An investigation into the relationships between adult attachment dimensions and information processing

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Declaration

I declare that this thesis is an original piece of academic work and has not been submitted for any other degree or to any other institution.

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Word Count

Section	Word Count
Systematic review	8,578 words (excluding references and appendices) 10,600 words (including references)
Empirical paper	11,308 words (excluding references and appendices) 13,476 words (including references)
Total	19,886 words (excluding title pages, references and appendices) 29,896 words (including title pages, references and appendices)

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Abstract for whole thesis

Literature review: This systematic review synthesised and critically evaluated 34 studies, which had investigated the relationships between adult attachment dimensions and attentional processes, to test theoretical assertions of attachment-related differences in information processing. Specifically, empirical data were examined to investigate the evidence for the hyperactivating and deactivating strategies associated with attachment anxiety and avoidance, respectively. Results showed mixed empirical support for these strategies and the authors' offered different interpretations of similar data patterns. Further methodological limitations are discussed, such as predominant recruitment from student populations, as are implications for clinical practice and future research.

Research report: A cross-sectional study was conducted to investigate the indirect effect of schizotypy characteristics on the relationships between adult attachment dimensions and cognitive flexibility, within a parallel mediator model. The relationships between adult attachment dimensions and schizotypy characteristics were also examined, and this study was the first to include a dimensional measure of attachment disorganisation in adulthood. Four-hundred-and-nine university students completed three online questionnaires of adult attachment dimensions and schizotypy characteristics. Subsequently, 48 of these participants agreed to complete a laboratory-based cognitive switching task, to measure attachment-related differences in cognitive flexibility. Results showed that conditions were not met for mediation analyses and therefore the parallel mediator model was not confirmed. However, attachment anxiety was strongly correlated with cognitive disorganisation, whereas attachment avoidance was strongly correlated with introvertive anhedonia. The relationships between attachment disorganisation and schizotypy were less specific. Theoretical and clinical implications are discussed as are key methodological limitations, such as small number of participants for mediation analyses.

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Finally, I would like to thank my family and friends for their continued support, since I left home at 18 to pursue a career in psychology! It has been a long time coming and I am very grateful to you all for pretending that you understood the route into the clinical psychology profession. Thank you.

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Contents

Section 1: Literature Review

A systematic review of the relationships between adult attachment and automatic attentional processes

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Abstract

Objectives. This systematic review aimed to examine the literature on the relationships between adult attachment dimensions (anxiety and avoidance) and automatic attentional processes, and to compare empirical findings to the proposed secondary strategies within the integrative model of the activation and dynamics of the attachment system.

Method. Systematic searches for papers that used quantitative methodology were conducted on the PsycInfo, Scopus, Web of Science, EThOS, and ProQuest databases. The search terms were '(attachment) AND (attention* OR process* OR cogniti* OR executive) AND (relationship* OR correlat* OR association* OR mediat* OR moderat* OR regress*)'. Inclusion and exclusion criteria and quality assessment checks were applied.

Results. Searches yielded 34 studies within 21 eligible results. Different attentional tasks and experimental procedures were employed, with undergraduate students predominantly recruited for studies. Studies showed attachment anxiety and avoidance were not consistently associated with hyperactivating and deactivating strategies, as measured by attentional tasks, respectively.

Conclusions. Findings do not consistently support theoretical assumptions. Methodological limitations also hinder generalisability of findings. Future research should consider alternative methods to examine the relationships between adult attachment dimensions and automatic attentional processes.

Key practitioner points.

- Caution should be taken when extrapolating findings from this review to clinical groups and practice.
- This review raises doubts about theoretical claims and the adequacy of research methods.

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1. Introduction

1. 1. Attachment theory and information processing

Attachment has been defined as "the propensity of human beings to make strong affectional bonds to particular others" (Bowlby, 1977a, p. 201); a bond that has long been associated with proximity seeking, nurture and survival in times of threat (Bowlby, 1980). Earlier observational studies provided empirical support for Bowlby's attachment theory (Ainsworth, Blehar, Salter, Walters, & Wall, 1978), a theory that proposed that early parent-child interactions shaped unconscious internalised working models (IWMs), or cognitive schemas, that guided attention to attachment-related social information (Maier, Bernier, Pekrun, Zimmerman, & Grossmann, 2004).

Theoretically, IWMs provide individuals with rules for engaging, organising and making sense of the self and others. It has long been argued that qualitative differences in attachment experiences influence biases in these internalised rules (Bowlby, 1980). Bowlby's "information processing approach to defence" outlined these biases between insecurely and securely attached individuals (Bowlby, 1980, p.41).

In Bowlby's model (Bowlby, 1980), information processing referred to a series of stages of selecting, interpreting and appraising information, before it influenced mood and behaviour. Information was thought to be matched to previously stored information, with most of the processing carried out quickly and outside of awareness. However, Bowlby also discussed how the exclusion of some information, as a defence against distress, could be maladaptive – with significant information or events permanently excluded from awareness. The notion of stages of information processing supported the view that information could be excluded during processing before it reached an individual's awareness – known as "defensive exclusion" (p.43).

It was suggested that individuals with insecure attachment experiences learned to deactivate or filter out social information that previously caused emotional pain

(Bowlby, 1980). Consequently, such individuals were thought to limit their attention and memory of attachment-related information, and misinterpret information based on previous expectations (Bowlby, 1980).

1.2. The development of attachment 'styles'

As mentioned, Ainsworth and colleagues conducted earlier observations of infant and caregiver reactions to separation and reunion (Ainsworth et al., 1978). Consequently, the infants' patterns of behaviour, in response to their caregivers, were categorised into three attachment 'styles': secure, anxious-ambivalent and anxious-avoidant. Main and Solomon (1990) later outlined a fourth style, named disorganised. Subsequently, the developmental psychological approach continued to investigate the categorisation of attachment behaviours within adulthood by 'styles'. Resultantly, four adult attachment styles were proposed: secure, preoccupied, dismissing and fearful, which largely resembled the secure, anxious-ambivalent, anxious-avoidant and disorganised styles, respectively (Bartholomew, 1990).

However, in contrast to infant work, the social psychological approach to attachment in adulthood has taken the fundamental assumption that individual differences in adult attachment are best conceived along two 'dimensions': 'avoidance' of intimacy and 'anxiety' about abandonment and rejection (Brennan, Clark, & Shaver, 1998; Mikulincer & Shaver, 2006). This dimensional approach diverged from the categorical approach of attachment 'styles' (Ainsworth et al., 1978; Bartholomew, 1990), see figure 1. Variation on these attachment dimensions between individuals indicates differences in attachment affect-regulation strategies.

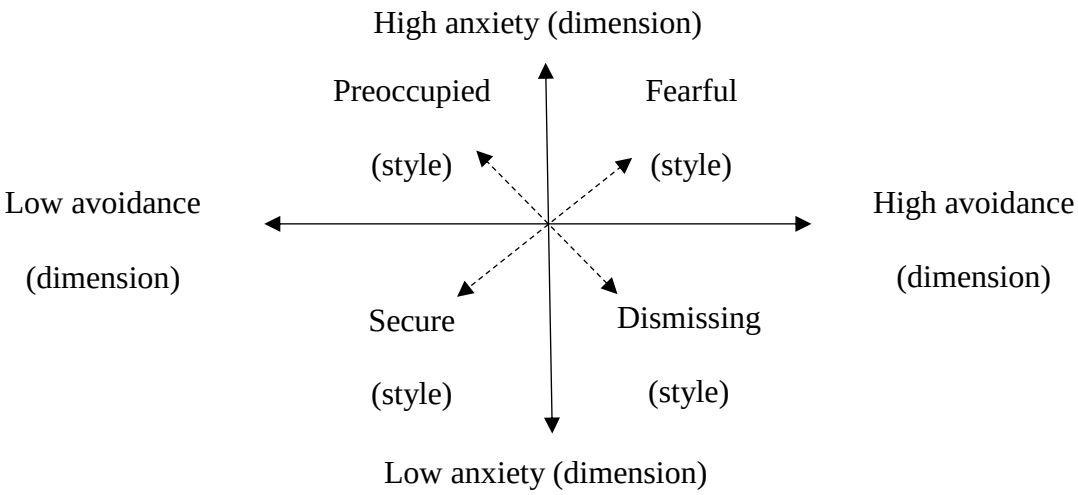

Figure 1. Dimensional and categorical attachment concepts.

1.3. Information processing and attention

As discussed, Bowlby proposed that insecure attachment experiences impacted attention to attachment-related information. Attention refers to the ability to selectively process certain information whilst ignoring other information. Previous theorists have proposed a non-unitary system of attention that differentiates between central attention and peripheral attention (see Fougnie, 2008, for a review). Central attention refers to goal- and rule-focused processes that are cognitively controlled (i.e., top-down processes). Peripheral attention refers to more automatic processes engaged with input from the external world (i.e., bottom-up processes) – more akin to the unconscious processes described by Bowlby's model (1980). In their review, Tamber-Rosenau and Marois (2016) suggested a hierarchy of several mechanisms between central and peripheral, rather than a dichotomy, which resembled Bowlby's discussion about several stages of attention and defensive exclusion.

Measurement of attentional processes has typically relied on experimental methods, such as cognitive tasks, to examine automatic attentional processes (e.g., recording reaction times to experimental stimuli). Notably, these tasks have been used

to examine the relationships between automatic attentional processes and different adult attachment styles/dimensions, by presenting attachment-related stimuli, to measure the degree to which they disrupt typical attentional processes.

1.4. The integrative model of the activation and dynamics of the attachment system

A theoretical model that has provided conceptual links between adult attachment dimensions and attention to attachment-related information is the integrative model of the activation and dynamics of the attachment system (IMDAS; Mikulincer, Shaver, & Pereg, 2003; Shaver & Mikulincer, 2002). The IMDAS has attempted to characterise these affect-regulation strategies in three parts. First, an individual monitors and appraises threat; perceived or actual threat then activates the attachment system, and attention becomes focused on proximity-seeking to the attachment figure. This is known as the *primary attachment strategy*. Second, an individual monitors and appraises attachment figure availability. Consistent attachment figure availability strengthens *security-based strategies* over time (e.g., greater resilience in times of distress and an ability to depend on others for support). Third, previous experiences of repeated attachment figure unavailability lead to attachment insecurity. Consequently, concerns regarding attachment figure availability dominate attention and result in the development and use of effective, but maladaptive, *secondary attachment strategies* (i.e., hyperactivating and deactivating strategies).

Within the third part of IMDAS, these hyperactivating strategies involve constant hypervigilance, clinging and controlling responses, and an overdependence on attachment figures. Theoretical assumptions posit that high attachment anxiety yields greater interference to attentional processes (Mikulincer et al., 2003). Theoretically, hyperactivating strategies are consequences of inconsistently responsive (e.g., unavailable or intrusive) attachment figure experiences, and are more commonly characteristic of those with relatively high attachment anxiety (Myhr, 2014).

Conversely, deactivating strategies are consequences of consistently unresponsive attachment figure experiences, and more commonly characteristic of those with relatively high attachment avoidance (Myhr, 2014). These deactivating strategies have been described as an exaggerated self-reliance and independence, suppression of need, and avoidance of closeness, intimacy and dependency. High attachment avoidance is thought to yield less interference to attentional processes (Mikulincer et al., 2003). Mikulincer et al. (2003) recommended that further confirmatory evidence was required for IMDAS, particularly within clinical populations.

Further review of the secondary strategies within IMDAS is important and relevant for clinicians in mental health settings. Evidence has suggested that individual differences in attachment insecurity can impact upon the development of psychopathologies, such as anxiety, depression and psychosis phenomena (Platts, Tyson, & Mason, 2002). Therefore, individual differences in information processing, of attachment-related threat, might be of interest (e.g., for understanding underlying cognitive mechanisms within psychological formulation). Furthermore, clinical guidance for practitioners working within adult mental health services has presented the secondary strategies as evidenced individual differences (Danquah & Berry, 2014), hence a comprehensive review of the evidence, albeit delayed, seems sensible.

Dykas and Cassidy (2011) provided a lifespan review of the relationships between attachment and social information processing (i.e., attention, memory and attributions), using Bowlby's information processing approach to defence model as a theoretical framework. Dykas and Cassidy's review showed differences between individuals high in attachment security and attachment insecurity. However, they were hesitant to draw conclusions for individual differences in information processing within those individuals higher in attachment insecurity. Whilst their review was

comprehensive, and provided a detailed critical examination, it was not systematic and a search strategy for the included papers was not outlined.

