parents due to the likelihood that 'parenthood imposes a cognitive proscription which truncates the process which would otherwise occur, even in response to young children of the 'preferred' gender' (Glasgow, 2001, p. 27). It is worth noting that in Chapter 3, Chapter 4 and the Beech et. al., study (2008) it was not specifically looked into whether the sex offenders did have children of their own and whether the intrafamilial child sex offenders did offend against their own children, which could have been an interesting aspect to explore and should be looked into in future research. However, although this was not examined in the previous chapters with child sex offenders it is still important to eliminate the possibility that the effect may occur in 'normative' groups of fathers with young children of their own.

Therefore, this chapter specifically investigated the responses of fathers with children under the age of two years old. The purpose was to examine whether responses observed in

the child the sex offender group in the Beech et. al., (2008) study and Chapter 3 would extend to a group of males with a strong affiliation and connection with children on a daily basis. It would not be unreasonable to suggest that based on the presumed interaction fathers have with their own children this may cause them to display similar responses to sex offenders seen in the Beech et. al., (2008) study and Chapter 3 with images of children. If fathers display similar response to child sex offenders it may suggest the increased AB found in sex offenders might not be due to a sexual interest in children but caused by some other underlying factor, shared with fathers with young children. However, if this effect is not displayed in fathers i.e. no heightened AB towards images of children, it may indicate that the findings in sex offenders are due to an underlying latent sexual attraction to children where their attentional set is tuned into child images due to their abnormal sexual interest (Flak et. al., 2009). In fact, in light of Glasgow's (2001) findings, of mothers with pre-pubertal children who did not display longer viewing time on child images, it is believed that fathers display similar trends as these mothers. It is predicted that 'new fathers' will display similar AB response as the control group (with no history of sexual offending) from Chapter 3, where AB was not attenuated after presentation of T1 images of children compared to T1 images of animals.

The specific hypothesis were:

Hypothesis 1: 'New fathers' and Control group will produce similar responses towards child and animal images, there will be no difference in mean accuracy reporting of T2 following T1 images, irrespective of whether T1 images are of a child or animal.

Hypothesis 2: There will be no difference in T2 reporting accuracy following T1 stimulus of child and animal in 'New fathers' or Control group.

Method

Participants

The samples were derived from two sources. 'New fathers' were drawn from a volunteer convenience sample such as friends and colleagues from the University of Birmingham. This group contained 13 adult men who were tested, but due to computer fault and subsequent loss of data, 2 men were excluded. Therefore, in total, 11 men between the age of 28-40 years old (mean age = 33.64, SD = 4.2), with children under the age of 24 months (range = 5-24

months, mean age = 15.45 months, SD = 6.49) participated in this study. All 'new fathers' were White British. None of the participants had any known history of offending. The control group were drawn from Prison B, 17 convicted offenders with no previous sexual offending history agreed to take part (mean age, 40.41; SD, 14.38). Of the control group, 14 participants were White British, 3 were African Caribbean. For more details on this group please see Chapter 3.

Design

Design of the experimental procedure is the exact design used in the previous chapters of this thesis, please refer back to Chapter 3 under the '*Design´* heading for a complete detailed description.

Stimuli

The stimuli used in the RSVP procedure is the exact same used in the previous chapters of this thesis, please refer back to Chapter 3 for a complete descriptions of the stimuli used.

Procedure

Each experimental procedure followed standardized scripted instruction (New fathers - Appendix G; Control group - Appendix A). On arrival, participants were given a brief description on what the experiment would entail. On completion of the experiment, the participants were debriefed briefly on the purpose of the study and were also informed that they could withdraw from the study at any point prior to write up of the study. Each participant completed the experiment in a standardized testing suite, prior to completing the experiment all participants signed a consent form. Each participant completed Condition 1 and Condition 2. The approximate time for each session lasted between 20 to 40 minutes. All responses were made on a computer keyboard adapted to the experimental conditions. In Condition 1, participants were instructed to press the corresponding key of whether they had seen a T1 child or a T1 animal, and then whether they had seen a T2 chair or a T2 train and whether it was facing towards the left or the right direction. In Condition 2, the participant only responded to whether they had seen a T2 chair or a T2 train and which way it was facing (left/right). The participants were instructed to respond every time, even if they were uncertain they had to make a guess. A brief break was integrated into the conditions between each block, and a further longer break was offered between Condition 1 and Condition 2. It was up to the participant whether to use these breaks or continue with the experiment.

Equipment

The experiment was conducted on a Intel Celron 1.7 GHz tower computer connected to a 15inch CRT monitor. A standard QWERTY keyboard was used for responses, with keys being labelled with the appropriate response (Insert- CHAIR LEFT, Delete TRAIN LEFT, Page up – CHAIR RIGHT, Page down – TRAIN RIGHT, End– ANIMAL, Home – CHILD). To prevent wrong keys being pressed, all surrounding key's were removed. The experiment was presented using E-prime for Windows.

Data Analysis

A Repeated Measures ANOVA was performed on the data. The Independent variable was Group, within subject factors were Condition (Condition 1: reporting of T1 and T2. Condition 2: reporting of T2 only), T1 Category (child/animal) and Interval were three repeated measures variables (SOA of 100 ms, 200ms and 300ms). The dependent variable was T2 accuracy. Data for 2 participants were lost and analysis was subsequently performed on 11 participants from the 'new father' group and 17 participants from the Control group. The analysis was conducted using SPSS Version 16.0.

Results

Analysis of data extracted from the Rapid serial Visual Presentation Procedure

Condition 1 = report of T1 and T2
Condition 2 = report of T2 only

The results from the overall multivariate analysis are displayed in Table 1. The analysis displayed a highly significant main effect for Condition, $F\ (1, 26), =203.63, p < .0001$ where Condition 1 produced an overall mean accuracy of 48.17 (SD 2.56) and Condition 2 produced a significantly higher mean accuracy of 72.85 (SD 2.96), a significant main effect of Interval, $F\ (2, 52), = 3.18, p < .05$ (see Table 2 for mean values of Interval in Condition 1 and Condition 2) was also detected. Further, the following significant interactions were found; Group and Interval, $F\ (2, 52), = 5.66, p < .01$. Condition and Interval, $F\ (2, 52), = 3.43, p < .05$. Category and Interval, $F\ (2, 52) = 6.59, p < .01$. The main effect of Condition indicates that participants' performance in Condition 2, where T2 only had to be reported, were better than performance in Condition 1, were T1 and T2 had to be reported. This significant finding

is in line with the AB literature (Shapiro, 2001). The main effect of Interval show that the AB effect was present, this links with previous findings within the general RSVP literature concerning the effect of presentation Interval on AB, in demonstrating that all participants were statistically more accurate when T1 was followed by the largest interval space between T1 and T2 (300ms). The significant interaction between Group and Interval, Condition and Interval, Category and Interval will be decomposed below in separate analysis for Condition 1 and Condition 2 below. A significant Between Groups effect was also detected, $F\ (1, 26) = 16.69$, $p < .0001$, this is apparent looking at the separate group means, where 'new fathers' had an overall mean of 71.27 (SD 4.1) and control group had significantly lower mean of 49.75 (SD 3.3).

Table 1

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,26**	**16.69**	**.0001**
Error			
Within Subjects			
Condition	**1,26**	**203.63**	**.0001**
Category	**1,26**	**3.16**	
Interval	**2,52**	**3.18**	**.05**
Group*Condition	**1,26**	**.62**	
Group*Category	**1,26**	**.42**	
Group*Interval	**2,52**	**5.66**	**.01**
Condition*Category	**1,26**	**3.23**	
Condition*Interval	**2,52**	**3.43**	**.05**
Category*Interval	**2,52**	**6.59**	**.01**
Group*Condition*Category	**1,26**	**.01**	
Group*Condition*Interval	**2,52**	**.91**	
Condition*Category*Interval	**2,52**	**.68**	
Group*Condition*Category*Interval	**2,52**	**1.25**	

[a]only *p* values below .05 or less are reported

Table 2

Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 1 (M/SD)**	**Interval 2 (M/SD)**	**Interval 3 (M/SD)**
Condition 1	**45.9%/2.42**	**47.06%/2.87**	**51.55%/2.9**
Condition 2	**73.06%/2.94**	**72.62%/3.04**	**72.8%/3.33**

Condition 1

Test of Hypothesis 1; 'New fathers' and Control group will produce similar responses towards child and animal images, there will be no difference in mean accuracy reporting of T2 following T1 images, irrespective of whether T1 images are of a child or animal.

An overview of the Repeated Measures ANOVA is displayed in Table 3. The analysis showed a significant main effect of Category $F\ (1,26) = 6.03,\ p < .05$, and a significant main effect of Interval, $F\ (2,52) = 6.45,\ p<.05$. Further, the following significant interactions were found; Group and Interval, $F\ (2, 52) = 3.81,\ p<.05$., Category and Interval, $F\ (2,52) = 4.65,\ p<.01$. The main effect of Category indicates that overall, participants performed worse at reporting T1 when T1 was a picture of an animal (Mean, 46.71.SD 2.65) compared with T1 picture of a child (Mean,49.55, SD 2.59. The significant main effect of Interval show that the AB effect was present in Condition 1 where accuracy increased with SOA between Intervals, where Interval 0 had a mean percentage accuracy score of 45.09 (SD, 2.41), Interval 1, 47.06 (SD, 2.87), Interval 2, 51.55 (SD 2.89). The significant interaction found between Group and Interval is a reflection of the difference in average score of 'new fathers' and control group, where control group were on average, overall mean of 58.25 (SD 3.9), much poorer in performance compared with 'new fathers', overall mean 38.09 (SD 3.2). The significant interaction between Category and Interval observed indicates that the accuracy of T1 varied significantly across the intervals for each Category.

Examining Categories closer, Table 4 provides a summary of mean and SD of Condition 1 and Condition 2 across Categories and Groups. This demonstrate that 'new fathers' displayed lower mean percentage accuracy score (57.15, SD 4.1) with animal images, compared to child images (59.34, SD 4.04). A similar trend is seen in the control group, with an average mean score of 36.43 (SD, 3.33) with animal images and a mean score of 39.76 (3.25) with child images. Finally, a significant Between Group effect was found, $F\ (1,26) = 15.43,\ p < .001$, with 'new fathers' producing an overall mean of 58.25 (SD 3.9) and control group of 38.09 (SD 3.21), showing that 'new fathers' were on average much better in performance compared to the Control group. This finding was also seen in Chapter 3, where sex offenders produced much higher average percentage accuracy compared with the control group. The analysis above confirms the hypothesis of the chapter, suggesting that no significant difference between animal and child images would be detected in either of the groups and no heightened AB towards child images would be seen in 'new fathers'.

Table 3

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,26**	**15.42**	**.001**
Error			
Within Subjects			
Category	**1,26**	**6.03**	**.05**
Interval	**2,52**	**6.45**	**.05**
Group*Category	**1,26**	**.254**	
Group*Interval	**2,52**	**3.81**	**.05**
Category*Interval	**2,52**	**4.65**	**.01**
Category*Interval*Group	**2,52**	**.84**	

[a]only *p* values below .05 or less are reported

Table 4

Mean Percentage Accuracy and Standard Deviation. T2 Accuracy Scores by T1 Child and Animal Categories in Condition 1 and Condition 2

Category	**New Fathers**	**Control**
Condition 1		
Animal		
M	**57.15%**	**36.43%**
SD	**4.10**	**3.33**
Child		
M	**59.34%**	**39.76%**
SD	**4.04**	**3.25**
Total Score		
M	**58.24%**	**38.09%**
SD	**3.99**	**3.21**
Condition 2		
Animal		
M	**84.43%**	**61.00%**
SD	**4.64**	**3.73**
Child		
M	**84.17%**	**61.81%**
SD	**4.74**	**3.81**
Total Score		
M	**84.30%**	**61.41%**
SD	**4.62**	**3.71**

Condition 2

Test of Hypothesis 2; there will be no difference in T2 reporting accuracy following T1 stimulus of child and animal in 'New fathers' or Control group.

In Condition 2 detection of T2 images only was required, accuracy was therefore calculated as T2 accuracy when T2 was preceded by T1 (child/animal), therefore the level of chance remained at 25%. A four-way repeated measures design ANOVA was performed on the data, independent variables were Group (Between: 'new fathers' and Control), and within subjects factors were Interval (0, 1, 2) and Category (T1: child/animal). See Table 5 for an overview of the analysis. The Dependent variable was T2 accuracy (chair/train and the direction). A significant Between Group difference was found, $F\ (1,26) = 14.9,\ p < .001$, where new fathers displayed an average mean of 84.3 (SD 4.62) and control group a mean of 61.41 (SD 3.71). No other significant findings were noted.

Looking closer at Table 4 in Condition 2, it is apparent that there are no significant differences in 'new father's' or the control groups percentage accuracy score on animal and child images. 'New fathers' produced the same average score of 84 % on both animal and child images. Equally, the control group demonstrated very similar accuracy score for both animal and child images, with an average of 61% for both images. These findings are in line with the hypothesis, proposing that there would be no significant difference or enhanced AB effect towards T1 child images.

Table 5

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,26**	**14.9**	**.001**
Error			
Within Subjects			
Category	**1,26**	**.07**	
Interval	**2,52**	**.04**	
Group*Category	**1,26**	**.25**	
Group*Interval	**2,52**	**2.85**	
Category*Interval	**2,52**	**1.89**	
Category*Interval*Group	**2,52**	**.49**	

[a]only *p* values below .05 or less are reported

Discussion

A significant difference was found between Condition 1 and Condition 2. This is caused by the enhanced attentional load Condition 1 produces on participants where detection of both T1 and T2 images is required compared to detection of T2 only images within Condition 2, specifically, T2 reporting was worse when T1 had to be classified relative to when no initial classification response was required in Experiment 2. This finding is in accordance with the AB literature (Shapiro, 2001) and is also similar to findings from Chapter 3 and Beech et al., (2008) study. All participants exhibited an attentional blink as seen by the main effect of Interval in Condition 1. Further, in line with the expectations of this paper, the study gave support of hypothesis 1 suggesting there would be no difference in AB response towards child and animal images in either groups. In fact, although non significant, the opposite trend to what sex offenders produced in the Beech et. al., (2008) study and Chapter 3 was present. To clarify, in Chapter 3 extrafamilial child sex offenders showed a mean score on child images 42.45%, and a mean score on animal images of 48.53%. In the present Chapter, Condition 1, fathers produced slightly higher accuracy scores for the animal category compared to child category. In Condition 2 and in line with Hypothesis 2, no significant differences or heightened AB effect was detected between animal and child category in either group.

The results demonstrate that fathers to young children display very similar responses to the control group from Chapter 3, and further, do not display similar responses in the RSVP procedure compared with child sex offenders' responses reported in the Beech et. al., (2008) and Chapter 3. This suggests that child sex offenders AB responses are related to their sexual attraction to children. The present study's findings are further in line with the research conducted by Glasgow (2001) where mothers did not show an increase in viewing time of child category compared to preferred sex (e.g. adult male) category. The lack of AB response in fathers in the present study could potentially be due to a protective element within their cognition which stops them from displaying the sexual attraction towards children. The present findings are also similar to the study conducted by Crooks et. al., (2009) where adolescent sex offenders displayed similar responses to Child and Animal images to the present sample. This leads us to the conclusion that there may be a latent attraction towards children in sex offenders, where their attraction could be related to an underlying physiological response which makes their AB attenuated after images of children have been presented. Whether this effect develops at a later age in the child sex offender is unknown and needs to be researched further.

Limitations

The sample size was small, particularly for the 'new father' group, and could be limited by selection bias as the sample were volunteers and may not represent the general population of fathers with young children. It is also possible the age of the children may have influenced the outcome, perhaps if the children had been of a differing age, e.g. older, a different effect may have been observed.