1.5. Review aims

This current review will systematically and critically appraise the quantitative research that examines the relationships between adult attachment dimensions (i.e., attachment anxiety and avoidance) and attention, with a focus on the third part of the IMDAS. Given the theoretical assertions that (i) painful material is driven out of consciousness (Bowlby, 1980), and (ii) recurrent use of secondary strategies creates implicit pathways (Mikulincer et al., 2003), this review will focus on automatic attentional processes. Specifically, this review will examine whether the automatic attentional processes, hypothesised within the third part of the IMDAS (Mikulincer et al., 2003; Shaver & Mikulincer, 2002), hold according to the available empirical data. Therefore, only studies that have provided behavioural data will be included. However, it is hard to predict what behavioural data patterns would indicate hyperactivating and deactiviating strategies, because the minimal evidence for IMDAS that was provided by Mikulincer et al. (2003) was contradictory. That is, the evidence they proposed suggested that faster reaction times on tasks indicated hyperactivating and deactivating strategies, as did slower reaction times, within two separate studies (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Gillath, & Shaver, 2002). Therefore, in what way researchers have reconciled these contradictions, and what predictions they have made, will be of interest. Finally, clinical and theoretical implications will be discussed, as will recommendations for future research.

2. Method

2.1. Search strategy

Electronic literature searches of PsycInfo, Scopus, Web of Science, EThOS, and ProQuest were conducted between August and October 2016. The search terms used

were '(attachment) AND (attention* OR process* OR cogniti* OR executive) AND (relationship* OR correlat* OR association* OR mediat* OR moderat* OR regress*)'.

2.2. Screening and selection

Database searches yielded 779 results, of which 155 duplicate results were removed. The titles and abstracts of the remaining 624 results were screened for relevance to this review, of which 25 were deemed potentially relevant. Subsequently the references of these 25 results were hand-checked for additional results, which yielded a further 22 results. Therefore, a total of 47 articles were assessed for eligibility.

2.3. Eligibility assessment

Studies were eligible if they met the following inclusion criteria: (1) written in English[1]; (2) access to full-text version[2]; (3) an empirical study; (4) participants were aged ≥16 years; (5) adult attachment dimensions as predictors or moderators of attention were examined; (6) dimensional measures of attachment were used, in line with the social psychological perspective; and (7) automatic attentional processes were measured using reaction time data. Consequently, 21 results were eligible for review, which included 36 individual studies (8 results reported multiple studies). Thirty-four of these 36 studies were deemed relevant and included within the review. Figure 2 outlines the search process, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009).

2.4. Quality assessment

The methodological quality of the eligible papers was assessed using the Downs and Black (1998) checklist. The quality of a study refers to "the degree to which a study employs measures to minimize bias and error in its design, conduct and analysis"

[1] Requests for versions written in English were made via e-mail to corresponding authors.
[2] Full access was defined as access to the entire research article, as opposed to title and abstract only. Full access was sought through the University of Sheffield's library system and inter-library loan requests.

(Khan, Kunz, Kleijen, & Antes, 2011, p. 39). The Downs and Black checklist was adapted for the purpose of this systematic review (see Appendix A). Thirteen checklist items that related to intervention studies were removed, and an additional item was developed to address the assessment of rigour and replicability of eligible studies[3]. The face validity of this additional item was checked by two third-year trainee clinical psychologists. Papers were scored either 0 or 1 for each item. The maximum score possible was 15. Subsequently, quality cut-off scores were applied[4]: ≤ 7 (Poor), 8-10 (Fair), 11-13 (Good), and 14-15 (Excellent). All 34 individual studies were quality assessed by the author and for the 8 results with multiple studies mean quality scores were given. An independent third-year trainee clinical psychologist rated a random 40% selection of results (n = 8) to confirm inter-rater reliability of the quality assessment. Intraclass correlation coefficient[5] yielded a score of .882 (95% CI: .403 - .976), which suggested strong agreement between raters (Field, 2014). Quality rating scores can be found in Tables 2-7. See Appendix B for full quality assessment grids, completed by the author and independent trainee clinical psychologist.

2.5. Final studies

No results were removed following quality assessment. Study quality ratings ranged from fair to excellent. Thirty-four individual studies, from 21 results, were included within this review.

[3] The additional item was 'Item 4: Are the attention tasks clearly described?'
[4] Quality cut-off scores were based on Hooper, Jutai, Strong and Russell-Minda (2008), and Woodward (2015).
[5] Calculations were performed on IBM SPSS v.23. The model was two-way mixed (due to fixed rater, but random papers) and the type was absolute agreement. The 'average measures' row within the intraclass correlation coefficient table was examined for interpretation.

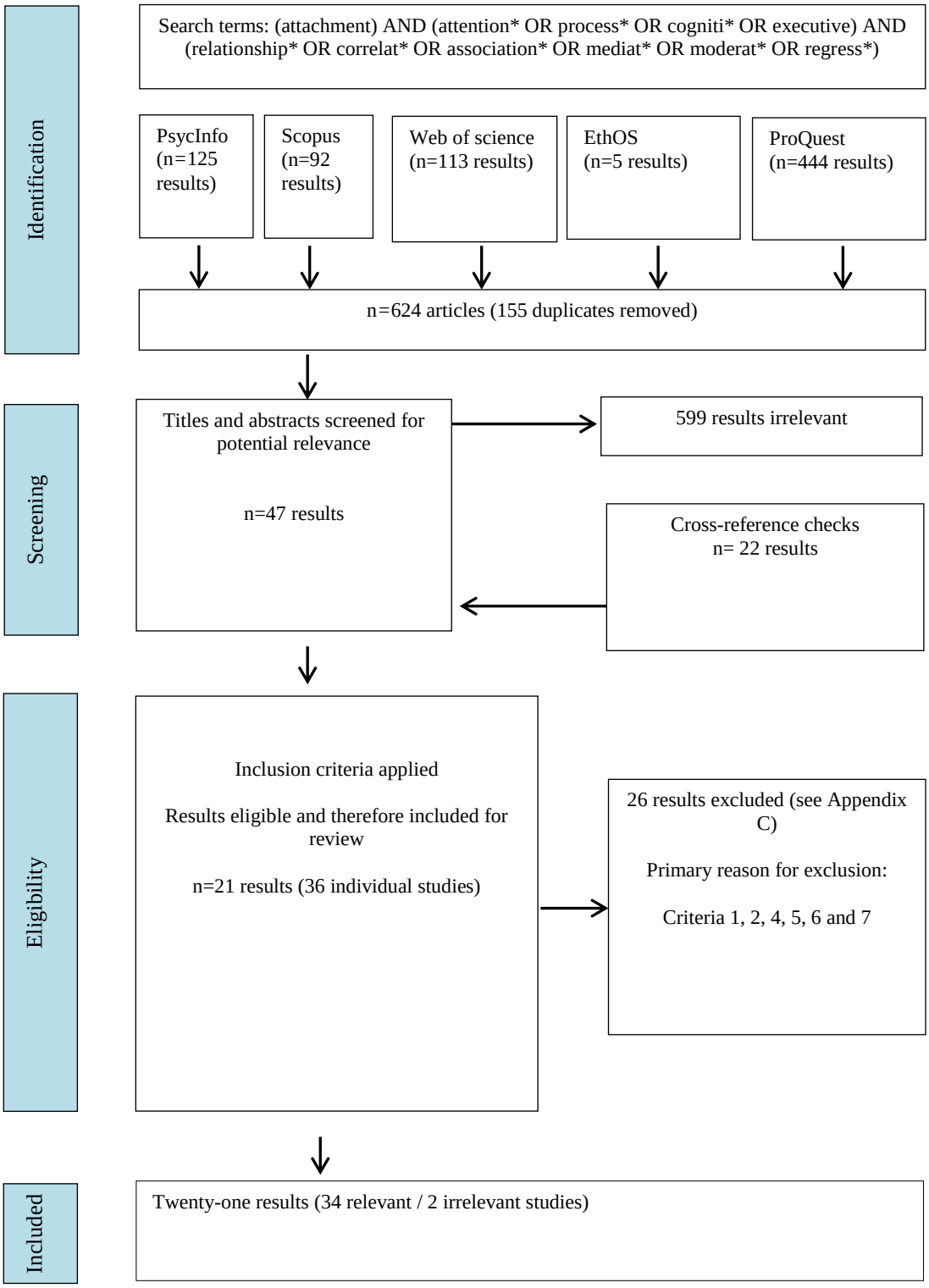

Figure 2. PRISMA diagram.

3. Results

3.1. Overview of studies

The 21 results described a range of attention tasks to investigate attachment-related differences in automatic attentional processes (see Table 1). Samples sizes varied, from 25 to 320 participants (*Median* = 97). Most published results recruited university students; 15 of the 21 results recruited only from this population. Four results also recruited from the general population; two of these results were unpublished dissertations (David, 2009; Woodward, 2015). Two results recruited solely from clinical populations (Davis, Fani, Ressler, Jovanovic, Tone et al., 2014; Fang, Hoge, Heinrichs, & Hofmann, 2014).

Dimensional measures of attachment were used, including the Experiences in Close Relationships (ECR) questionnaire (Brennan, Clark, & Shaver, 1998), Relationship Questionnaire (Bartholomew & Horowitz, 1991), Relationship Style Questionnaire (Griffin & Bartholomew, 1994a), a revised version of the ECR questionnaire (Fraley, Waller, & Brennan, 2000), the Attachment Style Questionnaire (Feeney, Noller, & Hanrahan, 1994) and an adapted measure from Mikulincer, Florian and Tolmacz (1990). Two results also used the Adult Attachment Interview (AAI) and Attachment Style Scale, categorical measures of attachment.

Sixteen results used primes to activate the attachment system (see tables 2-7), whereas 5 results did not. Primes either occurred immediately prior to the attention task, or were embedded into attention tasks and presented before a target stimulus; except for one prime that was used between two attention tasks (David, 2009). Eleven results administered attachment measures with attention tasks in one sitting, while 10 results administered attachment measures prior to attention tasks across two sittings. The task target stimuli for 11 results were pictures, whereas the remaining 10 results used words.

Fourteen results predicted differences in attentional processes, as a function of attachment style, according to the third part of IMDAS. However, as aforementioned in section 1.5, it was unclear what behavioural data patterns would confirm these strategies. Two results took exploratory approaches. Five results did not predict differences based on IMDAS. Different attention tasks were performed to measure automatic attentional processes. Table 1 specifies the different attention tasks that were used.

Table 1.

Attention tasks

Task type	No. of results (no. of studies)
Emotional Stroop (Stroop, 1938; Williams, Mathews, & Macleod, 1996)	6 (7)
Spatial Cueing (Posner, 1980)	4 (6)
Dot-Probe (Macleoud, Mathews, & Tata, 1986)	3 (6)
Lexical Decision (Meyer & Schvaneveldt, 1971)	2 (5)
Oddball (Squires, Squires, & Hillyard, 1975)	2 (2)
Others	5 (8)
Totals	22[6] (34)

3.1.1. Emotional Stroop tasks. Individual sets of words were presented in 1 of 2 colours. Participants had to judge the colour of the word. Faster reaction times (RTs) indicated less interference to attention, whereas slower RTs indicated greater interference.

Six results involved the emotional Stroop task (see Table 2). Five results predicted or explored variation in attentional processes as a function of different

[6] One result used an emotional Stroop task and a lexical decision task, hence the total of 22 and not 21 results.

attachment styles, whereas 1 did not (David, 2009). Mikulincer et al. (2002, study 3) reported that attachment anxiety was associated with heightened accessibility of attachment figure representations (i.e., slower RTs) in all prime contexts and attachment avoidance was associated with reduced accessibility (i.e., faster RTs) in threat contexts. Mikulincer, Dolev and Shaver (2004) confirmed that attachment avoidance was associated with an ability to suppress separation-related thoughts (i.e., faster RTs), which was weakened under a high cognitive load condition. Similarly, Edelstein and Gillath (2008) confirmed that attachment avoidance was associated with deactivating strategies (i.e., faster RTs) in attachment threat contexts, but only for participants in romantic relationships and under low cognitive load. Bailey, Paret, Battista, and Xu (2012) confirmed that attachment anxiety was associated with greater immediate interference (i.e., slower RTs) to attention to interpersonal-threat stimuli, moderated by weaker top-down control.

Conversely, Stroscio (2007) did not confirm predictions that attachment anxiety and avoidance were associated with slower and faster RTs respectively, and David (2009) did not show attachment style differences to attention during analysis. He had predicted that attachment insecurity would be associated with greater perseveration (i.e., slower RTs).

Table 2.

Data extraction table: Emotional Stroop task studies

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
*Mikulincer et al., 2002 (3 studies)	University students (*N* = 210), 74% female, Israel	(Study 3) Stimuli: Words (names: attachment figures, closer persons, known persons and unknown persons) Prime(s): Random allocation to 1 of 3 priming conditions (threat, separation, neutral). Embedded prime words were Hebrew versions of *failure*, *separation* and *hat* respectively.	ECR (Hebrew version)	**Findings:** High attachment anxiety was associated with slower RTs in all prime contexts, whereas high attachment avoidance was associated with faster RTs in stress contexts. **Author interpretation:** Attachment anxiety was associated with heightened accessibility of attachment figure representations in all prime contexts, whereas attachment avoidance was associated with reduced accessibility in threat contexts.	11 [a] , 10 [b] (Good/fair)
*Mikulincer et al., 2004 (2 studies)	University students (*N* = 320), 69% female, Israel	Stimuli: Words (separation, negative, neutral) Prime(s): Participants wrote a brief description of a separation or break-up from a romantic partner (study 1) or a neutral event (study 2) Effortful task: 2 cognitive load conditions (7-digits vs 1-digit)	ECR (Hebrew version)	**Findings:** High attachment avoidance was associated with faster RTs. **Author interpretation:** Attachment avoidance was associated with an ability to suppress separation-related thoughts. This ability was weakened under high cognitive load, and subsequently negatively impacted upon self-image.	11 [a] (Good)
Stroscio, 2007 (Thesis)	University students (*N* = 223), 81% female, USA	Stimuli: Words (attachment negative-positive, neutral, colours) across 5 tasks Prime(s): None	ECR-R, RQ	**Findings:** Whilst participants showed faster RTs to neutral stimuli, there were no differences based on attachment dimensions. **Author interpretation:** Significant findings might have emerged under conditions of attachment system activation.	14 [a] (Excellent)

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
Edelstein & Gillath, 2008	University students (*N* = 189), 43% female, USA	Stimuli: Words (attachment-positive/negative, positive/negative, neutral) Prime(s): None Effortful task: Random allocation to 1 of 2 cognitive load conditions (7-digits vs 1-digit)	ECR	**Findings:** High attachment avoidance was associated with faster RTs to attachment-related stimuli when participants were in a relationship. Strategies were weakened (slower RTs) under high cognitive load. **Author interpretation:** Deactivating strategies were associated with attachment avoidance. These strategies were effortful and more readily activated amongst those in relationships.	11 [a] (Good)
*David, 2009 (Thesis) (3 studies)**	University (91%) and general populations (*N* = 54 - same participants for both studies), 48% female, USA	(Study 3) Stimuli: Words (positive, negative, neutral) Prime(s): 45 minute audiostressor in which participants were guided through 3 attachment-threat scenarios	AAI, RQ, RSQ, ECR-R	**Findings:** No attachment style differences in attention. **Author interpretation:** Potential methodological limitations (small *N*) or a lack of distinctive cognitive processing by insecure individuals.	14 [a] (Excellent)
Bailey et al., 2012	University students (*N* = 137), 81% female, Canada	Stimuli: Words (interpersonal-threat, positive, neutral) A traditional Stroop task measured top-down control. Prime(s): None	ECR	**Findings:** High attachment anxiety was associated with immediate interference (i.e., slower RTs) to interpersonal-threat stimuli; only for those with weaker top-down control. Low attachment anxiety was associated with delayed interference (i.e., slower RTs to neutral words subsequent to threatening stimuli). **Author interpretation:** Immediate interference was associated amongst a subgroup of individuals with high attachment anxiety and weaker top-down control.	13 [a] (Good)

Notes. * = papers with multiple studies; ** = two studies were irrelevant; [a] = rated by author; [b] = independently rated; AAI = Adult Attachment Interview (George, Kaplan, & Main, 1985); ECR = Experiences in Close Relationships Scale (Brennan, Clark, & Shaver, 1998); ECR-R = Experiences in Close Relationships Scale - Revised (Fraley, Waller, & Brennan, 2000);

3.1.2. Spatial cueing tasks. A target stimulus was presented on a screen in 1 of 2 locations, cued by a picture of a face (emotion vs. neutral). A face preceded the target in either the same location (i.e., valid trial) or the other location (i.e., invalid trial) as the target. The participant had to locate the target as quickly as possible. Authors examined whether the preceding faces produced interference by measuring the cue validity effect[7], attentional engagement[8] or attentional disengagement[9]. A positive score indicated attention was directed more towards the cue (i.e., face).

Four results used this task (see Table 3). Two results explored or predicted variation in attentional processes as a function of different attachment styles (Cooper, Rowe, Penton-Voak, & Ludwig, 2009; Woodward, 2015). Two results tested other hypotheses (Dewitte & De Houwer, 2008; Fang et al., 2014). Cooper et al. (2009). conducted three studies and could not replicate findings. They found that attachment anxiety moderated the cue validity effect for happy faces (study 1), attachment avoidance moderated the cue validity effect for angry faces (study 2), and null findings (study 3). There were no associations between attachment anxiety and allocation of attention (i.e., engagement or disengagement). Woodward (2015) did not confirm that attachment anxiety was associated with faster engagement to and slower disengagement from threatening faces, nor that attachment avoidance was associated with slower engagement and faster disengagement. Dewitte and De Houwer (2008) predicted and confirmed that attachment anxiety and avoidance interacted to produce decreased attention to angry faces. Finally, Fang et al. (2014) found that attachment avoidance was associated with faster RTs to disgust and neutral faces but not happy faces when participants were given oxytocin, a drug thought to improve emotion recognition and attachment perception.

[7] Cue validity effect calculation: RTs on invalid trials – RTs on valid trials
[8] Attentional engagement calculation: RTs on neutral valid trials - RTs on emotional valid trials
[9] Attentional disengagement calculation: RTs on emotional invalid trials - RTs on neutral invalid trials

3.1.3. Dot-probe tasks. Two objects were presented on screen simultaneously (e.g., words or pictures). One object was attachment or affect-related and the other was neutral. These objects were removed and replaced with a dot probe in the attachment/affect-related (i.e., congruent trial) or neutral (i.e., incongruent trial) location. This task measured attentional biases associated with the attachment/affect-related or neutral objects that preceded the dot probe target[10].

Three results used this task (see Table 4). Two of these results predicted variation in attentional processes as a function of attachment styles consistent with the secondary strategies. Dewitte, De Houwer, Koster, and Buysee (2007) did not replicate the significant association between attachment anxiety and increased attention bias to attachment names (i.e., faster RTs on congruent trials compared to incongruent trials). Whereas, Dewitte, Koster, De Houwer, and Buysee (2007) found that high attachment anxiety and avoidance interacted to predict avoidance of attachment-related threat words, i.e., allocating attention to locations opposite to threat (Cisler & Koster, 2009). Moreover, Davis et al. (2012) predicted that high attachment anxiety and avoidance would interact with child maltreatment history to predict attentional bias away from happy and threatening stimuli. They found that attachment anxiety predicted attentional avoidance of happy faces, but interacted with child maltreatment to predict attentional avoidance of threat faces.

3.1.4. Lexical decision tasks. Individual words and nonwords were presented to participants, who had to categorise them as such. Faster RTs to attachment-related words suggested increased attention or accessibility to attachment representations, whereas slower RTs indicated inhibited access.

Two results used this task (see Table 5). The results took exploratory approaches and were published prior to Mikulincer et al. (2003). Mikulincer et al. (2000) found

[10] Attentional bias scores are calculated by subtracting the mean RT score on congruent trials from the mean RT score on incongruent trials.

consistently that attachment anxiety was associated with increased accessibility (i.e., faster RTs) to proximity and distance-related words. However, attachment avoidance was associated with decreased accessibility (i.e., slower RTs) to attachment-related words, unless the stress prime was combined with high cognitive load. Mikulincer et al. (2002) found that attachment anxiety was also associated with increased accessibility to attachment figure names, even in non-threatening contexts, and that attachment avoidance was only associated with deactivation in attachment-threat contexts.

Table 3.

Data extraction table: Spatial cueing task

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
Dewitte & De Houwer, 2008	University students (*N* = 42), 67% female, Belgium	Stimuli: Pictures (a black square) Prime(s): Angry, happy and neutral faces precede the target in valid or invalid trials.	ECR-R	**Findings:** High attachment anxiety and avoidance interacted to reduce attention to angry faces. **Author interpretation***:* High attachment anxiety and avoidance mirrored the 'fearful' categorical style and therefore results might represent fear and distancing from threatening stimuli.	9 [a], 10[b] (Fair)
*Cooper et al., 2009 (3 studies)	University students (*N* = 211), 65% female, UK	Stimuli: Pictures (shapes: square or circle) Prime(s): Angry, happy, sad and neutral faces	Study 1: ECR Study 2 & 3: ECR & ECR-R	**Findings:** Results could not be replicated and indicated no associations between different attachment styles and allocation of attention. **Author interpretation:** Inconclusive evidence or possible limitations with the attention task.	12 [a] (Good)
Fang et al., 2014	Clinical population (*N* = 54), 100% male, USA	Stimuli: Pictures (letters 'E' or 'F') Prime(s): Happy, disgust and neutral faces Other task: Cyberball task[11]	ECR	**Findings:** High attachment avoidance was associated with faster RTs to disgust and neutral faces. **Author interpretation:** Oxytocin sped up detection of disgust and neutral faces amongst individuals with high attachment avoidance.	13 [a], 10[b] (Good/fair)
Woodward, 2015 (Thesis)	University and general populations, 75 couples (*N* = 75), 100% female, UK	Stimuli: Pictures (letters 'E' or 'F') Prime(s): Happy and angry faces	ECR	**Findings:** No significant differences in attentional biases for the two attachment dimensions. **Author interpretation:** Attachment dimensions did not predict differences in attentional biases.	14 [a, b] (Excellent)

[11] A computerised ball tossing game: Participants are led to believe they are playing with other players in real time. This task is used to simulate and manipulate social rejection (via number of received ball tosses and subsequent tosses to players).

Table 4.

Data extraction table: Dot-probe task

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
Dewitte, Koster et al., 2007	University students (*N* = 39), 82% female, Belgium	Stimuli: Object (Dot-probe) Prime(s): Threat, attachment-threat, positive, attachment positive words	ECR-R	**Findings:** No main effects. High attachment anxiety and avoidance interacted to predict attentional avoidance (i.e., allocating attention to locations that were opposite to threat) of attachment-related words. **Author interpretation:** The data fits with other evidence and does not support theoretical assumptions of individual differences. Also, results might represent fear and distancing from threatening stimuli (i.e., 'fearful').	9 [a], 10 [b] (Fair)
*Dewitte et al., 2007 (4 studies)	High school and university students (*N* = 234), no gender ratio given, Belgium	Stimuli: Object (Dot-probe) Prime(s): Names of participant, attachment figure, known person, neutral) Additional prime(s): Prior to the task participants were asked to imagine their attachment figure going abroad for 1 to 2 years (studies 1 and 2); enjoying a day with their attachment figure (study 3); or a known person going abroad (study 4)	ECR	**Findings:** High attachment anxiety was significantly associated with increased attention to attachment figure name in 2 studies. Associations were marginally significant in another. **Author interpretation:** The data could provide support for the hyperactivating strategies.	9 [a] (Fair)
Davis et al., 2014	Clinical population (*N* = 97), 75% female, USA	Stimuli: Object (Dot-probe) Prime(s): Happy, threat and neutral faces	ECR	**Findings:** High attachment anxiety predicted increased attentional avoidance of happy faces, and interacted with child maltreatment history to predict attentional avoidance of threat faces. **Author interpretation:** Individual differences in attachment style may affect resilience factors in adulthood, and create bias.	14 [a, b] (Excellent)

Table 5.