The validity of the stimuli could also have confounded the results. The attentional demand may have differed across the image categories, the results showed, although non-significant, that the mean percentage score of the animal category had slightly lower accuracy score than the child category. There is a possibility that the child stimuli demanded less attentional load on the visual memory as they were standardised and semantically more similar, whilst the animal stimuli varied slightly and included different types of animals (e.g. domestic animals and wild animals) and the background of these images varied more hence producing heavier load on attention. Another plausible explanation for child images producing slightly higher percentage accuracy score could potentially be due to the fact that according to Anderson (2005) it is possible that stimuli which demands low processing resources should induce reduced AB. This was confirmed by a study conducted by Olivers and Nieuwenhuis (2005), who suggested that if participants are in a relaxed state of mind, this may induce a wider attention span. Although interestingly, child sex offenders in Chapter 3 had on average a much higher total score (approximately 85% average in Condition 1) for Animal and Child images compared to this study with 'New Fathers' scoring on an average around 58% accurate in Condition 1, suggest fathers were in a much less relaxed state than the sample in the Beech et. al (2008). However, there may be various extraneous reasons for this, state of mind, time of day, and so on. Another factor which may have influenced the results could be due to the design of the experiment, as the length of breaks were not consistent and some of the participants mentioned tiredness and inability to concentrate for the length of time the experiment lasted for. The reason why the present chapter did not alternate the experimental procedure was in order to maintain consistency throughout the chapters (Chapter 3 and Chapter 4) of this thesis. Further, it was also important to replicate the Beech et. al., (2008) study's procedure as this was identical to the one used in this chapter and the previous chapters. However, future research would benefit from developing standardized procedures in terms of breaks as well as shortening down the experiment so the attentional demand is reduced.

Overall, this study validates and provides more credibility to the RSVP measure as a measure of sexual interest in child sex offenders, however, further research looking at a larger sample size then the present one would give further support to the findings, as well as other studies on samples with close relations to children, such as teachers and nursery staff.

CHAPTER 6

CAN THE RAPID SERIAL VISUAL PRESENTATION PROCEDURE BE USED TO DETECT SEXUAL INTEREST IN A NORMATIVE SAMPLE OF MALES AND FEMALES?

Chapter rationale

The aim of this chapter was to test the RSVP procedure on a normative sample of males and females. In this chapter the RSVP procedure was slightly altered where child images were swopped with clothed adult males and females were used in order to investigate heterosexual adult males and females responses to the images they were sexually attracted too. The study aimed to look into whether the response found in Chapter 3 towards child images by the child sex offenders could also be found in the male/female sample towards adult male/female images. The outcome suggest that the females did in fact have a similar response towards male images compared to female and animal images, in that they showed an increase in errors detecting images following adult male images. However, this was not found in the male group which was unexpected, as normally males have a stronger response in these types of experimental settings. It is possible that the images of adult females was not a strong enough potent sexual cue for the male sample.

Can the rapid serial visual presentation procedure be used to detect sexual interest in a normative sample of males and females?

Introduction

Research utilising the RSVP in child sex offender has been limited, however, recent development of this procedure within the field is currently taking place. A study by Beech et. al., (2008) utilised the RSVP procedure in a sample of child abusers and offending controls (offenders with no violent or sexual offending background). Beech et. al., (2008) found that child abusers conducted more errors when reporting images of a child compared to the control group, hence showing heightened attentional blink (AB) when child images were present compared to animal images. This, the authors conclude, show a potential sexual interest in child images in the child abusers. The Beech et. al's., (2008) finding was replicated in Chapter 3.

The RSVP as a measure of sexual interest in child sex offenders have been established (for an overview see Kalmus & Beech, 2005), however, it is important to further validate this tool in normative samples of adult heterosexual males and females. Two unpublished studies, by Grace (2005) and Hudson (2005), have been conducted looking at the RSVP with samples of normal males and females with some conflicting findings. These two studies investigated whether T1 images of males and females produced higher error rate (i.e. larger AB) reporting T2 images (chair/train) compared to T1 images of animals in a group of heterosexual males and females, looking at preferred sexual interest. For example, in males they specifically looked at, whether T1 female images, compared with T1 male and animal images would produce stronger cognitive interference reflected by a heightened error rate when reporting T2 images following T1 image. Specifically, Grace (2005) examined the RSVP's ability to detect sexual interest in a sample of males and females', she used erotic images as T1 pictures of both unclothed and clothed males and females. Grace reported an overall significant difference in the AB induced by clothed and unclothed images, with images of nude females eliciting a particularly large AB in males, and in contrast, images of nude males did not elicit a greater AB than images of nude females in female participants. However, contrary to Grace's (2005) findings, Hudson (2005) did not report any differences between images using clothed images of males and females at T1 in male and female participants which suggest that the images may need to be a potent cue of sexual interest in order to induce the AB effect.

The RSVP utilised by Beech et al., (2008) and in all of the chapters throughout this thesis, was adapted for this study with the purpose of employing this procedure with a normal sample of males and females. Images of children were changed with images of males and females to correspond with the participants' sexual interest, the other images remained the same as in the Beech et al., (2008) study, Chapter 3, Chapter 4 and Chapter 5. The reasoning behind this piece of research was to further establish and evaluate the RSVP's validity and sensitivity in the assessment of sexual interest in a normative sample.

Therefore the aim of this study is to look at clothed males and females compared with animals, as T1, in two separate conditions. In the first condition, it was predicted that when T1 images displayed of the participants preferred sexual interest, this particular T1 image category would cause cognitive interference in participants, which would be apparent in an enhanced error rate reporting T2 images. The second condition looked at interference caused by T1 images without the participant having to manually respond to T1 but only having to respond to T2 images, and similar to Condition 1, T1 images of preferred sexual attraction would cause enhanced error response rate in T2 images. The following hypotheses were tested:

Hypothesis 1: In Condition 1 the heterosexual male group would display a larger number of errors reporting T2 stimulus following the reporting of T1 images of females and animals compared with the Female Group. Whilst the heterosexual female group would display a larger number of errors reporting T2 stimulus following the reporting of T1 images of males and animals compared with the Male Group.

Hypothesis 2: In Condition 2 the heterosexual male group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the heterosexual female group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Method

Participants

Participants were drawn from a sample of volunteers from University of Birmingham as well as convenience samples of colleagues and friends. In total, 27 males and 29 females, all self-

reported heterosexual, age ranged between 18-35. All participants were white British. Volunteers with any previous history of epilepsy or substantial physical disability were excluded from the study. Participants had the option of either receiving credits (part of psychology students course requirement), or a monetary reward of £7, some also did the experiment with no monetary or credits awarded.

Design

The participants completed two conditions, Condition 1 and Condition 2, these were counterbalanced to control for order effects. In Condition 1, T1 and T2 had to be reported, in Condition 2 only T2 had to be reported. Condition 1 looked into whether male and female participants displayed an increase in errors when identifying T2 post accurate identification of T1 images of preferred sexual preference (males or females) compared to images of non-preferred sexual image and images of animals. 1 of 4 separate responses could be made to accurately therefore to classify T2 by chance was 25%. In both conditions, 216 images were presented in sequences of 11 images (each image was presented at an SOA [stimulus onset asynchrony] of 100ms). This was separated into four blocks. Within each sequence, T1 target images were presented (male/female/animal) and T2 target images (chair or train facing towards the left or right), the other images were neutral images. To reduce primacy and recency effect the first and last image was neutral in every sequence. T1 image was always positioned between the second and seventh position, T2 was always positioned between the third and ninth position, and it followed either immediately (Interval 1, SOA 100ms), immediately but one (Interval 2, SOA 200ms), or immediately but two images (Interval 3, SOA 300ms) after presentation of T1. The pictures assigned to the particular interval were counter-balanced across participants within each group.

Stimuli

610 images were extracted from commercially available images (30.000 images PC world CD). 178 of the images were neutral images (objects or neutral scenes), 216 were used as T1 stimulus, 108 animals and 54 males and 54 females (all clothed). 216 were used as T2 stimulus, with 108 trains and 108 chairs (half facing left, half facing right). T1 male and female images were all either full body or facial length images in natural surroundings, a mixture of ethnic groups were also included. The T1 animal images included domestic and wild mammals, birds and reptiles. Images were facial, half-length or full-length pictures of single or groups of animals in a natural environment.

Procedure

The experimental procedure followed standardized scripted instructions (See Appendix H), Each session lasted for approximately 25-45 minutes. On arrival participants were provided with an information and consent form explaining the experimental procedure (See Appendix I). They were also asked to provide information regarding their sexual orientation. Participants were informed they would not be provided with the full information concerning the exact functioning of the RSVP prior to the experimental procedure as this could potentially influence their performance. However, they were informed that they would receive a debriefing sheet (See Appendix J) on completion of the task. This was done in order to ensure the RSVP measures validity. Each participant completed the computer task in a standardized testing suite. All participants completed both Condition 1 and Condition 2. The researcher read the script to each participant explaining how the experimental procedure would progress. In Condition 1 participants had to first respond to whether they saw T1 images (male, female or animal) and second whether they saw T2 images (train or chair and the direction they were facing, either left or right). A break was integrated into the experiment between each block, and a further break was allowed between Condition 1 and Condition 2. It was up to the participant whether to use these breaks or continue with the experiment.

Equipment

The RSVP procedure was presented using E-prime, on a TOSHIBA laptop PC connected to a 15 inch monitor. Participants responded by using an IBM USB keyboard, the corresponding keys were labelled for each response, *Insert* - CHAIR LEFT, *Delete*-TRAIN LEFT, *End* - ANIMAL, *Page Up* – CHAIR RIGHT, *Page Down* – TRAIN RIGHT, *Y* – FEMALE, *I* – MALE.

Ethics

Ethical approval was obtained from the School of Psychology's Human Research Ethics Committee at the University of Birmingham (See Appendix K). The anonymity of the participants and the right to withdraw from the experiment was highlighted.

Attentional Blink

In Condition 1 AB was calculated by looking at accuracy of reporting T2 (chair or train) when T1 (animal, male or female) was also reported accurately. This produced a percentage score of accuracy. In Condition 2, AB was calculated again by looking at T2 (chair or train)

accuracy and whether this was influenced by the preceding T1 (animal, male or female), producing a percentage of accuracy.

Data analysis

The data was subjected to a four way mixed analysis of variance (ANOVA), where the between subjects variable was Group (males and females). The three repeated measures variables was Condition (Condition 1 = reporting of T1 and T2, and Condition 2 = reporting of T2 only), Category T1 (animal, male, female), and Interval (T1 and T2 SOA of 100ms, 200ms and 300ms). Dependent variable was T2 accuracy of reporting. The analysis was performed using SPSS Version 16.0.

Results

Condition 1 = report of T1 and T2
Condition 2 = report of T2 only

Main Analysis

Result of the overall multivariate analysis is displayed in Table 1. Independent variables were between subjects factor Group (Males and Females), within subject factors of Condition (Condition 1 and Condition 2), Category (T1, male/female/animal) and Interval (Interval 0, 1, 2). The analysis showed the following significant main effects; Condition, $F\ (1, 49) = 4.354$, $p < .05$, Category, $F\ (2, 98), =125.036, p < .000$, and Interval, $F\ (2, 98), = 26.277, p < .000$. See Table 2 for overview of mean values across Conditions and Intervals. The following significant interaction effects were found: Category and Interval, $F\ (4,196) =62.795, p < .000$, Category and Condition, $F\ (2, 98) = 41.163, p < .000$, Interval and Condition, $F\ (2, 98) = 16.181, p < .000$, Category, Interval and Condition, $F\ (4,196) = 26.094, p < .000$. A significant Between Groups main effect was also found, $F\ (1, 49) = 8.024, p < .01$.The main effect of Condition suggest participants were slightly poorer in their performance in Condition 1 when T1 and T2 had to be reported (63.07%) compared to Condition 2 (64.39%) when only T1 had to be reported. The significant main effect of Interval suggests that the participants performed differently depending on the SOA between T1 and T2. In Condition 1 Identification was poorest at Interval o, then at Interval 1, then at Interval 2. This confirms that AB took place and is in line with the literature (Shapiro, 2001) stating that detection accuracy of T1 increases with SOA between stimulus. For Condition 2, identification was

poorest at Interval 0, then at Interval 2, then at Interval 1. See Table 2 for exact percentage accuracy on the separate Intervals and Conditions. The main effect of Category suggest that participants, overall where better at reporting T1 when T1 image was of a male (75.59%), then female (64.52%) and poorest when the image was of an animal (51.09%). The between group effect was due to the difference in the overall response rate between males and females, where the average percentage score for females was 58.75%, and for males it was significantly higher at 68.73%. The interaction effects are explored in the analysis under *Hypothesis 1*.

Table 1

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects Group Error	**1,49**	**8.02**	**.01**
Within Subjects Condition Category Interval Group*Condition Group*Category Group*Interval Condition*Category Condition*Interval Category*Interval Group*Condition*Category Group*Condition*Interval Condition*Category*Interval Group*Condition*Category*Interval Group Error	 **1,49** **2,98** **2,98** **1,49** **2,98** **2,98** **2,98** **2,98** **4,196** **2,98** **2,106** **2,98** **4,196**	 **4.35** **125.04** **26.28** **.17** **.06** **.73** **41.16** **16.18** **62.79** **2.03** **1.51** **26.09** **.58**	 **.05** **.0001** **.0001** **.0001** **.0001** **.0001** **.0001**

[a]only *p* values below .05 or less are reported

Table 2

Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**	**Interval 3 (M/SE)**
Condition 1	**58.81%/2.00**	**61.49%/2.29**	**68.92%/1.70**
Condition 2	**60.26%/2.39**	**68.71%/1.70**	**64.22%/2.06**

Test of Hypothesis 1.

Hypothesis 1 suggested that males would generate lower accuracy scores on the female images compared to male and animal images, whilst females would generate lower accuracy scores on male images compared to the female and animal images. The data was subjected to a three-way repeated measures ANOVA, independent variables were Group (Between: Males and Females), and within subjects factors were Interval (0, 1, 2) and Category (T1: males/females/animal). The Dependent variable was percentage (percentage was calculated as Raw Scores x 100/36 for animal and 100/18 for male and female) of T2 accuracy (chair/train and direction) when T1 was also accurately reported. Responses where the participant inaccurately identified T1 were excluded from the analysis as T2 reporting would in this case not be a function of the image identified in T1. Accuracy of T2 scores were obtained by the participant's ability to accurately identify whether they saw a chair or a train and which way it was facing (left or right) hence the level of chance was 25%. In both experiments all participants were observed to perform above levels of chance.

Analysis of Condition 1.

Two male participants and one female participant did not complete Condition 1 due to faults with the PC and data was lost. Therefore the analysis was conducted on 28 females and 25 males. See Table 3 for an overview of the analysis, further, table 4 shows the mean percentage accuracy for the T1 stimuli (animal, male, female) between the groups in Condition 1 and for comparison the scores for Condition 2 is also displayed in this table. Analysis of Condition 1 showed a main effect of Interval, $F\ (2,102) = 11.57, p < .0001$, and a significant interaction between Category and Interval, $F\ (2,204) = 2.58, p < .05$. A significant main effect of Group was also found, $F\ (1,51) = 4.83, p < .05$. The main effect of Interval demonstrate that level of accuracy scoring of T2 images following T1 differed dependent on the SOA between intervals and that the AB effect took place, where lowest accuracy score was at Interval 0 (48.39%), followed by Interval 1 (50.15%) then Interval 2 (54.51%). The significant interaction between Category and Interval merely indicates that there was a difference in overall accuracy score of male, female and animal images dependent on which Interval the images were displayed in. The main effect of group was due to the overall differences in scores, where females had an average accuracy of 45.96%, and males of 56.07%, demonstrating that males were generally better at detecting T2 following T1 images of animal, female and males. The statistical analysis did not support the predicted hypothesis 1, however, examining the means in Table 4, it is apparent that a trend in the hypothesised direction is apparent for the female group, where

a slightly lower mean accuracy is noted for the male images with a mean of 45.45% compared to female images, mean 46.05%. The opposite trend was seen in the male participants.

Table 3

Result of Three-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,51**	**4.83**	**.05**
Error			
Within Subjects			
Category	**2,102**	**.21**	
Interval	**2,102**	**11.60**	**.0001**
Group*Category	**2,102**	**.34**	
Group*Interval	**2,104**	**.97**	
Category*Interval	**4,204**	**2.60**	**.05**
Category*Interval*Group	**4,204**	**.57**	

[a]only *p* values below .05 or less are reported

Table 4

Mean Percentage Accuracy, Standard Deviation. T2 Accuracy Scores by T1 Animal, Female and Male Categories in Condition 1 and Condition 2.