Data extraction table: Lexical decision task

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
*Mikulincer et al., 2000 (3 studies)	University students (*N* = 190), 66% female, Israel	Stimuli: Words (attachment-positive/negative, positive, negative, neutral) and nonwords Prime(s): Subliminal and supraliminal threat and neutral embedded prime words were Hebrew versions of *failure* and *hat* respectively (study 1); *death* and *hat* (study 2 – subliminal only); *illness* and *hat* (study 3 – subliminal only) Effortful task: Participants were asked to listen to, repeat aloud and remember a story (study 3)	ASS; 10-item dimensional measure**	**Findings:** Attachment anxiety was consistently associated with faster RTs to attachment-related words. Attachment avoidance was associated with slower RTs to attachment-related threat words. However, the combination of a stress word prime and high cognitive load increased the RT for those with attachment avoidance. **Author interpretation:** Attachment anxiety was associated with increased accessibility to attachment representations. Attachment avoidance might be associated with preconscious activation of attachment themes despite conscious deactivation.	11 [a] (Good)
*Mikulincer et al., 2002 (3 studies)	University students (*N* = 210), 74% female, Israel	(Studies 1 and 2) Stimuli: Words (names of attachment figures, close persons, known persons, unknown persons) and nonwords Prime(s): Threat and neutral embedded prime words were Hebrew versions of *failure* and *hat* respectively (study 1) and attachment-threat and neutral embedded words *separation* and *hat* respectively (study 2)	ECR (Hebrew version)	**Findings:** High attachment anxiety was associated with faster RTs to attachment figure names, regardless or priming condition, regardless of priming context. High attachment avoidance was associated with slower RTs to attachment figure names, following the attachment-threat prime word. **Author interpretation:** Attachment anxiety heightens the accessibility of attachment figure representations across contexts, whereas attachment avoidance inhibits accessibility in attachment-related contexts.	11 [a] (Good)

Notes. ** refers to a 10-item measure developed by Mikulincer, Florian, & Tolmacz (1990); ASS = Attachment Style Scale (Hazan & Shaver, 1987)

3.1.5. Oddball tasks. The target stimuli, known as oddballs within this task, were affective or neutral pictures that were shown *very infrequently* within neutral pictures. Participants had to judge whether target pictures were positive, negative or neutral.

Two results used this task (see Table 6). These results predicted that individual differences in attachment style would influence attentional processes and also measured ERP waveforms (e.g., P300 or Late Positive Potential [LPP] amplitude[12]). Mark, Geurdes and Bekker (2012) predicted attachment anxiety would be associated with an initial approach and subsequent avoidance of threatening faces, whereas attachment avoidance would be associated with suppression of processing threatening faces. RT data showed no significant main or interaction effects, and there were no significant amplitude differences associated with attachment avoidance. However, amplitudes showed that attachment anxiety was associated with the opposite pattern to that predicted, i.e., reduced initial attention but subsequent rumination. Chavis and Kisley (2012) also found no significant behavioural data, yet amplitudes showed larger attentional biases towards negative and positive images associated with attachment avoidance and anxiety respectively.

[12] A proposed measure of attention allocation.

Table 6.

Data extraction table: Oddball task

Author(s) and year	Population, sample size and setting	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
Mark et al., 2012	University students (*N* = 25), 100% female, Netherlands	Stimuli: Pictures (angry, fearful and neutral faces) Prime(s): None	ASQ	**Findings:** No significant RT data. However, ERP data showed high attachment anxiety was associated with reduced initial attention and subsequent rumination. **Author interpretation:** There were differences in emotional processing between the attachment dimensions, but the underlying mechanisms were unknown.	11 [a], 9 [b] (Good/fair)
Chavis & Kisley, 2012	University students (*N* = 42), 79% female, USA	Stimuli: Pictures (positive, negative, neutral images) Prime(s): None	ECR	**Findings:** No significant RT data. However, ERP data showed larger attentional biases to negative and positive images associated with high attachment avoidance and anxiety respectively. **Author interpretation:** Individual differences in the relationships between attachment dimensions and motivational relevance of interpersonal stimuli.	11 [a] (Good)

3.1.6. Other tasks. Five results used other tasks (see Table 7). Gillath, Giesbrecht and Shaver (2009) predicted that attachment avoidance would be associated with faster allocation of attention, which would diminish in the presence of an attachment-negative prime. They used a psychological refractory period task; 2 stimuli were presented in quick succession and participants had to apply different rules to categorise each stimulus. They confirmed that attachment avoidance was associated with faster RTs that slowed following an attachment negative prime (p = .08). However, they also found that attachment avoidance and anxiety interacted to predict faster RTs on a flanker task. Flanker stimuli ('>') were presented either side of a central stimulus, either in congruent (i.e., >>>>>) or incongruent (i.e., <<><<) alignment, and participants had to judge the direction of the middle stimulus.

Dewitte (2011) found that attachment avoidance was associated with greater inhibition of angry and sad faces (i.e., slower RTs), and attachment anxiety was associated with less inhibition of happy faces (i.e., faster RTs), on a negative affective prime (NAP) task. However, they could not replicate the latter in a follow-up study. In the NAP task, 2 faces on 2 separate screens are presented in a black and grey frame. Participants have to identify the face in the black frame (i.e., target) and ignore the other (i.e., distractor).

Dan and Raz (2012) predicted and confirmed that attachment avoidance was associated with slower RTs for angry faces, when stimuli were presented in an implicit emotional task (i.e., participants had to judge the sex of the different emotional faces), because these individuals must first attend to and quickly differentiate stimuli as part of deactivating strategies. Brain responses amplitudes supported early differentiation between angry and neutral faces associated with attachment avoidance. Dewitte and Koster (2014) used an attentional-breadth task to show that attachment avoidance was associated with a broader attentional field with partner faces, amongst men, following a

threat prime. Conversely, attachment anxiety was associated with a narrowing of attention field with partner faces, amongst women, with or without priming (p = .06), unless their partner reported relatively high attachment avoidance. For the task participants were shown pictures of their partner's or a neutral person's face and a black circle. This black circle was placed near to or far from the face. Participants then had to identify what face had been in the middle of the screen and which location the black circle had been placed into.

The results of a study by Lathrop, Davis and Kisley (2015) showed no significant differences in attachment dimensions following a word rating task (i.e., participants were asked to judge whether a word stimulus was positive, negative or neutral). However, LPP amplitudes showed that attachment anxiety and relationship status (i.e., partnered and single) interacted to predict increased attention to attachment negative and positive words respectively.

Table 7.

Data extraction table: Other tasks

Author(s) and year	Population, sample size and setting	Attention task	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
*Gillath et al., 2009 (3 studies)	University students (*N* = 300), 73% female, USA	(Study 1) Psychological Refractory Period (PRP) Task (Studies 2 and 3) Flanker Task	Stimuli: Pictures (shapes or letters) Prime(s): None Stimuli: Flankers (e.g., '>') Prime(s): Randomly allocated to 1 of 3 priming conditions. Participants were asked to remember a relationship in which they felt relatively secure, anxious, or avoidant	ECR	**Findings:** High attachment avoidance was associated with faster RTs. This ability held following a secure prime, but diminished following an attachment-threat prime (p = .08). Also, high attachment anxiety and avoidance interacted to predict faster RTs. **Author interpretation:** High attachment avoidance was associated with better performance on basic attention tasks (i.e., less interference), but this diminished following threat. Precise underlying mechanisms remained unknown.	10 [a] (Fair)
*Dewitte, 2011 (2 studies)	University students (*N* = 142), 77% female, Belgium	Negative affective priming task	Stimuli: Pictures (angry, sad, happy faces) Prime(s): Two sets of 2 faces were presented consecutively. The first set was a prime trial. The second set was a target trial.	ECR-R-NL	**Findings:** High attachment avoidance was associated with slower RTs for angry and sad faces. High attachment anxiety was associated with faster RTs for happy faces, but could not be replicated. **Author interpretation:** High attachment avoidance was associated with stronger inhibition of negative emotional stimuli, whereas high attachment anxiety showed no differences in inhibition associated with such stimuli.	11[a] (Good)
Dan & Raz, 2012	University students (*N* = 50), 64% female, Israel	Implicit emotional task	Stimuli: Pictures (angry, neutral faces) Prime(s): None	ECR (Hebrew version)	**Findings:** High attachment avoidance was associated with slower RTs for angry faces and differences in ERP data. **Author interpretation:** Attachment avoidance is associated with early differentiation, as part of deactivating strategies.	13 [a, b] (Good)

Author(s) and year	Population, sample size and setting	Attention task	Experimental task(s)	Attachment measure(s)	Main finding(s)	Quality rating score
Dewitte & Koster, 2014	Young adults, 45 couples (*N* = 90), 50% female, mostly university population, Belgium	Attentional-breadth task	Stimuli: Pictures (a black circle) Prime(s): partner or neutral person's face is presented simultaneously as the target. Additional prime(s): Allocation to priming condition or no prime. Participants were asked to write for several minutes about a situation when they felt their partner did not really love them	ECR-R-NL	**Findings:** High attachment avoidance was associated with a broader attentional field with partner faces, amongst men, following an attachment-threat prime. High attachment anxiety was associated with a narrowing of the attention field with partner faces amongst women (p = .06), regardless of condition, unless their partner reported high attachment avoidance (only when stimulus was presented quickly). **Author interpretation:** Avoidant strategies are activated in the context of distress, broadening represents avoidance driven by a fear for intimacy. High attachment anxiety might be associated with early vigilance, regardless of condition. Broadening of attention amongst those with avoidant partners might signal the relational impact of attachment insecurity.	12 [a] (Good)
Lathrop et al., 2015	University students (*N* = 33), 82% female, USA	Word rating task	Stimuli: Words (attachment-positive/negative, positive/negative, neutral) Prime(s): None	ECR-R	**Findings:** No significant RT data. ERP data showed high attachment anxiety and relationship status (i.e., partnered or single) interacted to predict increased attention to negative and positive words respectively. **Author interpretation:** ERP data supports assumptions that anxiously attached individuals attend to more attachment stimuli, but partnered individuals attend more to threat.	13 [a] (Good)

Notes. ECR-R-NL = Experiences in Close Relationships-Revised-Dutch Version (Buysee & Dewitte, 2004).

3.2. Methodological critique

Overall, the generalisability of findings was minimal due to sampling limitations. Fifteen out of 21 results involved exclusively undergraduate students. Moreover, whilst student samples provide advantages such as large samples and adequate statistical power, sample sizes were varied and in some cases small. Unfortunately, the level of detail for sample demographics varied, hindering comparability, and a common contributory factor to a lower quality score.

Studies that used the Stroop task were, on average, given a higher quality score than studies that did not. The most number of studies used the Stroop task also. However, the findings from only one of these studies supported both the hyperactivating and deactivating strategies. This study received an average quality score of 10.5 (between 'fair' and 'good'); the lowest of the Stroop task studies. The two other studies that reported findings in support of both secondary strategies, authored by Mikulincer and colleagues prior to the IMDAS theoretical papers (Mikulincer et al., 2003; Shaver & Mikulincer, 2002), used lexical decision tasks and both scored an average quality score of 11 ('good'). Of the results that did not support the secondary strategies as proposed within IMDAS (i.e., neither fully nor partially supported either strategy), five were given the highest quality ratings of all studies, two were rated as 'good' and three were rated as 'fair'. As no studies were rated on the quality of the task that was provided it is hard to infer whether any particular task is a better fit for these experiments. However, the highest quality papers did not support either secondary strategy.

Mean age of participants was not always reported (Davis et al., 2014; Dewitte & De Houwer, 2008; Dewitte et al., 2007 experiments 2-4; Dewitte & Koster, 2014; Dewitte, Koster, et al., 2007). For those studies that reported mean age, these ranged from 17 to 27.7 years, with most commonly reported mean ages falling within the early twenties. Several studies reported median ages, ranging from 19-24 years (Gillath et al.,

2009; Mikulincer et al., 2000; Mikulincer et al., 2004; Mikulincer et al., 2002). Therefore, it is unclear how representative results are for older adults. Furthermore, there were more female than male participants across results, also limiting generalisability.

Most studies included comparative dimensional measures of attachment, such as the ECR (Brennan et al., 1998) and the ECR-R (Fraley et al., 2000) scales, which have good psychometric properties (Brennan et al., 1998; Sibley, Fischer, & Liu, 2005). Two results also included categorical measures of attachment, however fundamental differences in categorical and dimensional measures should be considered when interpreting data. Categorical measures examine adult attachment representations of parent-infant relationships, whereas dimensional measures examine attachment representations of adult romantic relationships (Bartholomew & Shaver, 1998).

As described, a range of attention tasks were used across studies. Whilst evidence has suggested that threat-related bias can be reliably detected by common attention tasks the strength of this effect has been questioned (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). Several authors from the results reviewed also questioned the adequacy of tasks for attachment-related research (Cooper et al., 2009; Dewitte et al., 2007: Edelstein & Gillath, 2008). The results of this review not only further challenge the adequacy of methods, but also challenge the underpinning theoretical claims. Furthermore, varied threat-related stimuli were used across studies. The methodological use of a word stimulus as a natural source of threat has been questioned in support of more ecologically valid, automatically processed, face stimuli (Bradley, Mogg, Millar, Bonham-Carter, Fergusson et al., 1997; Morris, Ohman, & Dolan, 1998), but further questions have been raised about the ecological validity of processing static facial expressions (vs. dynamic expressions), such as anger, disgust, fear and sadness (Chiller-Glaus, Schwaninger, Hofer, Kleiner, & Knappmeyer, 2011).

Authors' interpretations of their RT data in relation to the secondary strategies of IMDAS were contradictory across studies, which is unsurprising given the earlier contradictions within the IMDAS theoretical paper (Mikulincer et al., 2003). Specifically, for studies that provided support for the secondary strategies, faster RTs were associated with attachment avoidance, and were taken as evidence that deactivating strategies were being used (Edelstein & Gillath, 2008; Fang et al., 2014; Gillath et al., 2002; Mikulincer et al., 2004; Mikulincer et al., 2002), whilst faster RTs were also associated with attachment anxiety, and considered to show hyperactivating strategies (Mikulincer et al., 2000). Conversely, slower RTs were associated with attachment anxiety and taken as evidence that hyperactivating strategies were being used (Mikulincer et al., 2002), whereas they were also associated with attachment avoidance and reported to show deactivating strategies (Mikulincer et al., 2000; Mikulincer et al., 2002; Dewitte, 2011; Dan & Raz, 2012). These idiosyncratic interpretations of the third part of IMDAS further limit the conclusions that can be drawn from the findings, with no clear explanation or clarification within this research.

4. Discussion

This review sought to examine the relationships between adult attachment insecurity and automatic attentional processes. It aimed to systematically gather and compare empirical findings to theoretical claims (Shaver & Mikulincer, 2002; Mikulincer et al., 2003). It also aimed to discuss the theoretical implications, to interpret findings for clinical practice, and to generate recommendations for future research.

4.1. Summary of findings

The search strategy yielded 21 results, which included three doctoral dissertations. Results were of fair to excellent quality. Overall, eleven of the 21 results provided evidence that supported the secondary strategies proposed within the integrative model of the activation and dynamics of the attachment system (Mikulincer

et al., 2003). However, only two of these results (i.e., three studies) supported both the hyperactivating and deactivating strategies (Mikulincer et al., 2000; Mikulincer et al., 2002). There was evidence that supported the hyperactivating strategies, but not the deactivating strategies. However, these supportive findings could not be replicated (Dewitte et al., 2007; Dewitte, 2011), were marginally significant (Dewitte & Koster, 2014), or conditional on weaker top-down control (Bailey et al., 2012). A greater number of studies provided support for the deactivating strategies (Dan & Raz, 2012; Dewitte, 2011; Edelstein & Gillath, 2008; Mikulincer et al., 2004), but some findings were conditional on oxytocin administration (Fang et al., 2014) or were inconsistent with other study findings, i.e., deactivating strategies were associated with a secure prime (Gillath et al., 2009).

Ten of the 21 results provided evidence that did not support the theorised secondary strategies due to null findings (Chavis & Kisley, 2012; Cooper et al., 2009; David, 2009; Davis et al., 2014; Dewitte & De Houwer, 2008; Dewitte, Koster et al., 2007; Lathrop et al., 2012; Mark et al., 2012; Stroscio, 2007; Woodward, 2015). Three of these results were unpublished doctoral dissertations (David, 2009; Stroscio, 2007; Woodward, 2015). The quality of five of these results were rated the highest (‘excellent’); a further two were rated as ‘good’ and three as ‘fair’. Interestingly, whilst three results found no significant differences in RT data, brain response amplitudes reported individual differences in attention as a function of attachment style (Chavis & Kisley, 2012; Lathrop et al., 2012; Mark et al., 2012). Inconsistencies between ERP and behavioural data could highlight the potential limitations of attention tasks. For example, Mark et al. (2012) argued that accurately measuring the timing of stimuli processing using RT data is difficult, because these data are a measure of motor response rather than time at which the stimuli were processed.

Indeed, it is questionable whether RT data are an appropriate measure of the secondary strategies proposed within the IMDAS. Inconsistencies found within the reviewed evidence would argue RT data are not. However, further clarification is also required to enable clear predictions and consistent testing of the secondary strategies proposed within IMDAS.

4.2. Clinical implications

Clinicians should be aware that the implications for practice from this review are limited by several factors. There is inconsistent support for the theoretical assumptions that high attachment anxiety and avoidance are associated with hyperactivating and deactivating strategies, as measured by attentional tasks, respectively. Most studies used student samples. Therefore, caution should be taken when extrapolating findings to clinical groups and when applying such theory in practice, particularly when considering these individual differences in attachment-related processing within psychological formulation. Tasks were experimental and conducted in relatively controlled situations, which might also reduce ecological validity. The focus of this review was limited to automatic processes, rather than controlled, and synthesis of findings for attachment security was beyond the scope of this review. The search strategy excluded some seminal papers that supported the integrative model (e.g., Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006; Fraley & Shaver, 1997; Mikulincer & Orbach, 1995). Moreover, unlike Dykas & Cassidy (2011) who provided a comprehensive lifespan approach, this review was limited to adults. The advantage of a narrower focus is that stronger conclusions can be drawn, especially in an extensive research area, and the systematic method allows for later replicability and clearer comparison.

4.3. Theoretical implications and future research

Student samples are ethically advantageous when testing a theoretical model, particularly when outcomes thus far have been inconsistent. However, there is still scope to further test the integrative model, and to question what would be found in clinical groups. Some results from this review indicated moderation effects that strengthened the relationship between attachment insecurity and automatic attentional processes. We suggest that future research examines moderation or mediation hypotheses in an attempt to account for inconsistent direct findings.

Additionally, future research could bridge the gap between normative and clinical samples by recruiting based on dimensional constructs of mental health within normative samples, to start to overcome limitations of sampling via categorical approaches (e.g., no diagnosis vs. diagnosis). For example, a dimensional model of psychosis advocates a continuum from observable characteristics within a general population to diagnoses in clinical populations (Mason & Claridge, 2006).

There is growing use of neurophysiological data to examine the relationships between adult attachment and automatic attentional processes. Ongoing inclusion of such neurophysiological techniques might address limitations with sole use of behavioural data, as mentioned. Also, studies reported an interaction between high attachment anxiety and avoidance. The integrative model does not explicitly consider disorganisation in adulthood (i.e., a general fear of romantic attachment figures). This interaction between high attachment anxiety and avoidance, discussed in relation to fearfully attached individuals (Dewitte & De Houwer, 2008; Main & Solomon, 1990), could be examined using a measure of disorganisation in adulthood (Paetzold, Rholes, & Kohn, 2015).

Although the present review systematically reviewed the evidence base, future research could conduct meta-analyses to examine more extensively the strength of

observed effects, and to provide robust summaries of effect, methodological heterogeneity and publication bias. Our search strategy yielded relatively few unpublished papers. In future, a search strategy could include correspondence with experts in the field to seek additional unpublished data (Rosenthal, 1979).

5. Conclusion

There is inconclusive evidence to support the secondary attentional strategies proposed by Mikulincer et al. (2003) within the IMDAS. This evidence is further limited by the use of predominantly undergraduate, normative samples, as well as by potential limitations with measuring attention using behavioural data. Further investigation of neurophysiological and behavioural data, greater synthesis and examination of observed effects, and expansion into clinical groups is recommended to develop findings from this review.

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Appendix A: Adapted quality rating scale

Item	Scoring		Guidance
Item 1: Is the hypothesis/aim/objective of the study clearly described?	Yes	1	
	No	0	
Item 2: Are the main outcomes to be measured clearly described in the Introduction or Methods section?	Yes	1	If the main outcomes are first mentioned in the Results section, the question should be answered no.
	No	0	
Item 3: Are the characteristics of the patients included in the study clearly described?	Yes	1	Inclusion and exclusion criteria should be given where appropriate. The recruitment source of participants should be given.
	No	0	
Item 4: Are the attention tasks clearly described?	Yes	1	Attention tasks should be clearly described, so to be replicable.
	No	0	
Item 5: Are the distributions of principal confounders within the sample clearly described?	Yes	1	A list of principal confounders is provided, e.g., age range and gender ratio.
	No	0	
Item 6: Are the main findings of the study clearly described?	Yes	1	Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).
	No	0	
Item 7: Does the study provide estimates of the random variability in the data for the main outcomes?	Yes	1	In non-normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.
	No	0	
Item 8: Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Yes	1	
	No	0	
Item 9: Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Yes	1	The source population and a description of how they were selected must be given.

Item 10: Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Yes	1	The proportion of those asked whom agreed should be stated.
	No	0	
	Unable to determine	0	
Item 11: If any of the results of the study were based on "data dredging", was this made clear?	Yes	1	Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.
	No	0	
	Unable to determine	0	
Item 12: Were the statistical tests used to assess the main outcomes appropriate?	Yes	1	The statistical techniques used must be appropriate to the data. For example nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.
	No	0	
	Unable to determine	0	
Item 13: Were the main outcome measures used accurate (valid and reliable)?	Yes	1	For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.
	No	0	
	Unable to determine	0	
Item 14: Were study subjects recruited over the same period of time?	Yes	1	For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.
	No	0	
	Unable to determine	0	
Item 15: Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	Yes	1	If the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.
	No	0	
	Unable to determine	0	

Appendix B: Quality assessment grids completed by the author and an independent trainee clinical psychologist

Quality ratings by author:

Items:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mikulincer et al. (2002) (Average)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Mikulincer et al. (2004) (Average)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Stroscio (2007)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Edelstein and Gillath (2008)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
David (2009)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Bailey et al. (2012)	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1
Dewitte and De Houwer (2008)	1	1	1	1	0	1	0	0	0	0	1	1	1	0	1
Cooper et al. (2009) (Average)	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1
Fang et al. (2014)	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1
Woodward (2015)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Dewitte, Koster et al., (2007)	1	1	0	1	0	1	1	0	0	0	1	1	1	0	1
Dewitte et al. (2007) (Average)	1	1	0	1	0	1	1	0	0	0	1	1	1	0	1
Davis et al. (2014)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Mikulincer et al. (2000) (Average)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Mark et al. (2012)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Chavis and Kisley (2012)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Gillath et al. (2009) (Average)	1	1	1	1	1	1	0	0	0	0	1	1	1	0	1
Dewitte (2011) (Average)	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1
Dan and Raz (2012)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1
Dewitte and Koster (2014)	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1
Lathrop et al. (2015)	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1

Quality ratings by independent trainee clinical psychologist (red indicates disagreement with author):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mikulincer et al. (2002)	1	1	1	1	0	1	1	0	1	0	1	1	1	0	0
Dewitte and De Houwer (2008)	1	1	1	1	0	1	1	0	1	0	1	1	1	0	0
Fang et al. (2014)	1	1	1	1	1	0	0	1	1	0	1	1	0	0	1
Woodward (2015)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Dewitte, Koster et al. (2007)	1	1	1	1	0	1	1	0	1	0	1	1	1	0	0
Davis et al. (2012)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Mark et al. (2012)	1	1	1	1	1	0	1	0	0	0	1	1	0	0	1
Dan and Raz (2012)	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0

Appendix C: Studies excluded from systematic review

26 results excluded

Primary reason for exclusion:

Criterion 1:
Fujii, Uebuchi, Yamada, Saito, Ito, Tonegawa et al., (2015); Chaperon, Dandeneau, Lydon, Pascuzzo & Auger (2016)

Criterion 2:
Konstantinos (1997)

Criterion 4:
Wilson & Constanzo (1996)

Criterion 5:
Claes, De Raedt, Van de Walle & Bosmans (2016)

Criterion 6:
Zeiljmans van Emmichoven, Van Ijzendoorn, De Ruiter, & Broisschot (2003); Leyh, (2016)

Criterion 7:
Mikulincer & Orbach (1995); Fraley & Shaver (1997); Mikulincer & Arrad (1999); Fraley, Garner, & Shaver (2000); Barrett & Holmes (2001); Niedenthal, Brauer, Robin, & Innes-Ker (2002); Rowe & Carnelly (2003); Meyer, Pilkonis, & Beevers (2004); Meyer, Ajchenbrenner, & Bowles (2005); Kim (2005), Hankin, Kassel, & Abela (2005); Hankin (2005); Gillath, Bunge, Shaver, Wendelken, & Mikulincer (2005); Collins, Ford, & Guichard (2006); Edelstein (2006); Fraley, Niedenthal, Marks, Brumbaugh, & Vicary (2006); Zilber, Goldstein, & Mikulincer (2007); Dewitte, De Houwer, Buysee, & Koster (2008); Smith-Jarden (2009)

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Section 2: Research Report

Adult attachment and cognitive flexibility: An investigation into the mediating role of schizotypy

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May 2017

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Abstract

Objectives. The main aim of this study was to test a parallel mediator model, which proposed that the relationships between adult attachment dimensions and cognitive flexibility were mediated by schizotypy characteristics.