Category	**Female**	**Male**
Condition 1		
Animal		
M	**46.36%**	**55.18%**
SD	**3.18**	**3.36**
Female		
M	**46.05%**	**57.03%**
SD	**3.44**	**3.64**
Male		
M	**45.45%**	**56.01%**
SD	**3.42**	**3.62**
Total Score		
M	**45.96%**	**56.08%**
SD	**3.16**	**3.34**
Condition 2		
Animal		
M	**74.31%**	**81.48%**
SD	**2.24**	**2.24**
Female		
M	**75.73%**	**80.84%**
SD	**2.57**	**2.57**
Male		

M	**65.77%**	**78.12%**
SD	**2.55**	**2.55**
Total Score		
M	**71.94%**	**80.15%**
SD	**2.25**	**2.25**

Analysis of Condition 2

Hypothesis two predicted that in Condition 2 the Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Two female participants did not complete Condition 2 due to the PC crashing and data was lost, therefore the analysis was conducted on 27 females and 27 males. Condition 2 required report of T2 only, accuracy was therefore calculated as T2 accuracy when T2 was preceded by T1 (male/female/animal), therefore the level of chance remained at 25%. A tree-way way repeated measures design ANOVA was performed on the data, independent variables were Group (Between: Male and Female), and within subjects factors were Interval (0, 1, 2) and Category (T1: males/females/animal). The Dependent variable was T2 accuracy (chair/train and direction).

See Table 5 for an overview of the multivariate analysis. The analysis showed a significant main effect of Category $F\ (2,104) = 17.50,\ p < .0001$ and Interval $F\ (2,104) = 20.57,\ p < .0001$.Significant interactions were found between Category and Group, $F\ (2,104) = 4.83,\ p < .01$, and Category and Interval, $F\ (4, 208) = 15.35,\ p < .0001$. A significant main effect of Between Groups was also found, $F\ (1,52) = 6.65,\ p < .01$. The main effect of Category shows that overall participants were better reporting T2 when T1 was an image of females (78.28%), followed by Animals (77.90%), then males (71.95%). Main effect of Interval demonstrate that the participants had different accuracy score dependent on the SOA between the Intervals, where lowest score was on Interval 2 (71.01%), whereas Interval 1 (78.29%) and Interval 0 (78.82%) displayed almost the exact same accuracy score. The significant interaction between Category and Group show that the groups scored differently on the separate categories (See Table 4 above for an overview of Mean percentage accuracy scores). The significant interaction between Category and Interval show that mean percentage accuracy of scores on categories differed dependent on the Interval. Main effect of between

Groups show that the groups differed in their overall average score on the categories, where females had an average score of 71.94% and males had a slightly higher score of 80.15%.

Table 5

Result of Three-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,52**	**6.65**	**.01**
Error			
Within Subjects			
Category	**2,104**	**17.50**	**.0001**
Interval	**2,104**	**20.57**	**.0001**
Group*Category	**2,104**	**4.83**	**.01**
Group*Interval	**2,104**	**1.49**	
Category*Interval	**4,208**	**15.35**	**.0001**
Category*Interval*Group	**4,208**	**.97**	

[a]only *p* values below .05 or less are reported

To explore the significant interaction between Group and Category in particular a repeated measures t-test was performed on Category and Groups. The t-test found a significant difference between the groups on the following categories; Animal Interval 0, *t (52) = -1.670, p < .05.* Animal, Interval 1, *t (52) = -2.06, p <.05,* Animal, Interval 2, *t (52) = -2.443, p < .01*, Male, Interval 0, *t(52) = -2.648, p < .01,* Male, Interval 1, *t(52) = -2.001, p < .05,* Male Interval 2, *t(52) = -2.563, p < .01*. These significant findings were looked at in detail below by transforming the data into 'outcome score' and conducting t-tests and Roc analysis on this data.

Outcome score: Condition 2

Outcome score was formed by creating a score derived by calculating the total accurate T1 Animal scores subtracting the total T1 male/female accuracy score for each individual participant. This gives a number where a positive value indicate poorer performance when T2 images followed T1 male or female images, whilst scores with a negative value indicated poorer performance when T2 images followed T1 Animal images

To look further at the between group differences in Condition 2 a repeated measures t-test was conducted on outcome score for the two groups, a significant difference was found for the Male outcome score, *t (52) = -2.063, p < .05,* suggesting that the difference in

accuracy scores differed significantly between the groups on the male outcome score. To explore this further a ROC analysis was conducted.

ROC analysis

To further look at Condition 2's discriminative ability between Groups a receiver Operating Characteristic (ROC) analysis of outcome score was conducted to measure sensitivity and specificity. Figure 1 displays the ROC analysis of Condition 2's discrimination of the female group versus the male group. The sensitivity axis displayed is the hit rate, therefore it represents male and female's correctly discriminated by the measure. The specificity axis represents the false alarm rate, which represents falsely discriminated males and females. A larger area under the curve (AUC) indicates greater accuracy of discrimination. Therefore a measure with a perfectly accurate discrimination (AUC of 1.0) would generate a ROC curve plotted straight up the sensitivity axis and then, at the top of the graph along the specificity axis until it reaches the far right-hand corner (c.f. Quinsey, Harris, Rice & Cormier, 1998 for a review). The diagonal line represents a line that would be produced if the experiments' discriminative effect was no better than chance (AUC of .5).

The ROC analysis of Female outcome score produced, as expected based on the t-test above, a non significant ROC Curve *AUC of .40, 95% CI of .50-.80, p=.213, p>.05,* See Figure 1. This indicates that Condition 2 did not discriminate between female and male group on accuracy of detection of Female images. However, the ROC analysis of Male outcome score between the two groups produced a significant AUC of *.65, 95% CI of .51-.80,* with a significance level of $p = .05$ *(*see Figure 1) suggesting that male outcome scores did discriminate between the two groups on male images. The above findings indicate that Condition 2 in the RSVP has the ability to detect sexual interest in female participants, but not in male participants.

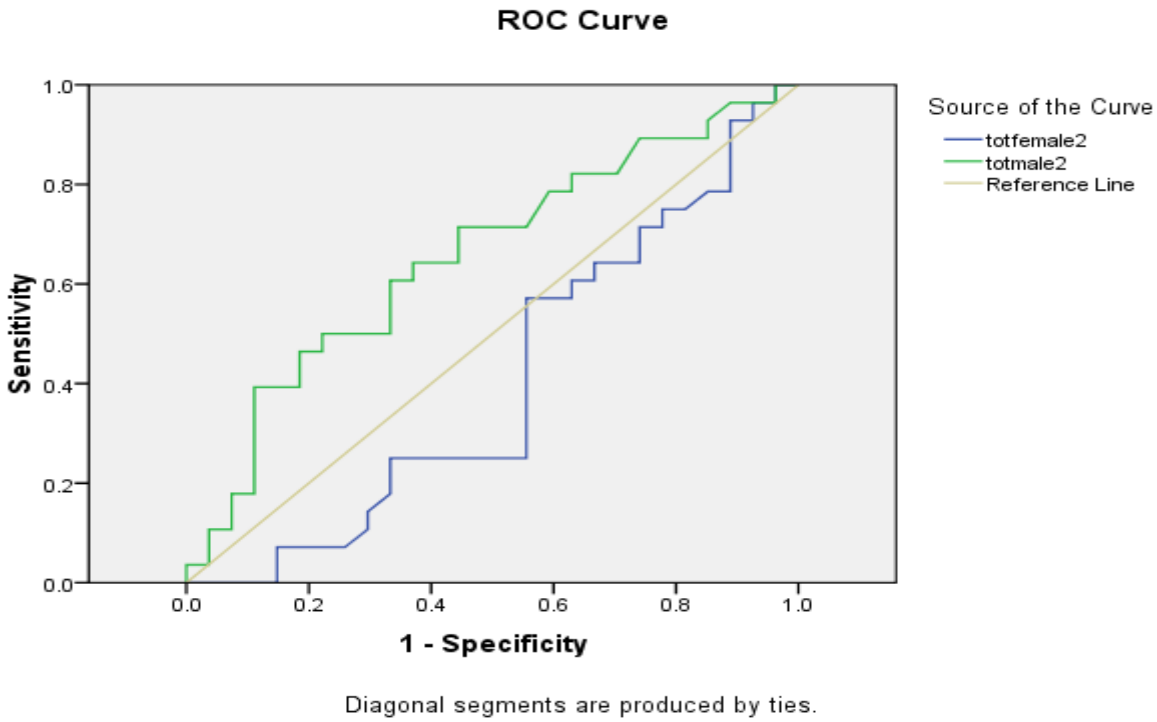

Figure 1: Female and Male Group Roc Analysis

Discussion

The overall above reported findings demonstrate that the Female Group displayed the hypothesised AB effect in Condition 2 only, where T1 images of Males significantly increased their error rate in responding to T2 images compared to Female and Animal images. The ROC analysis shows that Condition 2 had the ability to discriminate between the two groups on male images, suggesting that the RSVP Condition 2 can be used to detect sexual interest in the female sample. The experiment did demonstrate an overall AB effect looking at the main effect of Interval, where error accuracy for Condition 1 did increase with the Intervals SOA, and a significant difference between Conditions was demonstrated by the significant improvements made from Condition 1 to Condition 2.

With regards to the main hypothesis the result for the female participants are encouraging, although slightly unexpected. It is unusual for females to display a stronger response than males to this type of stimuli, research show that in most cases males display a

stronger effect in these types of experimental conditions (Grace, 2005, Most, Smith, Cooter, Levy & Zald, 2007; Murnen & Stockton, 1997; Bradley, Codispoti, Cuthbert & Lang, 2001).

It is important to speculate as of why the female images did not produce the desired effect in the male sample. One possibility is that the female images used in this study did not induce strong enough positively valenced emotions as they were not of an erotic nature. Erotic images are reported to induce strong arousing feelings in both males and females (Bradley, et al., 2001). Most et al., (2007) did find that erotic images induced AB when these images were distractors, this was particularly prominent in males. It seems very plausible that images utilised in the RSVP procedure needs to be a potent cue of strong emotional arousal in individuals, particularly in males with self-reported 'normal' sexual interest. This does raise the question as of why the sexual interest in child images in the sex offenders from the Beech et. al's., (2008) study and Chapter 3 was detected by the RSVP but no such effect was detected in the present male sample. This could indicate that there is a difference in sex offenders and 'normal' males level of arousal when viewing and responding to images of their preferred sexual interest. It is, however, possible that in sex offenders' anxiety has a mediating effect on their responses to child images, where the image of a child is a cue of fear and/or anxiety produced by the fact that they have been imprisoned as a result of their offence. It is feasible that they automatically cue into this stimuli and this causes the induced AB (Beech et. al, 2008; Flak et. al, 2007; Flak et. al, 2009; Chapter 3). However, although this is plausible, this possibility was explored in Chapter 3 where anxiety measures were given pre and post the experimental RSVP task. The result showed that anxiety did not increase across the experimental procedure, however, it is still possible that this did not pick up on anxiety experienced during the experiment. It is also possible that the difference between child sex offenders and normal males are due to the fact that the child images for sex offenders are a stronger potent cue of sexual arousal. It is interesting that these differences are apparent and suggest that RSVP is an indicator of sexual interest in child sex offenders but not in the present sample of 'normal' males. It may be likely that in child sex offenders, images of children induce a very strong sexual cue that has formed a part of their long term 'set' for attending to the world, tuning in the individual to attend to these stimuli rather than others and that this is not the case in normal males (Flak et. al., 2009).

The other interesting aspect of this is that in Beech et. al., (2008) and Chapter 3 Condition 1 was the only condition which induced this effect, Condition 2 did not produce any significant result. This is the opposite of what was found in the female sample of this research, where only Condition 2 showed the desired effect. It is currently unknown why this

occurred and will need to be looked at in future research to investigate whether the present findings could be replicated.

Future research and potential drawbacks with the RSVP

The validity of the stimulus used and the possible drawbacks will need to be discussed briefly. In order to further this experiment with male participants it is important to investigate whether erotic pictures of females would produce a heightened AB effect as mentioned, this was demonstrated in the Grace (2005) study. Future RSVP research should explore this further and employ erotic images in a normative sample.

Images of Animals were used as the 'control' stimuli as presumably most individuals do not perceive animals as sexually loaded. The animal images consisted of different types of animals, such as birds, reptiles and domestic animals, hence being more heterogeneous than images of males and females. Greater heterogeneity within the animal category may potentially interfere with cognitive processing and consequently may either induce an increase in AB, or perhaps the reverse effect may be seen where AB would be reduced as images would not be readily recognized (Kalmus, 2003). Therefore, future research looking at animal images and its heterogeneity could potentially benefit this RSVP procedure. Another potential drawback with the RSVP procedure is the demand it poses on participants' attention span, some participants reported fatigue and inability to concentrate at the end of the experiment. Whether this was due to individual participants level of tiredness or inability to concentrate, or whether this was due to the nature of the RSVP task is unknown, however, work should be done in order to reduce the length of time this task takes to complete as it will remove this potential bias.

To sum up, at present, no concrete of firm conclusion can be made regarding the question of whether the RSVP does work in detecting sexual interest in 'normal' male participants, if this is due to lack of the potency of the erotic images or whether there is a genuine difference in responses in sex offenders and normative samples to arousing images is not known and needs to be explored in future research. However, it does seem to have the ability to discriminate between females sexual interest in males, but this will have to be studied further.

CHAPTER 7

CAN THE RAPID SERIAL VISUAL PRESENTATION PROCEDURE DETECT SEXUAL INTEREST IN A NORMATIVE SAMPLE OF MALES AND FEMALES WITH NUDE IMAGES?

Chapter rationale

The aim of this chapter was to build on Chapter 6 which reported no AB effect of clothed female images were in the male sample. The reasoning behind the use of nude images was based on a previous study by Grace (2005) where nude images were used within the RSVP procedure and produced a heightened AB effect with nude female images in male participants. This chapter did not detect any enhanced AB in either the male or female group following nude T1 images, which did not support the hypothesis of this study nor Grace's (2005) findings. It is possible that the nude images which were of a soft erotic nature did not elicit strong enough potent cues to the groups or that the RSVP, particularly Condition 1, does not have the ability to detect sexual interest in normative samples of males and females.

Is the Rapid Serial Visual Presentation procedure able to detect sexual interest in a normative sample of males and females with nude images?

Introduction

The previous chapters and the study by Beech et. al., (2008) have demonstrated that the RSVP procedure has the ability to detect sexual interest in children in at least some samples of child sex offenders. This was shown by their response to the presentation of child images compared to responses to the presentation of animal images (images are presented within a stream of images within the RSVP procedure). The response displayed by the child sex offender is termed the attentional blink (AB; Shapiro, 2001) and appears to be particularly obvious if the stimuli (e.g. child images) presented within the RSVP stream has some emotional loaded significance (Beech et. al., 2008; Flak et. al., 2009; Flak et. al., 2007). The question remains of whether this apparent sexual attraction towards child stimuli can be seen in a normative sample of males and females. Chapter 6 investigated the RSVP and its ability to detect sexual interest towards the opposite sex in a heterosexual sample of males and females, stimuli used were normal clothed males and females in a normal setting. The study found a significant effect in the female group, but only in Condition 2. However, no effects were seen in the male sample in either condition, suggesting that the RSVP was unable to detect sexual attraction towards the opposite sex in male participants. This was an unexpected result as males are known to be normally more responsive in research looking at sexual attraction (Grace, 2005, Most, Smith, Cooter, Levy & Zald, 2007; Murnen & Stockton, 1997; Bradley, Codispoti, Cuthbert & Lang, 2001).

A few previous unpublished studies have been conducted in this particular area, Hudson (2005) and Grace (2005) looked into the use of the RSVP as a means to measure sexual interest in males and females. Hudson (2005) used normal clothed images of males and females as T1 and reported that there were no differences between responses to images in male and female participants. Whilst Grace (2005) looked at T1 images of both clothed and nude images of males and females on a sample of male and female college students. Grace reported that there was a significant difference in the AB induced by clothed and unclothed images, where nude images in males elicited a large AB, whereas, in females images of nude males did not produce that effect. This could suggest that images need to be of stronger sexual potent cue to elicit the effect found in child sex offenders and in the Grace (2005) study. The aim of the present investigation was therefore to look into the effect erotic nude images may produce in a normative heterosexual sample of males and females and to investigate whether

this effect is similar to the response seen in sex offenders when images of children (i.e. their preferred sexual target) are displayed as T1 (Beech et. al., 2008; Chapter 3).

Hypothesis 1: In Condition 1 the Male Group would display a larger number of errors reporting T2 stimulus following the reporting of T1 images of females and animals compared with the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following the reporting of T1 images of males and animals compared with the Male Group.

Hypothesis 2: In Condition 2 the Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Method

Participants

Participants were drawn from a sample of 32 volunteers, 16 males and 16 females all heterosexual and self-reported no previous history of offending. See Table 1 for demographic information. Exclusion criteria were history of psychosis, a significant physical disability, significant learning disability or no previous history of epilepsy due to the nature of the RSVP procedure containing flashing images.