Method. University students were recruited to complete three online questionnaires of adult attachment and schizotypy dimensions (N = 409). Participants were then invited to complete a switch task, within a laboratory setting, to measure attachment-related differences in cognitive flexibility. Forty-eight participants from the original sample agreed to complete this cognitive task.

Results. There was strong evidence for significant relationships between attachment anxiety and cognitive disorganisation, and between attachment avoidance and introvertive anhedonia. Attachment disorganisation showed a less discrete pattern. Conditions were not met for mediation analyses and therefore the parallel mediator model was not confirmed.

Conclusions. Correlations between adult attachment and schizotypy dimensions were expected given theoretical assertions, but the null findings from the examination of the parallel mediator model further added to an inconclusive evidence base for attachment-related differences in information processing. Future research should consider the adequacy of theoretical assertions and methods.

Key practitioner points.

- Clinicians should be aware that methodological issues (particularly small *n* for the cognitive task) limited the power of this study to detect a medium effect.
- This study further supports a dimensional approach to conceptualise attachment patterns and schizotypy characteristics.

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1. Introduction

1.1. Attachment theory and adulthood

Attachment theory proposes that early infant-caregiver relationships have a lasting impact on interpersonal functioning and social information processing (Bowlby, 1980). Attachment theory fundamentally assumes that infants are driven to maintain the emotional bond (i.e., attachment) to their caregiver for survival. Significant disruptions to this attachment process lead an infant to employ different, compensatory patterns of relating to the caregiver, to ensure ongoing survival. Such patterns diverge from what might be observed amongst children without disruption (Slade, 2000).

Bowlby focused his efforts on developing the theory and evidence base (Bowlby, 1969). Consequently, Ainsworth and colleagues conducted observational studies of infants with their caregivers (Ainsworth, Blehar, Salter, Waters, & Wall, 1978). Infant-caregiver interactions were observed and the infants' patterns of behaviour, in response to their caregivers, were differentiated into three organised attachment categories: secure, anxious-ambivalent and anxious-avoidant. Moreover, a fourth attachment category was later posited to categorise disorganised attachment behaviour (Main & Solomon, 1990).

Over the subsequent years, research has focused on the categorisation of attachment behaviours in adulthood. Two psychological perspectives emerged to measure and conceptualise adult attachment behaviours: the developmental and social perspectives (Danquah & Berry, 2014). The developmental perspective suggests that individual differences in attachment relate to the internalised representations of earlier attachment figures (George, Kaplan, & Main, 1985), whereas the social perspective conceptualises romantic love as an attachment process and assumes that attachment patterns of behaviour have a continued significant influence on an adult's psychology and behaviour (Hazan & Shaver, 1987).

The measurement and conceptualisation of attachment behaviours between the perspectives differ also. Developmental theorists have adopted a narrative approach whereby adult states of mind, related to attachment experiences, are measured based on a coherent narrative of earlier infant-caregiver relationships. These adult states of mind are placed into one of four categories: (1) secure-autonomous, (2) dismissing, i.e., the infant anxious-avoidant patterns, (3) preoccupied, i.e., the infant anxious-ambivalent patterns, and (4) unresolved, i.e., the infant disorganised, attachment orientations (Danquah & Berry, 2014).

Conversely, social theorists have adopted a self-report approach to measure attachment styles in adult relationships. Social theorists consider individual differences in attachment along two dimensions: *anxiety* about abandonment and *avoidance* of intimacy (Mikulincer & Shaver, 2006), which underlie self-report measures (Brennan, Clark, & Shaver, 1998) and are considered a more robust method to measure and conceptualise adult attachment patterns (Fraley, Hudson, Heffernan, & Segal, 2015). Whilst attachment categories might be easier for clinical formulation, the dimensional approach prevents individuals from being reduced to distinct categories (Slade, 2000).

Social psychologists have considered the impact of the adult attachment dimensions on information processing (Mikulincer, Shaver, & Pereg, 2003; Shaver & Mikulincer, 2002). The integrative model of the activation and dynamics of the attachment system (IMDAS) is a theoretical model, which includes the assertion that attentional biases differ as a function of adult attachment dimensions (Mikulincer et al., 2003; Shaver & Mikulincer, 2002). Specifically, within the IMDAS, it was proposed that different attachment strategies ('secondary strategies') were employed by adults to regulate distressing social material, and differed as a function of attachment anxiety and avoidance. Researchers have tested part of this theoretical model and produced inconsistent results, with varied methods employed and idiosyncratic interpretations

made. Therefore, it is hard to draw conclusions about individual differences in attachment-related information processing (Dykas & Cassidy, 2011). The next section will outline this literature in more detail.

1.2. Attachment theory, adulthood and information processing

For more than a decade, social psychologists have examined the attachment secondary strategies within IMDAS, i.e., hyperactivating and deactivating strategies (Mikulincer et al., 2003; Shaver & Mikulincer, 2002). Hyperactivating strategies, associated with attachment anxiety, describe attachment behaviours that indicate an overdependence on attachment figures in response to fear of abandonment (Myhr, 2014). Individuals who adopt these strategies would demonstrate hypervigilance to attachment-related cues (Mikulincer et al., 2003). Deactivating strategies, associated with attachment avoidance, describe attachment behaviours that indicate exaggerated self-reliance and independence in response to fear of intimacy (Myhr, 2014). Individuals who adopt these strategies would demonstrate distancing from attachment-related cues.

Researchers have examined attachment-related differences in secondary strategies within both cognitively controlled and automatic attentional processes; that is, participants' conscious efforts to control their attention (e.g., Fraley & Shaver, 1997; Mikulincer & Orbach, 1995) versus the processes outside of their awareness (e.g., Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Dolev, & Shaver, 2004; Mikulincer, Gillath, & Shaver, 2002). Different experimental attention tasks have been used, for example, emotional Stroop, spatial cueing and dot-probe tasks (Macleod, Mathews, & Tata, 1986; Posner, 1980; Stroop, 1938), to test for differences in reaction times to attachment-related stimuli, as a function of adult attachment dimensions. Greater focus has been placed on automatic attentional processes to reflect the theoretical position that attachment strategies are instinctual and unconscious (Bowlby,

1980; Mikulincer et al., 2003). However, as mentioned, data from these tasks are inconclusive (Dykas & Cassidy, 2011; Shearman, Millings, Carroll, & Rowe, in prep.).

The inconsistent evidence indicates that further research is required to examine attachment-related differences in information processing. There has been some attention given to the role of other variables on the relationship between adult dimensions and information processing. Variables such as relationship status and cognitive load have been consistently found to influence the relationship between adult attachment and attention (Dewitte & Koster, 2014; Edelstein & Gillath, 2008; Mikulincer et al., 2000; Mikulincer et al., 2004). However, the evidence for the influence of mental health has been less developed, with limited foci on depression, anxiety, and psychosis phenomena (Wilson & Costanzo; 1996; Woodward, 2015). More recently, there has been a growing focus on psychosis phenomena, i.e., schizotypy characteristics, both in relation to attachment experiences (Korver-Nieberg, Berry, Meijer, & de Haan, 2014) and information processing (Rawlings & Goldberg, 2001; Louise, Gurvich, Neill, Tan, van Rheenen et al., 2015). However, no additional published studies have examined the relationships between adult attachment, schizotypy and information processing. The next section will explain schizotypy in further detail.

1.3. Schizotypy

The term schizotypy refers to observable characteristics of psychosis phenomena within the general population (Claridge, 1997). Such characteristics are considered to fall along a continuum from subclinical to clinical presentations. The continuum approach was proposed to shift how clinical presentations, commonly termed 'psychotic', were conceptualised, and to normalise subclinical experiences (Mason & Claridge, 2006). More broadly, the evidence base has demonstrated that psychosis phenomena are more common within the general population than perceived and not exclusive to mental health service users (Beavan, Read, & Cartwright, 2011).

Two approaches to schizotypy measurement have been outlined within a recent literature review: clinical and personality (Mason, 2015). Clinical questionnaires of schizotypy have tended to reduce schizotypy to scale scores that reflect traditional symptoms (e.g., 'positive' and 'negative' schizotypy) or diagnoses of psychosis, whereas personality questionnaires of schizotypy have attempted to normalise experiences and create distance from diagnostic labels and symptoms.

The growing interest in a continuum approach to psychotic experiences has offered an alternative to measurement of such experiences. As previously alluded to, this alternative approach has gained ground with a growing interest in the relationships between schizotypy and adult attachment.

1.4. Adult attachment and schizotypy

Current evidence suggests that there are specific patterns of relationships between adult attachment and schizotypy. Korver-Nieberg et al. (2014) conducted a systematic review that examined adult attachment and positive and negative schizotypy measurement in non-clinical samples. Their results suggested stronger relationships between attachment anxiety and positive schizotypy (Berry, Band, Corcoran, Barrowclough, & Wearden, 2007; Berry, Wearden, Barrowclough, & Liversidge, 2006; Tiliopoulos & Goodall, 2009; Wilson & Costanzo, 1996), and attachment avoidance and negative schizotypy (Wilson & Costanzo, 1996; Berry et al., 2007; Berry et al., 2006; Meins, Jones, Fernyhough, Hurndall, & Koronis, 2008; Tiliopoulos & Goodall, 2009). These stronger relationships have been further supported (Easton, Mohr, Millings, Morris, & Rowe, 2014; Sheinbaum, Bedoya, Ros-Morente, Kwapil, & Barrantes-Vidal, 2013).

However, variability in chosen attachment measures has been a repeated limitation (Berry et al., 2007; Gumley, Taylor, Schwannauer, & Macbeth, 2014; Korver-Nieberg et al., 2014), and most studies have used clinical questionnaires of

schizotypy that capture a reduced range of schizotypy characteristics (Berry et al., 2006; Meins et al., 2008; Tiliopoulos & Goodall, 2009; Wilson & Costanzo, 1996). Moreover, there has been limited attention given to the relationships between attachment disorganisation in adulthood and schizotypy.

Recently, researchers have developed a dimensional measurement of attachment disorganisation in adulthood and proposed the central characteristic was general fear of attachment figures, which is pervasive and without solution (Paetzold, Rholes, & Kohn, 2015). Growing evidence indicates links between childhood traumatic experiences and psychosis phenomena (Varese, Smeets, Drukker, Lieverse, Lataster et al., 2012), with attachment insecurity as a potential underlying mechanism (Read & Gumley, 2008; Sitko, Bentall, Shevlin, O'Sullivan, & Sellwood, 2014). One published study examined the links between childhood trauma, an adult disorganised style (i.e., fearful) and schizotypy (Sheinbaum, Kwapil, & Barrantes-Vidal, 2014). They found that a fearful attachment style mediated the relationship between emotional and physical abuse and schizotypy, but as evident Sheinbaum et al. adopted a categorical approach. No published studies have examined the relationships between the adult attachment disorganisation and schizotypy using a dimensional approach, which is considered more robust (Fraley et al., 2015).

1.5. The present study

Investigations of the relationships between adult attachment and information processing have yielded mixed results. As mentioned, a growing interest in schizotypy characteristics has shown significant relationships between these characteristics with both adult attachment and information processing. Only one previous preliminary study considered the relationships between attachment, schioztypy and attention, and reported an interaction between attachment and attention to predict negative schizotypy. No significant direct relationship between attachment and attention was found, without the

presence of schizotypy (Wilson & Costanzo, 1996). Wilson and Costanzo (1996) recommended that future research examined the relationship between interpersonal processes, cognitive deficits and schizotypy, with a larger sample size. As of yet, no published studies have. Furthermore, previous research has indicated a sequence of relationships, within a mediator model, whereby adult attachment explains relationships between earlier abuse and schizotypy characteristics (Sheinbaum et al., 2014). Resultantly, and arguably, there remains further scope to explore whether schizotypy subsequently explains the relationship between adult attachment and the processing of attachment-related information; a relationship that remains empirically elusive.

Previous attachment researchers, who have examined cognitively-controlled and automatic attentional processes, have implied that a specific focus on attention was of the utmost importance. Consequently, efforts have remained focused on attachment-related differences in attention. However, previous theorists have argued that one vital difference between controlled and automatic processing is flexibility, and that automatic processes suffer from an inflexibility that disrupts processing performance during moments of change (Shiffrin & Schneider, 1977). Therefore, measurement of cognitive flexibility when examining attachment-related differences in automatic processing might be of greater interest, and prove more fruitful, than attention.

Cognitive flexibility, also known as task switching, is an executive function (Miyake, Friedman, Emerson, Witzki, Howerter et al., 2000). Executive functions refers to a set of cognitive skills that aid in the planning and programming of action, and flexibility (Beaumont, 2008). There have been challenges to the organisation of executive functions, but agreement that whilst these functions overlap they are also considerably distinct (Miyake et al., 2000). Task switching or cognitive flexibility can be measured within a clinical setting, using neuropsychological tests (e.g., Delis, Kaplan, & Kramer, 2001), or within a controlled laboratory setting, using an

experimental switch-task (Monsell, 2003). The benefit of the latter is that minimal facilitator input would be required. Previous evidence has shown that higher levels of schizotypy were associated with poorer cognitive flexibility (Louise et al., 2015), and it has been stated that attachment-related information processing required cognitive flexibility (Mikulincer & Arad, 1999).

Secure individuals are more cognitively open, flexible and optimistic to new social information, including attachment-related threat (Mikulincer & Arrad, 1999). However, this openess, flexibility and optimism towards threat is less evident for insecure individuals. Therefore, we argue that attachment-related threat would be more disruptive to insecure processes. Moreover, as mentioned, it has been argued that automatic processes suffer from an inflexibility, so it could be assumed that attachment-related automatic processes would suffer further (e.g., on a switch task). Previous evidence has shown that higher levels of specific schizotypy (e.g., unusual experiences and cognitive disorganisation) were associated with poorer cognitive flexibility (Louise et al., 2015). Therefore, poorer cognitive flexibility within attachment-related automatic processes could be expected, given the associations between adult attachment dimensions and schizotypy. However, as not all schizotypy have been associated with poorer cognitive flexibility (Louise et al., 2015), there might be different cognitive flexibility outcomes dependent on the relationships between attachment dimensions and specific schizotypy.

Within a switch-task, an individual has to categorise stimuli based on two rules. The rule may remain the same throughout an experimental trial (i.e., non-switch trial) or it may switch to the other rule (i.e., switch trial). The latter creates the required change to test flexibility. Moreover, changing the sorting rule generally leads to additional processing demands. The added demand is referred to as a switch cost.

1.5.1. Experimental hypotheses: First aim. This study will examine the relationships between adult attachment dimensions and schizotypy, and include dimensional measurement of attachment disorganisation in adulthood (Paetzold et al., 2015). This measure of attachment disorganisation in adulthood is relatively new, so an exploratory approach will be taken for the relationships between attachment disorganisation and schizotypy. However, it is anticipated that high attachment disorganisation might be related to higher schizotypy dimension scores than low attachment disorganisation, due to the links between earlier childhood adversity and subsequent psychosis phenomena. Furthermore, in line with previous evidence we predict:

(H_1) stronger positive relationships between attachment anxiety and positive schizotypy dimensions: 'unusual experiences' and 'cognitive disorganisation'.

(H_2) stronger positive relationships between attachment avoidance and negative schizotypy dimensions: 'introvertive anhedonia' and 'impulsive nonconformity'.

1.5.2. Experimental hypotheses: Second and main aim. The second and main aim of this study will be to investigate the relationships between adult attachment dimensions and cognitive flexibility, with schizotypy dimensions as mediators. See Figure 1 for this proposed parallel mediator model. We predict that:

(H_3) participants with higher attachment anxiety will show significantly greater vigilance to attachment-related words, and therefore produce larger attachment-related switch costs (relative to nonattachment-related switch costs) due to the interference to cognitive flexibility from attachment-related content. These greater switch costs will be mediated by higher levels of unusual experiences and cognitive disorganisation, because evidence has suggested strong links between attachment anxiety and these positive schizotypy, and relationships between these positive schizotypy and poorer cognitive

flexibility. These schizotypy might serve a defensive function within attachment-related information processing (e.g., to increase social anxiety and alertness to threat).

(H_4) participants with higher attachment avoidance will show significantly less vigilance to attachment-related words, and therefore produce smaller attachment-related switch costs (comparable to nonattachment-related switch costs), due to deactivating strategies. These lower attachment-related switch costs will be mediated by higher levels of impulsive nonconformity and introvertive anhedonia dimensions, because evidence has suggested strong links between attachment avoidance and negative schizotypy, and no significant relationships between negative schizotypy (i.e., introvertive anhedonia) and poorer cognitive flexibility. Introvertive anhedonia might also serve a defensive function with attachment-related information processing (e.g., to distance from threat).

2. Method

2.1. Ethical approval

Ethical approval for this study was gained from the University of Sheffield ethics committee (see Appendix D for the ethical approval letter).

2.2. Design

This study used a cross-sectional experimental design to examine the relationships between two adult attachment dimensions and four schizotypy dimensions (six predictor variables), and switch costs (dependent variables), in a parallel mediator model. This model was the primary aim of this study (see Figure 1). The predictor variables were measured using online questionnaires. The dependent variable was measured using a computerised switch task. Participants completed all experimental trials on the switch task, which varied as a function of *attachment relevance* (attachment stimuli, non-attachment stimuli) and *task rule* (switch, repeat). The emotional valence of all stimuli was negative. Switch cost was calculated by subtracting mean reaction

times (milliseconds) on task-repeat trials from mean reaction times on task-switch trials for each participant.

This study also examined the relationships between adult disorganisation (a third attachment dimension) and the four schizotypy dimensions. This was the secondary aim of this study.

2.2.1. Control variables. There were five planned covariates: Medication status (prescribed, not prescribed), to minimise the potential confounding influence of prescribed medications on cognitive performance (Jolley, Jones, & Hemsley, 1999); Relationship status (single, partnered), given its previous implication as a moderator (Dewitte & Koster, 2014; Edelstein & Gillath, 2008); Age; Level of study (undergraduate, postgraduate); and Gender (male, female).

2.3. A priori power analysis

A priori power analysis was conducted, using G*Power 3.0 software (Faul, Erdfelder, Lang, & Buchner, 2007), to determine sample size to test the main hypotheses (H_3 and H_4). Eleven tested predictors (six tested, five control), and assuming a medium effect size ($F^2 = 0.15$), α of 0.05 and power of 0.80, meant at least ninety-eight participants were required. Moreover, a priori power analyis indicated that eighty-four participants were required to test hypotheses H_1 and H_2 (see Appendix E for the GPower output). Previous reporting of effect sizes within studies of attachment-related information processing is sparse. Simultaneously, previous studies have been successful at recruiting large *N* within student populations, yet this has been variable and recruitment factors within this research area are poorly discussed (Shearman et al., in prep.). Therefore, the decision to choose a medium effect size was pragmatic given these limitations. A small effect size ($F^2 = 0.02$) required forty-seven participants, which seemed small for a student population. A large effect size ($F^2 = 0.35$) required 688 participants, which seemed unfeasible for this project due to time restrictions.

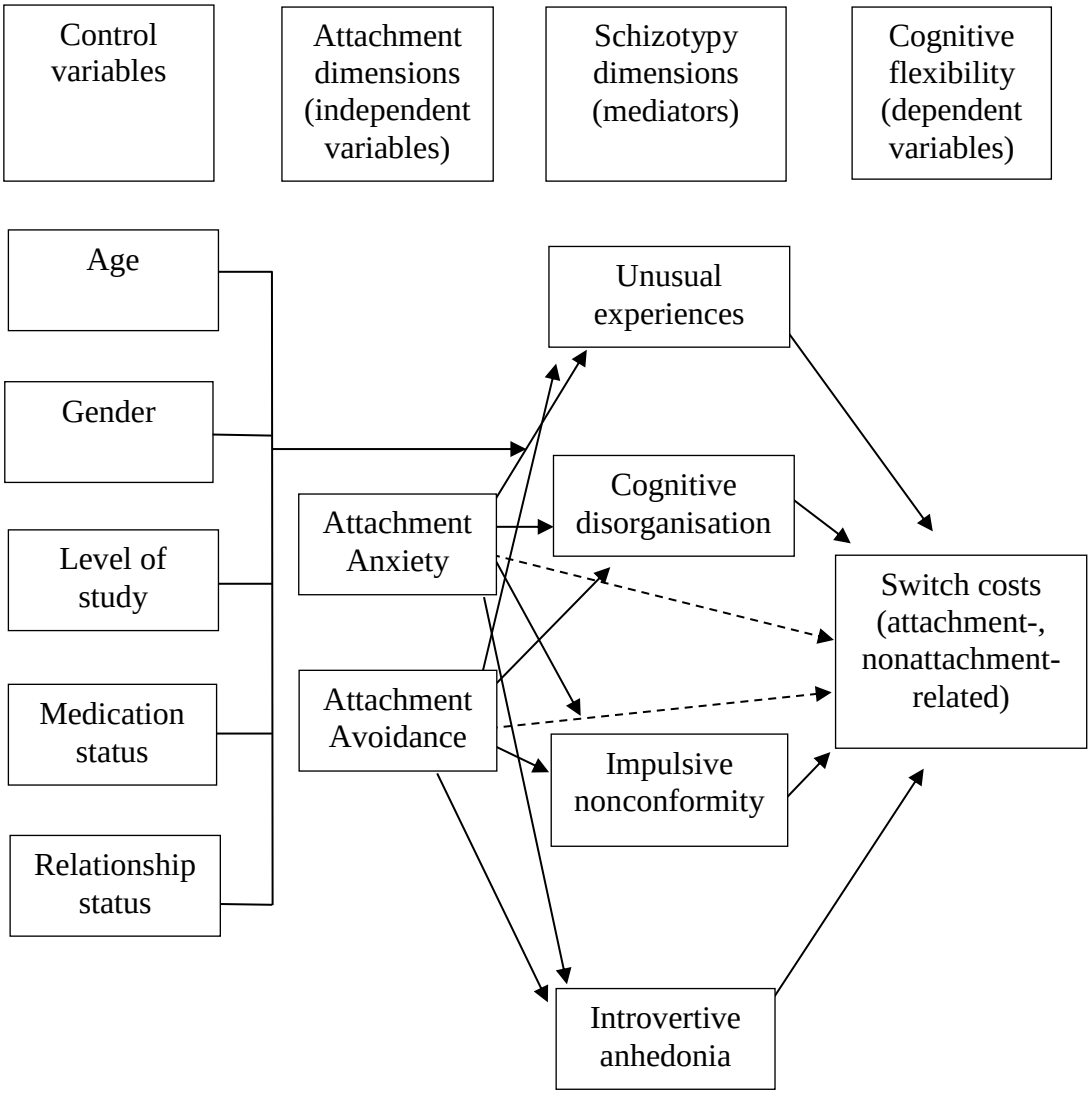

Figure 1. Parallel mediator model (arrows refer to the direct and indirect pathways).

2.4. Participants and recruitment

2.4.1. Stage one: Online questionnaires. Four-hundred-and-nine participants completed three online questionnaires and demographic information. Participants were students at the University of Sheffield and recruited from two sources. First, an advert was added to a research participation scheme for first-year undergraduate psychology students. This scheme provided course credit for research participation. Seventy-eight participants received course credits to take part in this study. Second, an advert was added to a student volunteers e-mail list, for all University of Sheffield students. Three-

hundred-and-thirty-one volunteer participants were entered into a monetary prize draw (1 x £50 Amazon voucher). All participants who agreed to take part were directed to the online study via a hyperlink.

2.4.2. Stage two: Computerised switch-task. All participants who had completed online questionnaires were subsequently invited to complete a laboratory-based switch-task within the Psychology Department at the University of Sheffield, approximately one month after online participation. As mentioned, a minimum of ninety-eight participants were required to test the main hypotheses. Only sixty-eight participants arranged to take part; however, twenty participants did not attend their appointments. Consequently, forty-eight participants took part in stage two; thirty-two participants were from the volunteers list and sixteen participants were first-year psychology students.

Specifically, thirty-seven females, ten males and one agender participated. The mean age of participants was 22.3 years (*SD* = 6.07). The ages of participants ranged from 18 to 48 years. Thirty-one participants were undergraduates and seventeen participants were postgraduates. Twenty-six participants were single whereas twenty-two participants were partnered. Forty-one participants were not prescribed medications, four participants were prescribed medications and three participants preferred not to say. Of the seven participants who reported the use of prescribed medications, five participants gave specific medication names, with potential side effects on cognitive performance (Joint Formulary Committee, 2016). Two participants did not state what their medication targeted and therefore guidelines could not be consulted. After the switch task, participants were debriefed. Information on participant ethnicity and race was not collected. Participants completed the switch task within four months of their online participation.

2.5. Measures and materials

Three questionnaires were used to measure attachment and schizotypy dimensions. Demographic information was also collected. These questionnaires were presented via Qualtrics, an online survey service.

2.5.1. Demographic information. Participants were asked to provide their age, gender and level of study (undergraduate, postgraduate). Participants were also asked to provide their relationship status (single, partnered) and prescribed medication status (yes, no), but were given the option not to state.