Table 1

Demographic information

	Males	**Females**
Number	16	16
Mean age at testing	36.69yrs	25.75yrs
Ethnicity: Caucasian	100%	100%

Design

The experiment consisted of two conditions participants had to respond to, Condition 1 and Condition 2. Condition 1 required T1 and T2 responses, Condition 2 required T2 responses only. Condition 1 looked into whether T1 male/female nude images would elicit an increased

error rate in T2 detection following T1 images, compared to when T1 was correctly identified as an animal. Condition 2 has similar function to Condition 1, however, this condition looked into whether the report of T2 only would elicit similar response towards T1 images, when T1 images did not have to be reported but were still presented.

Each condition consisted of 216 trials presented within four blocks. Every trial presented 11 images in sequence. Each image was displayed for 100ms, with the interstimulus interval being 0ms in each sequence. The first and last image was neutral for each individual sequence in order to ensure no effect of primacy and recency. T1 image was across each sequence positioned between the second and seventh position, T2 image was positioned between the third and ninth position for every sequence. T2 images were either consecutive (stimulus onset asynchrony [SOA] = 100ms), separated by one neutral image (SOA = 200ms), or separated by 2 neutral images (SOA = 300ms). Pictures presented within each interval were counterbalanced between participants within each group. When conducting the statistical analysis T2 accuracy was the dependent variable for both conditions, but only when T1 was correctly identified in Condition 1. T2 stimuli were pictures of chairs or trains facing either left or right, a response of four could be made to T2 (chair left, chair right, train left, train right), consequently the probability level of classifying T2 by chance was 25%.

Stimuli

610 images were used in the sequences. Most of the nude male/female images were drawn from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005) as well as commercially available resources. All images from IAPS had been independently assessed and were categorised as 'erotic' and the other erotic images were of similar presentation and independently assessed by 4 individuals as being classified as 'erotic'. The other images drawn from commercially available resources were of similar nature to those drawn from the IAPS. The erotic images were half-length or full-length images. The animal and neutral images were drawn from commercially available images. 178 images were 'neutral' images of scenes of objects, 216 were presented as T1 stimuli (54 nude males, 54 nude females, 108 animals). T1 images of animals included domestic and wild animals, birds and reptiles. These images were portrait, half-length, full-length pictures of single or groups of animals in natural settings.

Procedure

All participants completed Condition 1 and Condition 2. Each Condition lasted for approximately 25 to 40 minutes and was conducted in a standardized testing room with a script read for each participant (See Appendix H for script). Condition 1 requested the participants to respond by pressing the corresponding key to whether they had seen a nude male, nude female or an animal (T1), followed by whether they had seen a chair or a train (T2) facing left or right (again by pressing the corresponding key). If the participants were unsure of their responses, they were told to respond and make a guess if necessary. A break was integrated between each block for approximately 5 minutes, if required a longer break was offered.

Equipment

The experiment was presented on a Toshiba Satellite Pro laptop. Responses were input employing and adapted 104-key IBM USB keyboard. The *insert* key was labeled CHAIR LEFT, the *delete* key was labeled TRAIN LEFT, the *End* key was labeled ANIMAL. The *Page up* key was labeled CHAIR RIGHT, the *Page down* key was labeled TRAIN RIGHT. The *Y* key was labeled FEMALE, the *I* key was labeled MALE.

Ethical Approval and Consent

Ethical Approval was received from the School of Psychology's Ethics Committee at the University of Birmingham, United Kingdom (See Appendix L). It was made clear to the participants they could withdraw at any time and that their responses were completely confidential and that they could withdraw at any time (See Appendix M).

Data Analysis

A four-way repeated measures ANOVA was used for analysis of the data. Group (male, female) was the between group variable. Condition (Condition 1 = reporting of T1 and T2; Condition 2 = reporting of T2 only), T1 category (animal, male, female) and interval (SOA between T1 and T2 of 100ms, 200ms, 300ms) were the three repeated measures variables. Dependent variable was accuracy in reporting T2. The analysis was conducted on 16 females and 16 males.

Results

In Table 2 the overall result of the multivariate analysis is outlined. It is apparent from this table that four sources produced significant results: Condition, Interval, interaction between Condition and Interval, Condition and Category. The significant main effect of Condition suggest that participants performance was much better in Condition 2 (91.5%), when T2 only had to be reported, compared to Condition 1 (67.8%), when T1 and T2 had to be reported. Main effect of Interval suggests that participants performed differently dependent on the SOA between the three intervals (See Table 2 for Performance on Interval in the two separate conditions). The interaction between Condition and Interval suggest that participants performed differentially dependent on the SOA and the Condition and the interaction between Condition and Category suggest that differential accuracy was performed by the participants on categories dependent on which condition images were presented in. The interaction effect, displayed in Table 4, illustrates how the SOA affected the processing ability differently across Categories. The trend is similar for all 3 Categories, where lower accuracy is apparent at Interval 0, and gradually increases at Interval 1 to be highest accuracy at Interval 2.

Table 2

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects	**1,30**	**.002**	
Group			
Error			
Within Subjects			
Condition	**1,30**	**101.46**	**.0001**
Category	**2,60**	**.99**	
Interval	**2,60**	**17.68**	**.0001**
Group*Condition	**1,30**	**1.40**	
Group*Category	**2,60**	**.64**	
Group*Interval	**2,60**	**.78**	
Condition*Category	**2,60**	**1.98**	
Condition*Interval	**2,60**	**4.34**	**.01**
Category*Interval	**4,120**	**5.86**	**.0001**
Group*Condition*Category	**2,60**	**1.67**	
Group*Condition*Interval	**2,60**	**.75**	
Condition*Category*Interval	**4,120**	**.48**	
Group*Condition*Category*Interval	**4,120**	**.80**	
Group Error		**366.12**	

[a]only *p* values below .05 or less are reported

Table 3

*Condition * Interval Interaction Effect*

Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**	**Interval 3 (M/SE)**
Condition 1	**58.51%/3.03**	**72.72%/2.99**	**72.40%/2.27**
Condition 2	**88.60%/1.79**	**90.94%/1.54**	**94.91%/4.03**

Table 4

*Category * Interval Interaction Effect*

Mean Percentage Accuracy, Standard Error score T2 score by Interval

Category	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**	**Interval 3 (M/SE)**
Animal	**62.32%/2.87**	**72.05%/2.99**	**73.09%/2.76**
Nude Male	**51.82%/4.55**	**68.40%/4.94**	**72.35%/3.48**
Nude Female	**56.89%/4.04**	**75.00%/3.19**	**70.72%/2.78**

Testing of Hypothesis

Condition 1 = report of T1 and T2

Condition 2 = report of T2 only

Condition 1

Testing of Hypothesis 1

The hypothesis predicted that males would produce more errors in reporting T2 stimulus when T1 stimulus was presented as nude females compared to nude male images and animal images. Conversely, females would produce more errors reporting T2 stimulus when T1 stimulus was nude males compared to nude females and animal images. See Table 5 for a complete overview of the Multivariate ANOVA. The data was subjected to a four-way repeated measures ANOVA, independent variables were Group (Between: Male and Female), and within subjects factors were Interval (0, 1, 2) and Category (T1: nude male/nude female/animal). The Dependent variable was percentage (percentage was calculated as Raw Scores x 100/36) of T2 accuracy (chair/train and direction) when T1 was also accurately reported. Responses where the participant inaccurately identified T1 were excluded from the analysis as T2 reporting would in this case not be a function of the image identified in T1. Accuracy of T2 scores were obtained by the participant's ability to accurately identify

whether they saw a chair or a train and which way it was facing (left of right) and therefore level of chance was 25%. In both conditions all participants were observed to perform above level of chance.

See Table 5 for a complete overview of the analysis and Table 6 for an overview of the accuracy percentage scores for Condition 1 and Condition 2 across the groups for Animal, Nude Male and Nude Female stimuli. The analysis showed a significant main effect of Interval and a significant interaction effect between Category and Interval, where the SOA between Intervals affected the participants differently. For the sake of comparison Table 6 displays means and SD of Categories from this study and in addition the means from the clothed male/female categories from Chapter 6. Looking at means in Table 6 in Condition 1 from the present study it is apparent that both females and males performance was consistent across the categories, with almost identical response rate for the three categories, apart from Condition 2 mean scores on the nude male images, where male participants scored 98.28% accurate, and females scored at 90.26%. The difference between accuracy scores of male participants on the female images, 98.28%, was much higher than their scores on the male images, 88.54%, this is in the opposite direction to what was expected. It is also further apparent, when comparing the two studies mean response rate across both Conditions, that overall performance on clothed males and females appears lower than performance on nude males and females in both Condition 1 and Condition 2.

Table 5

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,30**	**.572**	
Error			
Within Subjects			
Category	**2,60**	**1.08**	
Interval	**2,60**	**77.90**	**.0001**
Group*Category	**2,60**	**.75**	
Group*Interval	**2,60**	**.11**	
Category*Interval	**4,120**	**5.08**	**.001**
Category*Interval*Group	**4,120**	**1.93**	

[a]only *p* values below .05 or less are reported

Table 6

Percentage Accuracy, Mean and Standard Deviation T2 Accuracy Scores by T1 Nude Male, Nude Female, Clothed Female, Clothed Male and Animal Categories in Condition 1 and Condition 2

Group	**Female Participants**		**Male Participants**	
Category	**Nude Female**	**Clothed Female**	**Nude Male**	**Clothed Male**
Condition 1				
Animal				
M	**69.56%**	**46.36%**	**68.74%**	**55.18%**
SD	**3.74**	**3.18**	**3.74**	**3.36**
Nude Male				
M	**69.28%**	**45.54%**	**65.28%**	**56.07 %**
SD	**4.01**	**3.42**	**4.01**	**3.63**
Nude Female				
M	**69.19%**	**45.95%**	**65.20%**	**57.03 %**
SD	**3.74**	**3.43**	**3.74**	**3.63**
Total Score				
M	**69.34%**	**45.95%**	**66.41%**	**56.09%**
SD	**3.63**	**3.16**	**3.63**	**3.43**
Condition 2				
Animal				
M	**90.91%**	**74.31%**	**91.55%**	**81.48%**
SD	**1.90**	**2.34**	**1.90**	**2.24**
Nude Male				
M	**89.37%**	**65.82%**	**88.54%**	**77.89%**
SD	**2.60**	**2.58**	**2.60**	**2.58**
Nude Female				
M	**90.26%**	**75.90%**	**98.28%**	**80.92%**
SD	**5.52**	**2.58**	**5.52**	**2.58**
Total Score				
M	**90.18%**	**72.01%**	**92.79%**	**80.1%**
SD	**2.64**	**2.26**	**2.64**	**2.26**

Condition 2

Testing of Hypothesis 2.

The hypothesis predicted that the Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group. The participants were only required to report T2 images, not T1 images.

The data was subjected to a four-way repeated measures ANOVA, independent variables were Group (Between: Male and Female), and within subjects factors were Interval

(0, 1, 2) and Category (T1: nude male/nude female/animal). The Dependent variable was percentage (percentage was calculated as Raw Scores x 100/36) of T2 accuracy. The analysis showed no significant findings, not supporting the experimental hypothesis, and it was therefore not deemed necessary to conduct any more statistical analysis. See Table 6 of mean accuracy score across categories for Condition 1 and Condition 2.

Table 7

Result of Four-Way Repeated Measures ANOVA (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,30**	**.49**	
Error			
Within Subjects			
Category	**2,60**	**1.42**	
Interval	**2,60**	**1.78**	
Group*Category	**2,60**	**1.13**	
Group*Interval	**2,60**	**.93**	
Category*Interval	**4,120**	**2.35**	
Category*Interval*Group	**4,120**	**.84**	

[a]only *p* values below .05 or less are reported

Discussion

The study indicates that the RSVP in this particular sample was unable to detect any difference in AB as a result of participant's sexual preference of nude male and female images. The statistical analysis showed no significant difference between the two groups, and no difference in their responses towards images of their preferred sexual interest. The analysis did show a very slight trend with male participants having lower responses towards nude male images compared to nude female images in Condition 2. This is interesting as it is the reverse effect to what would have been expected. Overall, there is a strong possibility that the images did not have strong enough potent sexual cues, where the images were of soft erotic nature and may have failed to elicit strong enough sexual interest in the nude images.

Comparing the responses of the RSVP with clothed images compared to nude images it is obvious to the naked eye that performance with nude images is better than performance with clothed images. In theory and according to the literature (Kyllingsbaek et. al., 2001; Beech et. al., 2008; Harris & Pashler, 2004; Anderson, 2005) you would expect this to have the opposite effect, where, overall a potent sexual cue could elicit a stronger AB, hence poorer performance on the RSVP task. However, it is possible, as outlined in Flak et. al., (2009)

where the authors debate whether stimuli which capture attention could potentially require minimal load on the attentional span and hence may produce a weak AB (Anderson, 2005) which is what was seen with the Male participants in Condition 2, where their response towards nude female images was much lower than responses towards male images. This effect seems unexpected and requires further research and consideration. It is possible that the nude images did not produce much load on the attentional span, compared to clothed images, and consequently produced a weak AB response. However, it is also possible that because the participants were from different populations this may have caused the difference in responses between the two groups, where overall one group was simply better in their performance compared to the other group. Similarly Olivers and Nieuwenhuis (2005), suggest that if participants' are encouraged into a relaxed state of mind, their attention span may adapt a broader span, where consequently more resources are available for processing stimulus. According to this theory, it is certainly possible the result found in this study, where the nude images encouraged a relaxed enjoyable state of mind, where the processing of nude images, regardless of sex, did reduce AB. However, these suggestions are speculative and needs to be looked into in future research.

In conclusion, the RSVP utilised in normative samples using clothed or nude images provide diverse results, with no consistent findings between the studies conducted within this area (Hudson, 2005; Grace, 2005; Chapter 6, including the present study) it is obvious that more research is needed within normative samples utilising the RSVP for the purpose of detecting sexual interest, however, at present, this study does suggest that the enhanced AB found in child sex offenders (Beech et al, 2008; Chapter 3) is very much specified to child sex offenders, and does not extend into a normative sample of males and females. This does give strength to the RSVP as a valid and reliable tool to measure sexual interest in child sex offenders.

CHAPTER 8
RELIABILITY AND VALIDITY OF THE RAPID SERIAL VISUAL PRESENTATION PROCEDURE IN A NORMALTIVE SAMPLE OF MALES AND FEMALES. TEST-RETEST

Chapter rationale

The purpose of this chapter was to look at the RSVP procedure and participants responses across time. A subsample from Chapter 6 of heterosexual males and females was used. The main finding, supporting the experimental hypothesis, was a significant difference between Session 1 and Session 2, where an improvement in groups' performance was found from Session 1 to Session 2 but only in Condition 1. This was due to practice effect from Session 1 to Session 2, which is an important aspect in need of careful consideration if the RSVP were to be used as a tool to assess treatment effect over time in child sex offenders.

Test retest of the RSVP used on a subsample of the male female sample from Chapter 6.

Introduction

The previous chapters have investigated the rapid serial visual presentation procedure (RSVP) as a tool to measure sexual interest in child sex offenders. The following groups have been tested on the RSVP; incarcerated child sex offenders, released child sex offenders, 'new fathers' with children under the age of two, and normative samples of heterosexual males and females. The general finding is that the RSVP does impact incarcerated child sex offenders (Chapter 3) response towards images of children by displaying a heightened attentional blink (AB; Einhäuser, Kock & Makeig, 2007; Raymond et. al., 1992) effect towards child images (Chapter 3; Beech et. al., 2008; Kalmus & Beech, 2005), whereas this effect was not found in released child sex offenders (Chapter 4). In Chapter 5, 'new fathers' were examined with the exact same RSVP procedure as the sex offenders in Chapter 3 and Chapter 4. The findings showed that 'new fathers' did not display the AB effect towards child images. In normative samples of heterosexual males and females the above effect was generally only found in the female participants, this was looked into in Chapter 6 where an examination of males and females AB towards clothed male/female images was researched. It was hypothesised that participants would display a heightened AB effect towards the opposite sex, showing sexual attraction towards the preferred sexual interest, similarly to the sex offenders in Chapter 3. The findings suggested that this was only true for the female participants, where they displayed a heightened AB effect for male images. Chapter 7 built on Chapter 6 and used a normative sample of males and females examined their responses towards erotic images of males and females. However, no indication of a heightened AB towards images of preferred sexual interest was apparent.

These are all varied and interesting findings, however, an important factor with any assessment tool are issues of validity and reliability. Although the RSVP is a very well researched and established tool it has not been used previously for the purpose of an assessment tool of sexual interest. It was therefore deemed necessary to investigate how participants would respond over time and whether their responses would change, particularly looking at practice effect (Thorndike, 1911) as this is particularly relevant if a tool were to be used assessing treatment effect in child sex offenders. Research state that practice effect is an important factor in experimental procedures such as the RSVP (Martini & Maljkovic, 2009).

An important aspect with regards to the validity and reliability of the RSVP is in relation to potential future use looking at treatment effect in child sex offenders. One could

speculate that child sex offender's responses towards child images (heightened AB) may decrease in accordance with treatment exposure, this may be seen as a decrease in the AB towards child images post treatment compared to responses towards child images pre treatment. Although this is for future research it highlights the importance of validating the RSVP.

Therefore the aim of this study was to investigate whether participants, as a group, would produce similar results from Session 1 to Session 2 and/or whether their performance would improve from Session 1 to Session 2.

Specific hypothesis were:

Hypothesis 1: Session 1 and Session 2, Condition 1: Male Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of females and animals compared with the Female Group. Whilst the Female Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of males and animals compared with the Male Group.

Hypothesis 2: Session 1 and Session 2, Condition 2: Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Hypothesis 3: There will be an improvement in responses from Session 1 to Session 2 in both Female and Male Group.

Method

Participants

All participants were volunteers from the University of Birmingham. The participants were drawn from a sub-sample from Chapter 6. In total, 14 heterosexual females and 4 heterosexual males, age ranged between 18-35, all white British took part. None of the volunteers had any history of epilepsy or had any substantial physical disability. Participants

could choose between either receiving credits (part of BSc Psychology students course requirement), or a monetary reward of £7.

Design

Participants had to complete the experiment on two separate occasions, where at least 1 week in between the two trial sessions was required, with a maximum of 2 weeks between each session. It was not possible to get a set amount of days in between sessions due to the participants' schedules. On average there were 9 days between each session. In both sessions participants had to follow the exact same procedure. In each session, both Condition 1 and Condition 2 were completed, these two conditions were counterbalanced to control for order effects. In Condition 1, T1 and T2 had to be reported, in Condition 2 only T2 had to be reported. Condition 1 investigated whether male and female participants elicited an increased error rate when identifying T2 post identification of T1 images of preferred (males of females) images, compared to non-preferred images and animals. In total, 1 of 4 different responses could be made. To accurately classify T2 by chance was 25%, this did not occur in any participants. In both conditions, 216 images were presented in a succession of 11 images, where each individual image was presented for 100ms; this was separated into four blocks. Within each sequence, T1 target images were presented (male/female/animal) and T2 target images (chair or train facing towards the left or right), the other images were neutral images. In every sequence the first and last image was neutral, in order to reduce primacy and recency effect. T1 image was always positioned between the second and seventh position, T2 was always positioned between the third and ninth position, and it followed either immediately (Interval 0, SOA 100ms), immediately but one (Interval 1, SOA 200ms), or immediately but two images (Interval 3, SOA 300ms) after presentation of T1. The pictures assigned to the particular interval were counter-balanced across participants within each group.

Attentional Blink

In Condition 1 AB was calculated by looking at accuracy of reporting T2 (chair or train) when T1 (animal, male or female) was also reported accurately. This produced a percentage score of accuracy. In Condition 2, AB was calculated again by looking at T2 (chair or train) accuracy and whether this was influenced by the preceding T1 (animal, male or female), producing a percentage of accuracy.

Stimuli

Images used were the exact same images used in Chapter 6. All images were drawn from 30.000 commercially public images (PC world CD), 610 images were extracted from these. Images were neutral, males and females. Neutral images were objects or neutral scenes (178 in total). 216 images were used as T1 stimulus, 108 animals and 54 males and 54 females (all clothed). 216 were used as T2 stimulus, with 108 trains and 108 chairs (half facing left, half facing right). T1 male and female images were all either full body or facial length images in natural surroundings, a mixture of ethnic groups were also included. The T1 animal images included domestic and wild mammals, birds and reptiles. Images were facial, half-length or full-length pictures of single or groups of animals in a natural environment.

Procedure

The experimental procedure followed standardized scripted instructions (See Appendix H), each session lasted for approximately 25-45 minutes, dependent on the participant's performance. On arrival participants were provided with an information sheet and consent form explaining the experimental procedure (Appendix I) and they were asked to come back on a second session approximately 1 week later. Prior to the experimental procedure the participants were informed that they would receive a debriefing sheet (See Appendix N) on completion of the task which would explain in detail the back ground of the research. This was done in order to ensure the RSVP measures validity. All participants conducted the experimental procedure in a standardized testing suite. All participants completed both Condition 1 and Condition 2. Condition 1 required participants to first respond to whether they saw T1 images (animal, female, male) and second whether they saw T2 images (train or chair and the direction they were facing, either left or right). There were 4 blocks in total, therefore each participant had a short break between each block, and a longer break between Condition 1 and Condition 2, participants decided whether to use this longer or a short break between Conditions.

Equipment

A TOSHIBA laptop PC was used connected to a 15 inch monitor. The programme E-prime was used to present the RSVP procedure. Participants responded by using an IBM USB keyboard, the corresponding keys were labelled for each response, *Insert* - CHAIR LEFT, *Delete*-TRAIN LEFT, *End* - ANIMAL, *Page Up* – CHAIR RIGHT, *Page Down* – TRAIN RIGHT, *Y* – FEMALE, *I* – MALE.

Ethics

Ethical approval was obtained from the School of Psychology's Human Research Ethics Committee, the University of Birmingham (See Appendix L). The anonymity of the participants and the right to withdraw from the experiment was highlighted.

Data analysis

Data from Session 1 and Session 2 were subjected to Repeated Measures ANOVA, in both sessions between subjects variables were group (males and females). The three repeated measures variables Condition (Condition 1 = reporting of T1 and T2, and Condition 2 = reporting of T2 only), Category T1 (animal, male, female), and Interval (T1 and T2 SOA of 100ms, 200ms and 300ms). Dependent variable was T2 accuracy of reporting. Further, to look at improvement and investigate the differences between Session 1 and Session 2 in more detail data for each Category (3 intervals) was added up into one single variable. ANOVA's were then performed comparing Condition 1 and Condition 2 across Session 1 and Session 2. The analysis was performed using SPSS Version 18.0.

Hypothesis 1 predicted that the Male Group would produce lower accuracy scores on female images compared to male and animal images, and that the Female Group would produce lower accuracy scores on male images compared to female and animal images. Data was therefore subjected to a three-way repeated measures ANOVA, independent variables were Group (Between: Males and Females), and within subjects factors were Interval (0, 1, 2) and Category (T1: males/females/animal). The Dependent variable was percentage (percentage was calculated as Raw Scores x 100/36 for animal and 100/18 for male and female) of T2 accuracy (chair/train and direction) when T1 was also accurately reported. Participants inaccurate responses made towards T1 were excluded from the statistical analysis as T2, hence, responses would not be a function of the image identified in T1. Accuracy of T2 scores were obtained by the participant's ability to accurately identify whether they saw a chair or a train and which way it was facing (left or right), the level of chance was therefore 25%. In both Conditions all participants were observed to perform above level of chance.

Result

Result for Session 1

Main Analysis of Session 1, Condition 1 and Condition 2.

The analysis was conducted on 14 females and 4 males. See Table 1 for an overview of the analysis, Table 2 show mean interval across Condition 1 and Condition 2, and Table 3 show mean percentage accuracy for the T1 stimuli (animal, male, female) between groups in Condition 1 and Condition 2. Independent variables were between subjects factor Group (Males and Females), within subject factors of Condition (Condition 1 and Condition 2), Category (T1, male/female/animal) and Interval (Interval 0, 1, 2). The analysis showed the following significant main effects; Condition, $F\ (1, 16) = 50.557, p < .0001$, Category, $F\ (2, 32) = 5.581, p < .01$. The following significant interaction effects were found: Condition*Category, $F\ (2, 32) = 10.634, p < .0001$, Condition*Interval, $F\ (2, 32) = 10.957, p < .0001$, Category*Interval, $F\ (4, 64) = 6.636, p < .0001$. A three-way interaction was seen between Condition*Category*Interval, $F\ (4, 64) = 8.953, p < .0001$. Finally, a main effect of Between Subjects Group was found, $F\ (1, 16) = 6.7, p < .05$. Main effect of Condition suggest that participants performed worse in Condition 1 (mean 51.6%, SD 4.2) compared with Condition 2 (76.80%, SD 3.52), which is according to expectations and the AB literature. Main effect of Category indicate that overall the participants were better reporting T1 when T1 image was of animals (mean 67.2%, SD 3.52), followed by female images (mean 64.75%, SD 4.3), with lowest score on male images (60.61%, SD 3). The significant interaction between Condition*Category will be decomposed further in the separate analysis of Condition 1 and Condition 2. The significant interaction between Condition*Interval can be looked into detail in Table 2, in Condition 1 participants performed with the lowest average score in Interval 1 (Mean 48.44, SD 4.4), followed by Interval 0 (51.3, SD 3.92), and highest score in Interval 2 (Mean 55, SD 5.5). For Condition 2, the trend was opposite, where highest score was seen in Interval 0 (Mean 81.67%, SD 4), followed by Interval 1 (48.45%, SD 4.4), and lowest score on Interval 2 (Mean, 68.39%, SD 3.42). The significant interaction between Category*Interval is explained by a difference in overall mean scores on the various categories within the 3 intervals. The significant three-way interaction between Condition*Category*Interval merely suggest that average mean scores in the various Categories differ significantly dependent on what Condition and which Interval they were

displayed in within the RSVP stream This significant finding is not directly relevant to the hypothesis and will not be looked into in detail.

Table 1

Result of Three-Way Repeated Measures ANOVA of Session 1 Condition 1 and Condition 2 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**6.7**	**.05**
Within Subjects			
Condition	**1,16**	**50.56**	**.0001**
Category	**2,32**	**5.58**	**.01**
Interval	**2,32**	**2.02**	
Group*Condition	**1,16**	**.31**	
Group*Category	**2,32**	**.85**	
Group*Interval	**2,32**	**.44**	
Condition*Category	**2,32**	**10.63**	**.0001**
Condition*Interval	**2,32**	**10.96**	**.0001**
Category*Interval	**4,64**	**6.64**	**.0001**
Group*Condition*Category	**2,32**	**.43**	
Group*Condition*Interval	**2,32**	**1,80**	
Condition*Category*Interval	**4,64**	**8.95**	**.0001**
Group*Condition*Category*Interval	**4,64**	**.20**	

[a] ***Only p values of .05 or less are reported***

Table 2

Session 1 Condition 1 and Condition 2. Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 0 (M/SE)**	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**
Condition 1	**51.30%/3.92**	**48.45%/4.40**	**55.00%/5.46**
Condition 2	**81.67%/4.00**	**80.30%/3.90**	**68.39%/3.42**

Table 3

Mean Percentage Accuracy, Standard Deviation T2 Accuracy Scores by T1 Child And Animal Categories in Session 1 Condition 1 and Condition 2

Category	**Female**	**Male**
Condition 1		
Animal		
M	**45.89%**	**63.19%**

SD	**3.66**	**6.85**
Female		
M	**42.18%**	**55.09%**
SD	**4.90**	**9.17**
Male		
M	**42.85%**	**60.35%**
SD	**4.06**	**7.60**
Total Score		
M	**43.64%**	**59.54%**
SD	**3.97**	**7.42**
Condition 2		
Animal		
M	**70.83%**	**88.89%**
SD	**3.50**	**6.56**
Female		
M	**71.93%**	**89.81%**
SD	**3.88**	**7.26**
Male		
M	**59.80%**	**81.48%**
SD	**3.22**	**6.03**
Total Score		
M	**66.85%**	**86.73%**
SD	**3.32**	**6.22**

Table 3 above show the mean percentage accurate values of reporting of T1 (animal, female and male) values in Session 1 across both groups for both Conditions. Scores for the female group in Condition 1 were very similar for both male (42.85%) and female (42.18%) images, a slightly higher score was found for animal images (45.89%). Condition 2 show that the Female group scored much lower on the male images (59.8%) compared to the female images (71.93%) and animal images (70.83%), this is in line with the hypothesis and also what was seen in Chapter 6. The Male group scored lower on the female images (55.09%) compared to the male images (60.35%) and the animal images (63.19%), which is also in line with the hypothesis. For Condition 2 the Male group scored lowest on the male images (81.48%), followed by animal (88.89%), and finally the female images (89.81%).

Analysis of Condition 1, testing of Hypothesis 1.

Hypothesis 1: *Session 1 and Session 2, Condition 1*: Male Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of females and animals compared with the Female Group. Whilst the Female Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of males and animals compared with the Male Group.

See Table 4 below for an overview of the multivariate analysis for Session 1, Condition 1. The statistical analysis did not reveal any significant findings, no further analysis was deemed necessary. However, looking at Table 3 above, there is a trend in the hypothesised direction with regards to the male sample mentioned above which showed that they scored lower on female images, 55.09% compared to the male images at 60.35% and animal images at 63.19%, although non-significant.

Table 4

Result of Three-Way Repeated Measures ANOVA Session 1 Condition 1 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**3.56**	
Within Subjects			
Category	**2,32**	**2.33**	
Interval	**2,32**	**1.92**	
Group*Category	**2,32**	**.64**	
Group*Interval	**2,32**	**.26**	
Category*Interval	**4,64**	**.58**	
Category*Interval*Group	**4,64**	**.33**	

[a] ***Only p values of .05 or less are reported***

Analysis of Condition 2 testing Hypothesis 2.

Hypothesis 2: Session 1 and Session 2, Condition 2: Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Table 5 shows the multivariate analysis for Session 1, Condition 2, which did show the following significant findings. A significant main effect of Category $F\ (2, 32) = 14.89, p < .0001$, and Interval $F\ (2, 32) = 11.05, p < .0001$. A significant interaction between Category and Interval was also detected, $F\ (4, 64) = 12.16, p < .0001$. A significant main effect of Between Groups was also found, $F\ (1, 16) = 7.95, p < .01$. The main effect of Group is clear looking at the overall mean, where Female Group had a mean of 66.85 (*SD,* 3.32) whilst the

Male Group were significantly higher with a mean of 87.73 (*SD,* 6.22). The main effect of Category shows that overall participants were better reporting T2 when T1 was an image of a female (Mean, 80.87%, SD 4.1), followed by Animals (Mean 79.90%, SD 3.7), and lowest score on male images (Mean 73.18%, SD 4.1). Although looking at Table 3 a trend in the hypothesised direction is apparent for the female group in this condition, where percentage accuracy score is much lower on the male images (59.8%) compared to the female images (71.93%) and animal images (70.83%). Main effect of Interval (see Table 2) show that the participants had different accuracy score dependent on the SOA between the Intervals, where lowest score was on Interval 1 (Mean 48.45%, SD 4.4), followed by Interval 0 (Mean 51.3%, SD 3.92) and highest score on Interval 2 (Mean 55.5%, SD 5.46). No significant interaction was detected between Group and Category. This would have confirmed whether a difference between groups percentage accuracy score on the 3 categories would have been present, hence no further analysis was deemed necessary.

Table 5

Result of Three-Way Repeated Measures ANOVA Session 1 Condition 2 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**7.95**	**.01**
Error			
Within Subjects			
Category	**2,32**	**14.89**	**.0001**
Interval	**2,32**	**11.05**	**.0001**
Group*Category	**2,32**	**1.05**	
Group*Interval	**2,32**	**.66**	
Category*Interval	**4,64**	**12.16**	**.0001**
Category*Interval*Group	**4,64**	**.27**	

[a] ***Only p values of .05 or less are reported***

Result for session 2

Main Analysis of Session 2, Condition 1 and Condition 2.

Table 6 shows the overall multivariate analysis for Session 2, Condition 1 and Condition 2. A significant interaction between Group and Category, $F\ (2, 32) = 3.15$, $p < .05$, was found, suggesting a difference in responses between the groups on the 3 Categories (see Table 10 for

an overview of Category means across Conditions). This difference is decomposed further below in separate analysis for Condition 1 and Condition 2.

Table 6

Result of Three-Way Repeated Measures ANOVA of Session 2 Condition 1 and Condition 2 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**.42**	
Error			
Within Subjects			
Condition	**1,16**	**1.10**	
Category	**2,32**	**1.57**	
Interval	**2,32**	**.88**	
Group*Condition	**1,16**	**2.99**	
Group*Category	**2,32**	**3.15**	**.05**
Group*Interval	**2,32**	**.39**	
Condition*Category	**2,32**	**2.96**	
Condition*Interval	**2,32**	**1.25**	
Category*Interval	**4,64**	**1.60**	
Group*Condition*Category	**2,32**	**.56**	
Group*Condition*Interval	**2,32**	**.35**	
Condition*Category*Interval	**4,64**	**.79**	
Group*Condition*Category*Interval	**4,64**	**.49**	

[a] ***Only p values of .05 or less are reported***

Analysis of Condition, testing of Hypothesis 1.

Hypothesis 1: *Session 1 and Session 2, Condition 1*: Male Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of females and animals compared with the Female Group. Whilst the Female Group will display a larger number of errors reporting T2 stimulus following the reporting of T1 images of males and animals compared with the Male Group.

Table 7 shows the multivariate analysis for Session 2, Condition 1. This shows no significant findings, hence no further analysis was deemed unnecessary.

Table 7

Result of Three-Way Repeated Measures ANOVA Condition 1 Session 2 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**.61**	
Error			
Within Subjects			
Category	**2,32**	**2.92**	
Interval	**2,32**	**.45**	
Group*Category	**2,32**	**.14**	
Group*Interval	**2,32**	**.82**	
Category*Interval	**4,64**	**1.56**	
Category*Interval*Group	**4,64**	**.18**	

[a] ***Only p values of .05 or less are reported***

Analysis of Condition 2, testing of Hypothesis 2.

Hypothesis 2: Session 1 and Session 2, Condition 2: Male Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of females and animals compared to the Female Group. Whilst the Female Group would display a larger number of errors reporting T2 stimulus following a display of T1 images of males and animals compared with the Male Group.

Table 8 shows the multivariate analysis for Session 2, Condition 2. This showed a main effect for Interval, $F\ (2, 32) = 1.25, p < .05$ and a significant interaction between Group and Interval, see Table 9 for an overview of Interval scores across Conditions. Main effect of Interval (see Table 9) show that the participants had different accuracy score dependent on the SOA between the Intervals, where lowest score was on Interval 2 (Mean 66%, SD 4.7), followed by Interval 1 (Mean 74.25 %, SD 10.36) and highest score on Interval 0 (Mean 76.47%, SD 10.5).

Table 8

Result of Three-Way Repeated Measures ANOVA Condition 2 Session 2 (Group x Condition x Category x Interval)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**1.17**	
Error			
Within Subjects			
Category	**2,32**	**1.25**	
Interval	**2,32**	**3.55**	**.05**
Group*Category	**2,32**	**1.44**	
Group*Interval	**2,32**	**3.96**	**.05**
Category*Interval	**4,64**	**2.00**	
Category*Interval*Group	**4,64**	**1.06**	

[a] ***Only p values of .05 or less are reported***

Table 9

Session 2 Condition 1 and Condition 2. Mean Percentage Accuracy, Standard Error score T2 score by Interval

Condition	**Interval 0 (M/SE)**	**Interval 1 (M/SE)**	**Interval 2 (M/SE)**
Condition 1	**64.81%/5.3**	**63.60%/4.72**	**66.00%/4.7**
Condition 2	**76.47%/10.5**	**74.25%/10.36**	**73.80%/10.5**

Table 10

Mean Percentage Accuracy, Standard Deviation T2 Accuracy Scores by T1 Child And Animal Categories in Session 2 Condition 1 and Condition 2

Category	**Female**	**Male**
Condition 1		
Animal		
M	**67.59%**	**62.03%**
SD	**5.02**	**9.40**
Female		
M	**67.26%**	**59.95%**
SD	**4.45**	**8.33**
Male		
M	**71.49%**	**62.50%**
SD	**4.40**	**8.22**
Total Score		
M	**68.78%**	**61.50%**
SD	**4.39**	**8.22**

Condition 2		
Animal		
M	**64.75%**	**88.19%**
SD	**10.30**	**19.28**
Female		
M	**60.78%**	**87.73%**
SD	**9.80**	**18.28**
Male		
M	**61.90%**	**85.64%**
SD	**9.92**	**18.56**
Total Score		
M	**62.48%**	**87.19%**
SD	**9.98**	**18.67**

Table 10 above show the mean percentage accurate values of reporting of T1 (animal, female and male) values in Session 2 across both groups for both Conditions. In Condition 1, Female Group, the scores were very similar for both Animal (67.59%) and female (67.26%) images, a slight higher score was found for male images (71.49%). In Condition 2 the Female Group score lower on the female images (59.95%) compared to the male (62.5%) and animal images (62.03%). In Condition 1 the Male Group scored lowest on the female images (59.95%), followed by animal (62.03%), and finally the male images (62. 5%). This is somewhat in line with the hypothesis, where Males were predicted to score lower on female images compared to animal and male images. In Condition 2 the Male Group scored lower on the male images (85.19%) compared to the female (87.73%) and the animal images (88.19%), which is also in line with the hypothesis, although not significant.

Further Analysis, testing of Hypothesis 3.

Hypothesis 3: There will be an improvement in responses from Session 1 to Session 2 in both Female and Male Group.

For this analysis the main interest was to investigate whether a difference in performance between Session 1 and Session 2 was present, in order to compare the data across Session 1 and Session 2 it was deemed necessary to only look at 1 main score for each category (animal, male and female), as opposed to looking at scores separated for each category in interval 0, interval 1 and interval 2. Therefore, for both sessions, the three intervals within each category was added up, this resulted in only 1 variable for each category, where instead of e.g. animal being looked at across 3 intervals there was now only 1 variable for each participant within all

categories. For example, participant 1 would have 1 score for animal stimuli, 1 score for male stimuli and 1 score for female stimuli.

Two separate repeated measures ANOVAs' were conducted, one for condition 1 and one for condition 2. The first Anova examined responses in animal, females and male images and compared them between Session 1 and Session 2. The second Anova did the same analysis with data from Condition 2, comparing responses between Session 1 and Session 2, for animal, male and female categories. In both Repeated Multivariate ANOVA the independent variables were between subjects factor Group (Males and Females), within subject factors of Session (Session 1 and Session 2) and Category (T1, male/female/animal).

Condition 1, Session 1 and Session 2

The analysis showed the following significant result; Main effect of Session, $F\ (1, 16) = 10.57, p < .005$, main effect of Category, $F\ (2, 32) = 4.16, p < .05$, interaction effect between Session*Sex, $F\ (1, 16) = 7.74, p < .01$. (See Table 11 for an overview of the analysis, and Table 12 for the mean percentage accuracy for the T1 stimuli (Animal, male, female) between the groups), Main effect of Session suggest that participants scored significantly higher in Session 2, Condition 1 (*Mean*, 195.92, *SD, 13.9).* Compared to Session 1, Condition 1 (*Mean, 154.78, SD, 12.63).* The main effect of Category can be looked into more detail by inspecting the mean for the 3 categories (Table 12). The mean for the Female Group in Session 1; scored highest for the Animal category 137.7 (*SD*, 11), lowest at 126.53 (*SD*, 15.7) for Female category, and 128.55 (*SD*, 12.19) for male category. The Male Group had the following scores, highest score of 189.58 (*SD, 20.55)* on the animal category, followed by 181 (*SD*, 22.8) in the Male category, and 165.28 (*SD, 27.5)* in the female category. Session 2, Female Group, highest scores were same for both animal (*Mean*, 211, *SD*, 12.86) and female (*Mean*, 211, *SD*, 14.78) and lowest score on male category at 196.83 (*SD*, 13.29). The Male Group scored highest on the animal category with a mean of 197.92 (*SD*, 24.05) lowest on the female category with 173.6 (*SD*, 27.64), and with a mean of 181.94 (*SD*, 24.85) on the Male category.

Table 11

Result of Three-Way Repeated Measures ANOVA in Condition 1 comparing total sum of Categories in Session 1 and Session 2 (Group x Session x Category)

Source	***Df***	**F**	***P*[a]**
Between Subjects			
Group	**1,16**	**.3**	
Error			
Within Subjects			
Session	**1,16**	**10.57**	**.005**
Category	**2,32**	**4.16**	**.05**
Session*Sex	**1,16**	**7.74**	**.01**
Session Category	**2,32**	**.69**	
Category*Sex	**2,32**	**1.89**	
Session*Category*Sex	**2.32**	**.17**	

[a] ***Only p values of .05 or less are reported***

Table 12

Mean Percentage Accuracy and SD for Groups across Session 1 and Session 2 across Condition 1

Condition 1, Session 1	**Female**	**Male**
Animal		
M	**137.70%**	**189.58%**
SD	**11.00**	**20.55**
Female		
M	**126.53%**	**165.28%**
SD	**15.70**	**27.50**
Male		
M	**128.55%**	**181.00%**
SD	**12.19**	**22.8**
Total Score		
M	**130.92%**	**178.63%**
SD	**11.91**	**22.28**
Condition 1, Session 2		
Animal		
M	**211.00%**	**197.92%**
SD	**12.86**	**24.05**
Female		
M	**211.00%**	**173.60%**
SD	**14.78**	**27.64**
Male		
M	**196.83%**	**181.94%**
SD	**13.29**	**24.85**
Total Score		

M *SD*	**206.35%** **13.18**	**184.49%** **24.65**

Condition 2, Session 1 and Session 2

The repeated measures ANOVA of Condition 2 displayed in Table 13 show the following significant findings. A significant effect of Category, *F (2, 30) =7.85, p<.002* and a significant interaction effect of Session*Category, *F (2, 30) =14.3, p <.0001.* The significant effect of Category can be explained by differences in mean displayed in Table 14 where mean differences for the Female Group in Condition 2, session 1 were, animal (*mean*, 211.11, *SD*, 11) and female (*mean*, 214.18, *SD*, 12.39), and much lower for the male category (*mean*, 174.12, *SD*, 10.33). For Session 2, mean for animal was 200, (*SD, 28.62),* Female, had the highest score of 206.4 (*SD, 29.66*), and lowest for male category, 199.14 (*SD,* 28.65). Within the Male Group scores were overall higher than for the Female Group. Highest mean was for female category with a mean of 266.67 (*SD,* 20.18), lowest for the male category with mean of 244.44 (*SD, 18.63),* and the animal category displayed a mean of 266.67 (*SD, 20.18).* The significant interaction between Category*Session suggest the participants differed significantly with their performance on the Categories between the two sessions.

Table 13

Result of Three-Way Repeated Measures ANOVA for Condition 2 comparing total sum of Categories in Session 1 and Session 2 (Group x Session x Category)

Source	***Df***	**F**	***P*[a]**
Between Subjects Group	**1,15**		
Within Subjects Session Category Session*Sex Session*Category Category*Sex Session*Category*Sex	 **1,15** **2,30** **1,15** **2,30** **2,30** **2.30**	 **.01** **7.85** **.01** **14.30** **1.40** **.30**	 **.002** **.0001**

[a] ***Only p values of .05 or less are reported***

Table 14

Mean Percentage Accuracy and SD for Groups across, Session 1 and Session 2 across Condition 2

Condition 2, Session 1	**Female**	**Male**
Animal	**211.11%**	**266.67%**
M	**11.00**	**20.18**
SD		
Female		
M	**214.18%**	**269.44%**
SD	**12.39**	**22.33**
Male		
M	**174.12%**	**244.44%**
SD	**10.33**	**18.63**
Total Score		
M	**199.80%**	**260.18%**
SD	**10.66**	**19.22**
Condition 2, Session 2		
Animal		
M	**200.00%**	**261.11%**
SD	**28.62**	**51.61**
Female		
M	**206.40%**	**258.33%**
SD	**29.66**	**53.48**
Male		
M	**199.14%**	**265.27%**
SD	**28.65**	**51.65**
Total Score		
M	**201.85%**	**261.57%**
SD	**28.90**	**52.09**

Discussion

The purpose of the statistical analysis was to look at the differences in responses between Session 1 and Session 2 and to also look at whether T1 images of males and females would have an effect on T2 responses where this was affected by sexual attraction towards images of the opposite sex. This was done by performing several repeated measures ANOVA's individually in both Session 1 and Session 2. Specifically, it was predicted that Males would have a heightened AB (i.e. lower T2 accuracy when T1 was an image of a female) towards female images, and that Females would have a heightened AB towards male images. To sum

up the findings, the main findings of the overall repeated measures ANOVA on Session 1, Condition 1 and Condition 2, showed a significant main effect of Condition and Category. The main effect of Condition is as expected, where performance in Condition 1 was better than in Condition 2. The main effect of Category was decomposed further when separate analysis were conducted on each individual Conditions and Sessions, see further discussion below. Further, a significant interaction between Condition and Category was detected, suggesting that participants scored differently across Conditions on the individual Categories. A significant interaction between Condition and Interval was seen, suggesting that performance varied across intervals dependent on the condition. There was also a significant interaction between Category and Interval, suggesting that dependent on which category would influence how participants scored on each Interval. Finally, a significant three-way interaction between Condition, Category and Interval was detected, confirming the above interactions, suggesting differing scores dependent on Condition, Category and Interval.

Analysis of the individual sessions revealed some significant findings. The three-way repeated measures ANOVA of Session 1, Condition 1 showed no significant findings, disproving the predicted hypothesis, that males and females would have a heightened score on the opposite sex, hence showing no heightened attentional blink. In Chapter 6 there were no significant findings for the male group, only for the female group. However in this sample there was a trend in the right direction for the Male participants where they had slightly lower accuracy score on the female images compared to the male images in the present study, however, it is important to keep in mind that the male group only consisted of 4 participants.

Further, looking at the main analysis for Condition 2, Session 1, which showed a main effect of Group, where males on average produced higher accuracy score than females. However, as mentioned above, it is important to keep in mind that the male sample for this chapter was very low, and should therefore be considered accordingly when looking at the results. A strong main effect of Category was found, which show that the hypothesised prediction for the Female Group was confirmed as the percentage accuracy score on the Male images was significantly lower than percentage accuracy scores on the Female and Animal images. Main effect of Interval did in fact go in the opposite direction to what would be expected (lowest score on Interval 0, followed by Interval 1 and highest score on Interval 2), where in this case poorest response towards images was seen at Interval 2, whilst best response was seen at Interval 0. The significant interaction between Category and Interval show that the participants' responses to the 3 categories were impacted by which interval they were displayed at. Looking closer at the overall means for the two groups, the Female Group

percentage accuracy score showed a trend in the hypothesised direction, with a lower overall mean for male images compared with female images, this effect was not found in the Male Group.

Analysis for Session 2, Condition 1 showed no significant findings, hence indicating that no AB effect took place. This was similar to Session 1, Condition 1, which also did not find the AB effect hypothesised. However, if you look at the means you can see that the means are much higher than in Session 1 (scored in the 40 % range), here Females scored in the 65-72% range. The males scored in the range of 59% to62.03%, compared to Session 1, condition which was 55% to 63.19%, so top range was only 1% higher.

The repeated measures ANOVA for Condition 2, Session 2 showed a significant main effect of Interval, which displayed highest score on Interval 0 and lowest on Interval 2, opposite to the expected trend but very similar to the above reported findings in Session 1, Condition 2. A significant interaction of Group and Interval showed that groups differed in scores on the separate Intervals. When we looked at the means for Session 2, Condition 2 the means for the Female Group and the Male Group produced similar trends to the means in Session 1, Condition 2 in terms of percentage accuracy overall, the Male Group scored in the 80% range and the Female Group scored in the 60% range for both Session 1 and Session 2.

Further analysis was conducted to get a better overview of how participants performed in the two separate sessions, this was done by calculating a total sum of the intervals for each category and comparing them across Session 1 and Session 2. Repeated Measures ANOVA's were performed on this data. The analysis showed some interesting results. The analysis performed on Condition 1 for Session 1 and Session 2, showed a significant main effect of Session, suggesting that as predicted, the performance overall was significantly better in Session 2, compared to Session 1. It is likely that this is caused by a common phenomenon known as practice effect, which is very typical with these types of experiments (e.g., Ebbinghaus, 1964; Kelley, 2009). The term practice effect stem as far back as Thorndike (1911) who created the terms 'The Law of Practice' and 'The Law of Recency', this is the assumption that repeating or practicing a material increases the individual's ability to remember (Law of Practice) and the more time lapsed since last study of the material in question recall will decrease (Law of Recency). However, this is a highly debatable area with regards to short-memory and practice effects in cognitive tasks such as the RSVP, the scope of this chapter is not able to look into this further, for more in depth reading on this topic it is suggested to look at Roediger (2008). Further, the ANOVA conducted for Session 1 and Session 2 in Condition 2 did not show a significant improvement. This was most likely due to

the fact that performance in Condition 2 is much easier for the participants, and a form of ceiling effect was seen, where overall performance is high in Condition 2 regardless of which Session they conducted, it is difficult for the participant to improve their performance regardless of how many times they were to do the experimental task in this condition. This suggests that practice effect did not have an impact with Condition 2 specifically. Research (Broadbent & Broadbent, 1987; Raymond et al., 1992), have found this to be a common phenomenon within the RSVP task that if T2 only has to be reported performance improves significantly compared to when both T1 and T2 has to be reported. This has been a consistent finding in the current thesis (Chapter 3 through to the present chapter).

Overall, the above findings suggest that if the RSVP were to be utilised with sex offenders as a means to measure treatment effect, where they for example would be tested on the RSVP pre and post treatment. It would be necessary to alter the experimental procedure, where, for example, different sets of images could be used pre and post treatment to avoid confounding variables such as practice effect. Alternatively one could also try to increase the time laps between each session, as in this experiment, a maximum of 2 weeks was the lapse. The reason why the interval between session 1 and session 2 had to be between 1 and 2 weeks in this study was due to practical reasons. The testing of participants (all students) took place at the end of term and it was not possible for them to come back after the term break. This may be too little time, and it is likely that treatment of sex offenders would last for longer than 2 weeks, so this may be an irrelevant issue. However, all of these possible methodological problems would need to be looked into further for future research.

A problem with this study was the issue of time-lapse between Session 1 and Session 2, this was not standardized and differed between each participant with a few days. This was due to problems getting participants back to do the testing. This may have confounded the result, where participants who came back after 1 week may have experienced more practice effect compared to those who came back 2 weeks later. This needs to be standardized if possible for future research. The other issue with time-lapse with this type of participants is that the participants could have guessed or been told the purpose of the experimental procedure from other students who also took part in this study, where by the time they were tested on Session 2, they would have been aware of the purpose of the experiment, this may have affected their responses. However, if this were to be conducted in a prison environment, this could have been controlled easier.

In conclusion, as discussed in previous chapters, the issue of the images not being sexually potent (Flak et. al., 2009) enough for the male participants is an issue which needs to

be addressed in future research (Chapter 6 and Chapter 7, Hudson, 2005; Grace, 2005). Further, the main finding that performance improved from Session 1 to Session 2, particularly in Condition 1 needs to be taken into consideration for future research, especially with regards to looking at treatment effect in child sex offenders.

CHAPTER 9: GENERAL DISCUSSION

The overall aim of this research was to investigate assessment of sexual interest in child sex offenders with the use of a computerised cognitive procedure termed the Rapid Serial Visual Presentation (RSVP) procedure. The main purpose was to determine whether the RSVP has the ability to detect sexual interest in child sex offenders. In order to do this the RSVP was utilised to capture data from various samples such as incarcerated and released sex offenders, offenders convicted of non-sexual offences, fathers with children under the age of two, and normative samples of males and females. Collectively, each piece of research I would argue has contributed to this aim, suggesting that the RSVP may be a useful tool in evaluating sexual interest in child sex offenders. There will be a summary of each chapter in chronological order, specifying each chapter's aims, and the main findings will be highlighted. Consideration of how each chapter addresses the aims outlined in the introduction will also be given. Practical implications along with limitations of this research will be discussed collectively. Finally, the overall implications, directions for future research and conclusions of this thesis are evaluated and discussed.

Summary of Findings

The aim of Chapter 1 was to review and provide an overview of the various methods currently used to evaluate sexual interest in child sex offenders. The purpose of this was to get an in-depth insight into the various methods currently used to assess sexual interest in child sex offenders as well as their effectiveness. Measures such as the penile plethysmograph (PPG; Freund & Blanchard, 1989), self-report and various attentional paradigms (e.g., viewing time and information processing procedures were discussed). The purpose was also to understand the methodological downfalls and limitations as well as benefits of these various measures. The general conclusion made in this paper suggested that procedures such as the PPG and self-report measures are too susceptible to faking, and suffer from various other methodological faults. Some of the specific issues with the PPG are the use of images of nude children (Abel et. al,. 1998), low reliability and test-retest coefficient (Kline, 1986; Barbaree et. al., 1989) and low responding (Looman et. al., 1998). Specific problems with self-report are issues of social desirability and denial (Flak et. al., 2007). Many sex offenders are deniers and do not want to admit to their crime which makes it very difficult to assess and evaluate with self-report measures. Further discussion on which information processing procedures needed to be the area research should focus on with regards to future development of assessment techniques was also included here. It was concluded that information processing procedures such as the RSVP are theoretically resilient to faking, easy to distribute and very cost-effective. However, until research within this particular area develops and becomes established, the current best possible way to asses sex offenders would be a combination of the measures mentioned above, such as the RSVP, PPG and self-report, as this would, at present, provide the most accurate evaluation, assessing problems both at physiological and psychological levels.

Chapter 2 expanded and built on Chapter 1, providing a much more detailed view of the RSVP paradigm, the attentional blink (AB), and cognitive theories that attempt to explain this phenomenon. Here, three theories of AB were examined, these were; the Inhibitory model (Broadbent & Broadbent, 1987), the Interference model (Ward & Shapiro, 1996) and the Two-stage model (Chun & Potter, 1995). Various techniques currently used to investigate the AB theories, such as event related potentials (Luck & Vogel, 2001) and functional magnetic resonance imaging (e.g., Marois & Chun, 2004), was also discussed. Further, a rationale was provided of the AB's ability to capture sexual attraction towards child images in child sex offenders, as well as limitations and methodological downfalls of the RSVP procedure. It was

concluded that it is important it is to explore the effect of sexual interest related to an image, and investigate how this can be linked to an explicit theory of visual selection.

Chapter 3 investigated the RSVP's ability to detect sexual interest in child images with a group of child sex offenders, divided into intrafamilial and extrafamilial groups, from HM Prison 1, and compared their responses to a control sample, a group of white-collar non-sexual offenders from Prison 2. Statistical analysis suggested the extrafamilial child sex offender's abnormal sexual interest in children was manifested by producing more errors in terms of the level of reporting T2 images when T1 images of children were displayed compared to T1 images of animals. It was also found that the AB effect was not affected, or mediated, by IQ, social desirability or anxiety in any of the participants. Furthermore, the AB effect was not observed in the intrafamilial child sex offenders or in the control group. The findings indicated that the RSVP could be a way of measuring abnormal sexual interest in extrafamilial child sex offenders and potentially intrafamilial offenders (Beech et. al., 2008).

Chapter 4 attempted to build on Chapter 3's findings and employed the RSVP on a sample of convicted child sex offenders who had been released from prison and were going through the admissions phase in order to enter into the sex offender treatment programme at the West-Midlands Sex Offender Unit. The performance of this (small) group of child sex offenders was compared with the control sample of non-sexual offenders from Prison 2 from Chapter 3. The overall result demonstrated that child sex offenders performed very similarly to the control sample; hence no heightened AB effect was found when T1 child images were present compared to T1 animal images. However, there were several methodological issues which may have contributed to the non-significant findings, such as a very small sample size, no knowledge of whether the sexual offender sample were intrafamilial, or extrafamilial, child sex offenders and no knowledge of whether they had previously completed a treatment programme for sex offenders.

The aim of Chapter 5 was to explore the RSVP in a sample of fathers with children under the age of two. This was based on a suggestion from a colleague that fathers with children may have similar response towards child images as sex offenders due to their close contact with children. It was found that 'new' fathers did not display any enhanced AB towards images of children as compared to images of animals. In fact their performance was very similar to other non-offender control groups, the intrafamilial sex offenders reported in Chapter 3, and the sex offender group reported in Chapter 4. It was concluded that these results reinforced the hypothesis that the RSVP has the ability to detect sexual interest in extrafamilial child sex offenders and appears to remain exclusive to this group as the AB

response is not seen in fathers who have daily contact with young children, and obviously a high level of empathic involvement with this children.

Chapter 6 explored the RSVP's ability to detect sexual interest in a normative sample of heterosexual males and females. The overall findings indicated that the AB effect towards images of preferred sexual attraction was detected in the female sample but not the male sample. The females displayed an enhanced AB effect towards male images i.e. when T1 image was of males, compared to images of females and animals, however, this was unexpectedly only in Condition 2. In Condition 2 the participants were only required to respond to T2, not T1, even though T1 was still presented. It was suggested that it is possible the female images did not induce a strong enough sexual cue for the male participants. Regardless, these findings build on the notion that child sex offender response towards child images in Condition 1 remains exclusive for this population, but that the female sample in this chapter elicited a similar response towards male images in Condition 2.

Chapter 7 aimed to build on Chapter 6's findings that images of males and females used in Chapter 6's study did not provide a strong enough sexual potent cues for the male sample. In light of this, T1 images used in Chapter 6 were changed to nude images of males and females, in an attempt to elicit a stronger sexual potent cue for the sample. A group of heterosexual males and females were tested, however, unexpectedly the statistical analysis of the data did not yield any significant findings. Although a trend in Condition 2 was seen where males had slightly lower accuracy (heightened AB) when T1 images of nude females were displayed. However, nude T1 images did not induce a heightened AB in the participants', again, as these images were of soft erotic nature, it is possible they were not sexually potent enough. This finding was similar to Hudson's (2005) study on the RSVP with males and females, using erotic images. This chapter concluded that more research is needed within this area, but that the heightened AB found in Chapter 3 in child sex offenders may only be seen in this group and does not appear to extend to a normative sample.

The aim of Chapter 8 was to investigate the reliability of the RSVP procedure. A subsample of heterosexual males and females from Chapter 6 was further examined and where participants had to conduct the experimental procedure on two separate occasions with a time lapse of no less than one week between testing sessions. The findings confirmed Chapter 6's findings where a heightened AB was found in the female sample, but not the male sample, suggesting the reliability of the measure. However, a significant difference was found between Session 1 and Session 2 in Condition 1 (report of T1 image and T2 image). It was concluded the significant difference was due to a practice effect. The paper suggested that

practice effect needs to be taken into consideration for future research, particularly with child sex offenders when examining any treatment effects. It is of note that the practice effect was not apparent in Condition 2. It was concluded that this result may to be due to the fact that Condition 2 responses are easy, and a high accuracy rate in Session 1 was already present, hence improvement in Session 2 would be difficult to achieve, due to this 'ceiling' effect.

Theoretical, Practical Applications, Limitations and Future Directions of the RSVP

The RSVP is a procedure, which has been established within cognitive psychology and various types of research (Shapiro, 2001), it examines attention and human beings' ability to process various types of stimuli. A lot of research has established, via the use of the RSVP, a defect in human beings' processing ability, which has to do with temporal limitations; as mentioned above this is termed the attentional blink (AB; Raymond et al., 1992). AB is the phenomenon where if a stream of images or letters is presented in the same space in a rapid succession, and the participants are asked to report two images (T1 and T2) they are normally quite accurate in reporting the first target (T1), however, reporting the second target (T2), proves to be quite difficult when it is presented below 500ms from T1 (Einhowser, Koch & Makeig, 2007; Raymond et. al., 1992). The literature disagrees as to the theories behind the AB phenomenon (Shapiro, 2001; Flak et. al., 2009). The purpose of this thesis was not to prove, or disprove, any of the theoretical standing on the AB, as this is beyond the scope of this thesis, and moves into a different field within psychology. However, it is worth briefly mentioning that in Chapter 4 (sex offenders from the Probation Service) an AB was not seen where an increase in accuracy did not occur with the increase in lags between T1 and T2 in Condition 1. Research within AB suggests that increase in intervals (Lags) improves memory recall of stimulus that is to be recalled, where items below 500ms are difficult to recall, and an increase in this improves recollection of targeted items (i.e. T2). In this thesis, lags were 100ms, 200ms and 300ms. this would suggest that an improvement in recall can be demonstrated for each increase in interval. It is not known why this has occurred, and one can only speculate that it may be due to methodological issues, however, it may also have had an impact on the non-significant findings in this Chapter 4, where no effect of child images was found in the sex offenders.

Comparisons between intrafamilial and extrafamilial offenders

The results from the chapters in this thesis does give somewhat conflicting findings for the main hypothesis suggesting the RSVP can be utilised as a tool to test sexual interest in child

sex offenders. It appears that for this particular thesis, this is true only in extrafamilial sex offenders and not intrafamilial sex offenders (as found in Chapter 3), however, this is somewhat conflicting with the findings from the Beech et. al. (2008) study. They reported that both intrafamilial and extrafamilial offenders had a poorer response to T2 images when they were followed by a T1 child image. The findings in Chapter 3 are consistent with the common view that extrafamilial offenders are more deviant than intrafamilial offenders (Beech et. al., 2008; Camilleri & Quinsey, 2008; Flak et. al., 2007). It is possible that the extrafamilial offenders display a stronger attraction towards children as they are often known to have more victims compared with the intrafamilial offenders and PPG studies often show a stronger response towards child stimuli. These findings have important implications for the assessment of sexual interest in child sex offenders. However, more extensive research is obviously needed within this specific area, especially utilising the RSVP with child sex offenders looking at intrafamilial and extrafamilial as separate groups. It is very important to establish the difference in intrafamilial and extrafamilial offenders because of treatment needs, why this difference occurs, and whether it is possible to tap into the intrafamilial offenders' sexual interest in children by the use of the RSVP and how one would go about doing this. However, there are some practical limitations and implications which need to be acknowledged and discussed, as well as a more in depth look into the varying findings of the different chapters and how this will affect future research. I will now examine the following in some detail: anxiety, faking, social desirability, and IQ, procedural and stimulus problems, and the nature of the images used.

Anxiety

As discussed in Chapter 2 there is an issue of anxiety related to the sexual offenders' heightened AB response, and how this could affect their performance proposing that anxiety was the cause of the AB effect not sexual attraction. It was suggested that one of the reasons this may have come about is based on the fact that as their sexual interest in children had been punished by imprisonment, this may have triggered an anxiety-related response. This was examined in detail in Chapter 3, where the results demonstrated that anxiety did not have an impact on the participants' performance. Unfortunately there was not sufficient enough time, or resources, to examine the issue of anxiety in any of the other samples in this thesis, so whether anxiety impacted these participants is unknown. If it did impact, for example, the sex offender sample in Chapter 4, we would have expected to see a heightened AB with images following children as T1, where anxiety would have presumably affected their level of

response. This would have been apparent in their performance and associated findings. With regards to the other 'normative' samples in Chapter 5, 6 and 7, the issue of anxiety should have ideally been looked at to investigate whether anxiety did impact individuals' performance in some ways. Obviously this observation needs to be investigated in future research.

Faking

Another issue mentioned previously, particularly in Chapter 1 and 2, but also throughout the thesis, is the issue of faking which is a common problem with assessment of child sex offenders (Flak et. al., 2009). Other limitations are denial, particularly with measures such as self-report, where denial may be due to the potential social consequences of admitting to such an offence (Jenkins, 1998), with PPG some of the limitations are suppression of sexual arousal and the use of nude child images (Flak et. al., 2007). This is where the RSVP has its benefits in that it appears to be resilient to faking and it is very difficult to suppress conscious sexual arousal towards these images. It is still not known whether it is possible to fake the RSVP as this was never tested directly but due to the way the procedure was designed, the participants would have to realise how the procedure worked and not report the T2 after the 'control' T1 stimulus (the animal), although this is of course possible, it is also very unlikely as it is difficult to figure this out whilst conducting the experiment. It was suggested in Chapter 2 that Condition 2 was also resilient to faking. In this condition the participants did not have to respond to T1 (image of sexual attraction, child, male or female) but only to T2 (chair or train), suggesting that it would be difficult for participants to change their response to T2 based on consciously noticing what T1 was. However, this effect was only seen in female participants in Chapter 6, which looked at the RSVP with a normative sample of males and females. This is an interesting finding, but from this thesis, and the Beech et. al., (2008) study, one can conclude that Condition 2 did not have the ability to detect sexual interest in child sex offenders, but had more the function of a control condition in which one could compare participants performance from Condition 1 to Condition 2 which was very useful in itself. For example, if only Condition 1 was run and performance was on average 50% it would not be known whether the poor performance was due to T1 categorization or whether it was because T2 was too difficult to report in itself. With the inclusion of ignore T1, and report T2 only in Condition 2, the participants are shown the same stimuli as in Condition 1 but they only had to concern themselves about reporting T2. Condition 2, as seen from this thesis and Beech et. al. (2008), have on average a significantly higher accuracy rate which suggest that

instructing the participants to only respond to T2 and ignore T1 induces a significant deficit in T2 performance, whereas if participants performance in this condition also had an average of 50% score, as in for example Condition 1, then this would reveal that T1 categorization would have no significant impact or play no role in T2 identification. Therefore for future research Condition 2 should be a part of the RSVP research but only for the purpose of a control condition to look at participant's performance in Condition 1, and whether the AB effect actually took place.

Social desirability

Social desirability was an important factor that was looked into in Chapter 3, where no effect of social desirability detected in the sample of sex offenders and control group. This is an issue which should have been looked into with the other samples in this study, particularly the sample in Chapter 4, unfortunately due to lack of time and resources this was not possible. However, social desirability is an issue in experimental procedures such as these (Kalmus & Beech, 2005; Flak et. al., 2007), in particular with child sex offenders, such as the sample in Chapter 4. For future research this should be included alongside the RSVP procedure.

IQ

IQ was a factor that was looked into in Chapter 3, where it was observed a general trend in the control group of non-sex offenders to exhibit overall poorer performance in both conditions. This may be a result of various extraneous factors, such as general motivation or IQ. However, all participants were required to fall within or above an IQ cut off point of .70, as measured by the Ammons quick test (1962). This resulted in a generally similar IQ estimates across the groups, although a non-significant trend was observed in the control group. Although it seems reasonable to expect level of IQ to have an effect on overall performance on the RSVP the child-specific enhancement of the AB is independent of such overall differences in performance, providing a measure relative to the individual's overall performance measured when T1 is an animal picture. Indeed, if a pure AB had manifested, all participants, irrespective of T1 category, would have displayed similar accuracies. As a significant discrepancy was noted between the two categories and the hypothesised AB effect occurred in the extrafamilial sex offender group it suggest that an additional factor, such as sexual attraction towards children, produced this discrepancy, suggestive of a deviant sexual interest. With regards to the other chapters in this thesis, although IQ tests were not provided due to lack of resources and time, it further suggests that findings in these chapters were not

affected by level of IQ. However, future research should provide a cutoff point of .70 and look further into whether level of IQ does have an influence on performance on the RSVP with child sex offenders. Research with normative samples should also provide the same measures, to reassure that IQ does not influence performance, as IQ test was not provided for any of the other samples in this thesis it is unknown whether this did influence performance, and should be taken into account in future studies.

Procedural and stimulus problems

Mentioned in previous chapters of this thesis are the potential confounding issues related to the procedure of the RSVP. Many of the participants who took part in the various experiments complained of tiredness and fatigue during the experimental task. This is understandable as the procedure can be quite demanding on an individual's attentional span, it requires focused attention and concentration for an extensive period of time. An attempt was made to counterbalance this effect by providing plenty of breaks, however this may not have been sufficient enough. Fatigue and tiredness or lack of concentration may have influenced the result in the chapters and added some noise to the findings. The overall testing time should have been reduced as opposed to providing breaks, however, this requires a lot of adjustment to the RSVP procedure and needs refinement in the future. Once accomplished, research should look at whether the AB effect of child images in child sex offenders are found with the stimuli presented in short blocks of trials, to enable the participant's attention span completely throughout the experimental procedure (Flak et. al., 2009). Ideally the experimental procedure in total, including both Condition 1, and Condition 2, should last for no longer than 20 minutes including breaks. However, the Polynomial Contrast analysis in Chapter 3 showed no difference in performance comparing Block 1 and Block 2 with Block 3 and Block 4, indicating that for this particular sample, fatigue did not appear to influence response accuracy towards the stimuli.

Nature of the images used

Images used in the RSVP procedures in the present thesis were extracted from various sources. Images used with the sex offenders in Chapter 3 and 4, and the 'new fathers' in Chapter 5, had previously been used in Kalmus' (2003) study and in the Beech et. al., (2008) study, hence were perceived as being fit for the purpose of this thesis. Although the salience of these images should be thought about in future research, for example, in Chapter 3, it was suggested that images of children are more salient and consequently encoded deeper into the

sex offenders' visual short term memory (VSTM; Jolicoeur, 2002, see Shapiro, 2001; Flak et. al., 2009), hence why the AB effect becomes apparent. Another suggestion from one of the reviewers of the Beech et. al., (2008) study pointed out that images of children are more complicated to encode in comparison to the images of animals. However, if this was the case the same findings would be seen in the control group of non-sexual offenders and in 'new fathers' who were all tested on the exact same procedure as the sex offenders. Further, the images of the children depicted various types of children, various ethnicity, age and sex, which may have influenced the result of the study in a pre-set direction. For example, if an offender had a sexual preference of a certain type of a child and this type did not appear within the RSVP stream, they may not have elicited sexual arousal towards the other child images and consequently showed no heightened AB. Although this is not certain it is important to look into this possibility in order to develop a valid and reliable RSVP. For future research it is necessary to get sexual offence history of the offenders, particularly age and sex of the victim, unfortunately most of this was missing from the subjects examined in Chapter 4, but this could also explain the non-significant findings. It would be interesting to tailor the images within the RSVP procedure towards specific types of child sex offenders, taking into consideration their offence history putting weight on victim typology, sex and looks. Interestingly enough, in a very recent meta-analysis by Babchischin et. al., (2010) it was found that most online (i.e., Internet) sex offenders were white Caucasian males, and that the child pornography mostly depicts Caucasian children (Mitchell, Finkelhor & Wolak, 2005).

Images used in Chapter 6 (i.e., normative males and females), should have ideally been tested for attractiveness by an independent source, however, due to limited time this was not done. The attractiveness of the images was judged by the researcher and may of course be biased. Furthermore, the images should also have been weighted with age and ethnicity to ideally suit the average population. All of the previously mentioned issues could potentially have affected the result and should be included in any future research.

Future research and directions

Above, several improvements to this thesis were suggested that could have been made. Of these, probably the most important, would be to improve the RSVP procedure to become more condensed, and easier for the participant to do, to enable them to have the ability to maximize their attention throughout the experiment. The RSVP should also be looked at

concurrently with other measures that have already been established, or are hopefully in the process of becoming established as reliable tools to assess sexual interest in child sex offenders. An interesting and fairly new tool is the Screening Scale for Paedophilic Interests (PPI) developed by Seto and Lalumiere (2001). The PPI is a four-item scale, which assesses and evaluates child sex offenders' characteristics, which include: at least one male victim; offending towards multiple victims; having at least one prepubescent victim; having a victim unrelated to the offender. Several studies (Seto, Harris, Rice & Barbaree, 2004; Seto, Murphy, Page & Ennis, 2003) have found the PPI to significantly correlate with PPG 'diagnosed' paedophilia in both adolescent and adults, it has also been found to predict recidivism in adult child sex offenders. An interesting study would be to look at a correlation between child sex offenders responses towards child images in the RSVP, PPI responses and PPG responses, especially if one were to look at recidivism rate in relation to intra and extra familial offenders, and their scores on the RSVP, PPI and PPG, as PPG studies have also found a difference responses between intrafamilial and extrafamilial offenders where extrafamilial offenders with multiple victims have been observed to exhibit significantly greater deviant arousal to children or lower arousal to adults (e.g. Abel, Becker, Murphy & Flanagan, 1981; Marshall, Barbaree & Butt, 1988; Marshall, Barbaree & Christophe, 1986; Quinsey & Chaplin, 1988; Wormith, 1986). However, extrafamilial offenders with single victims have not been found to demonstrate deviant sexual interest (Freund & Watson, 1991).

Conclusions

Based on the findings from this thesis, and the Beech et. al., (2008) study, it can be concluded that the RSVP procedure has the potential to be a very useful tool in assessing 'deviant sexual preference' (Beech, Fisher & Thornton, 2003). Previous research has looked into benefits and downfalls with the PPG, self-report and various other methods of assessments, whereas now, most researchers and clinicians within this field realise that there is a need for an easy accessible assessment tool that does not have the inherent methodological issues outlined in Chapter 1 and Chapter 2. Research looking into this potential assessment tool is timely, not only in terms of looking into the initial assessment, but also looking at treatment of child sex offenders, where this tool could be used to evaluate sexual interest before and after treatment. However, there are aspects such as practice effects, looked at in Chapter 8, which needs to be investigated and researched in much more detail as to potential impacts on the outcome of assessment. Other practical benefits of the RSVP are that it can be implemented into any setting with access to a computer or a setting where a computer can be brought in, it is very

easy for the researcher to comprehend and use and it is also easy for the participant to understand and do, and IQ, as seen from Chapter 3, should not have an impact on participant performance or ability to take part. This procedure would most likely cause less stress as compared to, for example, the PPG, and most importantly it is believed to be very difficult to fake, however, faking is an issue which has been discussed in detail above and also needs to be considered. In view of the findings in this thesis future research should focus on the RSVP procedure, making it easier to use and easier to do for the participants, focus on the differentiation between intrafamilial and extrafamilial child sex offenders and how this relates to the AB and the significance of this and finally to focus on how this tool can be implemented into a treatment environment of child sex offenders.

APPENDIX A

Script for all participants

Thank you for agreeing to take part in this research. I would just like to remind you of a few things. Firstly, you can withdraw from this research at any point. Any individual data gathered for this research will be held in the strictest confidence and not shared with anyone.

*The research is divided into two parts. The two parts will involve you looking at images on this monitor. Both parts involves you looking at sequences of pictures, each set of 54 sequences (*Dependent upon presentation order). *There will be regular breaks in within sequences and one longer one between the two parts.*

(Dependent upon presentation order)

Experiment 1:

In this part, after each sequence you will be asked to say if you saw an animal or or a child the animal or child button. You will then also be asked to say if you saw a chair or a train and which way it was facing. If you saw a left facing train push 'left train' button, if you saw a right facing train, push 'right train' button. If you saw a left facing chair push 'left chair' button, if you saw a right facing chair, press 'right chair' button. There will be a few trial runs before it starts, and there will be spaces for quick breaks too. Are you ready?

(On completion of the first experiment)
Well done, have a break.

Experiment 2:

In this part, after each sequence you will be asked to say if you saw a chair or a train and which way it was facing . If you saw a left facing train press 'left train' button. If you saw a right facing train, press 'right train' button. If you saw a left facing chair, press 'left chair' button, if you saw a right facing chair, press 'right chair' button. There will be a few trial runs before it starts, and the will be spaces for quick breaks too. Are you ready?

On completion of the second experiment)

Well done and thank you for taking part in this research.

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

APPENDIX G

Script for all participants

Thank you for agreeing to take part in this research. I would just like to remind you of a few things. Firstly, you can withdraw from this research at any point. Any individual data gathered for this research will be held in the strictest confidence and not shared with anyone.

*The research involves you looking at sequences of pictures, each set of 54 sequences (*Dependent upon presentation order).

Experiment 1:

In this part, after each sequence you will be asked to say if you saw an animal or male or female by pushing the animal or male or female button. You will then also be asked to say if you saw a chair or a train and which way it was facing. If you saw a left facing train push 'left train' button, if you saw a right facing train, push 'right train' button. If you saw a left facing chair push 'left chair' button, if you saw a right facing chair, press 'right chair' button. There will be a few trial runs before it starts, and there will be spaces for quick breaks too. Are you ready?

Well done and thank you for taking part in this research.

APPENDIX H

Script for all participants

Thank you for agreeing to take part in this research. I would just like to remind you of a few things. Firstly, you can withdraw from this research at any point. Any individual data gathered for this research will be held in the strictest confidence and not shared with anyone.

*The research is divided into two parts. The two parts will involve you looking at images on this monitor. Both parts involves you looking at sequences of pictures, each set of 54 sequences (*Dependent upon presentation order). *There will be regular breaks in within sequences and one longer one between the two parts.*

(Dependent upon presentation order)

Experiment 1:

In this part, after each sequence you will be asked to say if you saw an animal or male or female by pushing the animal or male or female button. You will then also be asked to say if you saw a chair or a train and which way it was facing. If you saw a left facing train push 'left train' button, if you saw a right facing train, push 'right train' button. If you saw a left facing chair push 'left chair' button, if you saw a right facing chair, press 'right chair' button. There will be a few trial runs before it starts, and there will be spaces for quick breaks too. Are you ready?

(On completion of the first experiment)
Well done, have a break.

Experiment 2:

In this part, after each sequence you will be asked to say if you saw a chair or a train and which way it was facing . If you saw a left facing train press 'left train' button. If you saw a right facing train, press 'right train' button. If you saw a left facing chair, press 'left chair' button, if you saw a right facing chair, press 'right chair' button. There will be a few trial runs before it starts, and the will be spaces for quick breaks too. Are you ready?

On completion of the second experiment)

Well done and thank you for taking part in this research.

APPENDIX I

Letter of Information and Invitation to Research

We are in the process of developing two separate computer programmes to assess visual attention to a range of different pictures. I would be grateful if you would be willing to take part in a trial of the programmes.

Programme 1:
The computer program displays a sequence of pictures, including animals, males, females, trains, chairs and scenery. Participants are then asked whether certain pictures were present in the sequence. The program takes about 30 minutes to complete, including breaks.

All data gathered will be tagged by a code number (so that an individual or individuals cannot be identified). At no point will you be named as someone who has taken part in this research. This also means that you will not be allowed to access the data at any time in the future. All data will be kept in a secure place.

Your participation in this research is completely voluntary, nothing will happen if you choose not to take part. You are also free to withdraw from the research at any point, if you so choose.

Thank you for considering taking part in this research.

Please complete and sign the participation statement.

Participant
I wish to take part in this research

Name (printed)……

Signed …… Dated……..

Researcher
Name (printed)……..

Signed…….Dated……..

APPENDIX J

De-briefing for Participants.

This experiment looks into people's sexual interest by their responses to the differing images.

The identity of the individuals who have participated in this research will not be revealed under any circumstances, it is entirely confidential. If you have any other questions please don't hesitate to ask.

Thank you very much for your time and effort in participating in this research.

Sincerely,

Vanja Flak

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APPENDIX K

[Not available in the digital version of this thesis]

APPENDIX L

[Not available in the digital version of this thesis]

APPENDIX M

INFORMATION AND INVITATION TO PARTICIPATE IN RESEARCH

Before this research is explained to you please let the researcher know whether you suffer from epilepsy, as if you do, unfortunately you will not be able to participate in this research.

We are in the process of developing a computer program to assess visual attention to a range of differing pictures. This computer program will measure individuals' general interest in different images. It is important that you are aware that some of the images used in this research are pictures of nude or in swimming costumes of males and females (non-pornographic), if this makes you feel uncomfortable in any way feel free to withdraw from this experiment at any time, no questions will be asked as of why. Other images will include animals, chairs, trains and other daily objects.

The purpose of your research is to understand how different images affect performance on the task.

If you choose to take part in this research the information you provide will be confidential, it will remain anonymous, with no name appearing on the paperwork. This will be done by tagging all information with a code number so that an individual cannot be identified. At no point will you be named as someone who has taken part in this research.

All information will be kept in a secure place. Any information gathered for this research will be in the strictest confidence and not divulged, under any circumstances.

Your decision to take part in this research is entirely voluntary. There will be no negative consequences if you decide not to consent. The decision is entirely yours. If you decide to withdraw from the research at any point, you may do so, further, if you wish the data can be withdrawn and destroyed, if requested, up until publication.

<u>What will I be asked to do?</u>

You will be asked to look at images of nude and swimming costume clothed males and females, animals, chairs, trains, nature scenes and other daily objects that will flash up on the computer screen. You will then be asked to say whether you have seen a male, female or an animal and/or a chair or a train by pressing the corresponding button on the keyboard.

The tasks are divided into two separate parts, with lots of breaks in between. It will take you approximately 30 minutes to complete.

CONSENT TO PARTICIPATE IN THE RESEARCH

If you are happy to volunteer to take part in the research then please sign and date the form below. In signing this form, it means that you understand that you have voluntarily agreed to participate in the research.

Participant

I wish to take part in this research

Name (printed)……

Signed …… Dated……..

Researcher/Signed in the Presence of

Name (printed)……..

Signed…….Dated……..

APPENDIX N

De-briefing for Participants.

This experiment looks into people's sexual interest by their responses to the differing images. The experiment also looks into the validity and reliability of the procedure, hence why you have conducted the experiment on two separate occassions.

The identity of the individuals who have participated in this research will not be revealed under any circumstances, it is entirely confidential. If you have any other questions please don't hesitate to ask.

Thank you very much for your time and effort in participating in this research.

Sincerely,

Vanja Flak

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