2.5.2. The Experiences in Close Relationships (ECR) scale. The ECR scale is a 36-item dimensional measure of attachment. Eighteen items measure attachment anxiety, $\alpha = .91$, and eighteen items measure attachment avoidance, $\alpha = .94$, (Brennan et al., 1998). The ECR requires participants to rate how they feel generally within close relationships, using a seven-point Likert scale (see the ECR scale in Appendix F). The ECR scale does not require a clear narrative of childhood.

2.5.3. The Adult Disorganised Attachment (ADA) scale. The ADA scale is a 9-item dimensional measure of attachment disorganisation in adults, $\alpha = .91$ (Paetzold et al., 2015). The ADA scale requires participants to rate how they feel generally within relationships using a seven-point Likert scale (see the ADA scale in Appendix G).

2.5.4. The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) scale. The O-LIFE scale is a 104-item dimensional measure of schizotypy (Mason, Claridge, & Jackson, 1995). Thirty items measure unusual experiences (UnEx), $\alpha = 0.89$, and twenty-seven items cognitive disorganisation (CogDis), $\alpha = 0.87$. Twenty-four items measure introvertive anhedonia (IntAn), $\alpha = 0.82$, and twenty-three items measure impulsive nonconformity (ImpCon), $\alpha = 0.77$ (Mason et al., 1995; Rawlings & Freeman, 1997). The O-LIFE scale represents a broader four-dimensional model of schizotypy (Mason & Claridge, 2006) and has been used to examine the relationship

between schizotypy and attachment (e.g., Berry et al., 2007), and schizotypy and executive function (e.g., Jolley et al., 1999; Louise et al., 2015). See Appendix H for a copy of the O-LIFE scale.

2.5.5. Experimental stimuli. Thirty words were used as stimuli for the switch task experimental trials (15 x attachment-related, 15 x nonattachment-related words). The attachment-related words were pretested for valence and the degree to which they described attachment relationships, and matched in length, frequency and valence to nonattachment-related words (Rowe & Carnelley, 2003). The experimental stimuli are listed in Appendix I.

2.5.6. Computerised switch-task. E-prime 2.0 computer software was used to develop the switch task (Schneider, Eschman, & Zuccolotto, 2012), which was presented on a computer laptop. See section 2.6 for the switch task configuration.

2.6. Procedure

Recruitment adverts contained access via a hyperlink to online information about stage one of this study, on Qualtrics. Participants were asked to identify whether they were recruited via the research participant scheme or the volunteers list, and were subsequently directed to the relevant information sheet. Participants provided their university e-mail address as a unique identifier and method for further contact. Consenting participants then completed demographic information, ECR, ADA and O-LIFE scales, followed by a debrief form. Participants were informed that they might be contacted to take part in stage two at the University of Sheffield.

One month after the completion of stage one, an e-mail was sent to participants inviting them to complete a computerised cognitive task at the University of Sheffield. Additional e-mails were sent twice a month as reminders until the completion of stage two. An online booking system was created, using simplybook.net, to co-ordinate participation. The recruitment e-mail stated that sixty undergraduate psychology

students could gain an additional credit for participation, via the research participation scheme, on a first come first served basis – due to the limited number of credits available per researcher. Those participants who signed up to complete the switch task were invited to the same research room, within the psychology department building, at the University of Sheffield. The same procedure was applied to all participants for stage two. A confirmation e-mail was sent no less than 2 days before the appointment. Participants were met at the entrance to the floor, taken to the research room and sat at a desk in front of a laptop. They were asked to read an information sheet and complete a consent form. Participants then started the computerised task and were presented with the first instruction screen (Figure 2).

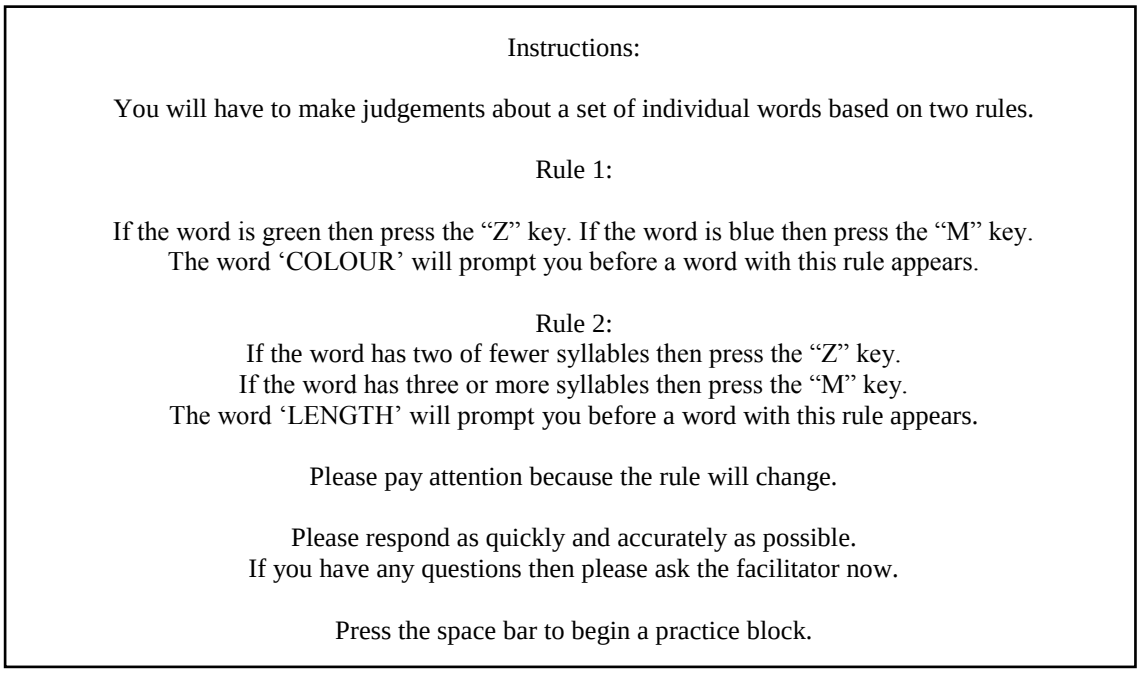

Figure 2. Practice instruction screen 1.

When the participant pressed the space bar a second screen appeared (Figure 3).

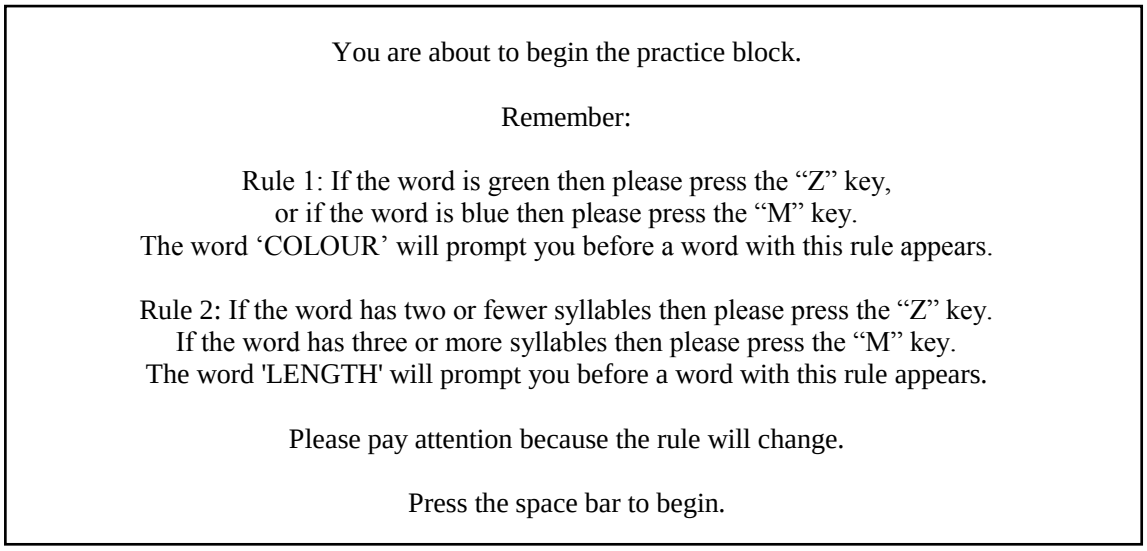

Figure 3. Practice instruction screen 2.

Participants then completed a practice switch task, which involved one block of seventeen trials. The practice stimuli were neutral words (see Appendix I). For each practice trial participants were presented with a series of screens, with the same sequence order as the main task (see description below), except accuracy feedback was provided. After the practice block, participants were shown a screen with the words 'Well done!' before a follow-up instruction screen was presented prior to the main task (Figure 4).

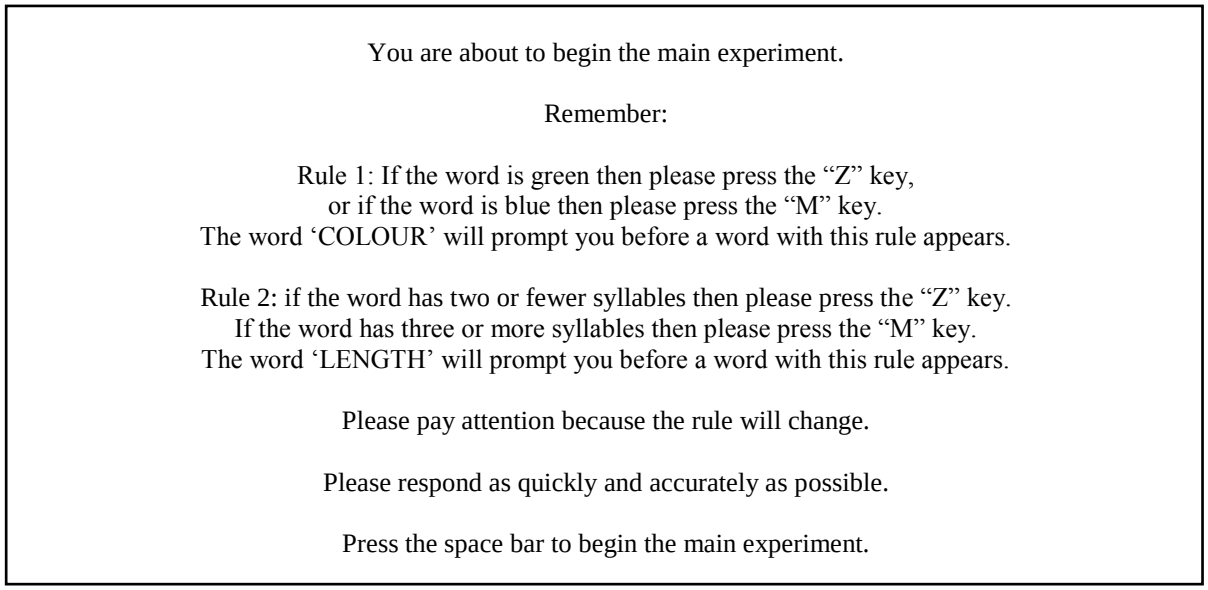

Figure 4. Main task instruction screen.

Participants then completed a counterbalanced switch task of attachment-related and nonattachment-related stimuli. There were two blocks, comprising 30 experimental trials each. Rule type was counterbalanced so that there were equal 'colour' prompts and 'length' prompts. Two-thirds of trials on each block were switch trials, and one-third were non-switch trials. Participants were randomly allocated to receive either the attachment-related stimuli in block one (n = 20) or two (n = 28).

For each trial, participants were shown a series of screens. First, one of two prompt words was shown, i.e., 'COLOUR' or 'LENGTH'. This prompted the participants to recall the relevant rule. The prompt word was shown for 1000ms. Then, to help participants maintain their gaze, a fixation point was shown, i.e., '+'. The fixation point was shown for random intervals of between 800 and 1400ms to minimise anticipation. Then, the stimulus word was presented and participants had to categorise the word based on the relevant rule. If the prompt word was 'COLOUR' then participants had to press the 'Z' key if the word was green and the 'M' key if the word was blue. If the prompt word was 'LENGTH' then participants had to press the 'Z' key

if the word had two or fewer syllables and the ‘M’ key if the word had three or more syllables. The words remained either green or blue throughout the experimental trials. The stimulus word was shown until the participants provided a response and a blank screen was presented for 1500ms before the next prompt word. However, a maximum time limit of 2000ms was set on the stimulus screen. If participants had not categorised the stimulus word by 2000ms then a feedback screen presented ‘too slow!’ to participants for 1500ms and then the next prompt word was shown. See figure 5 for the screen sequence order for each trial.

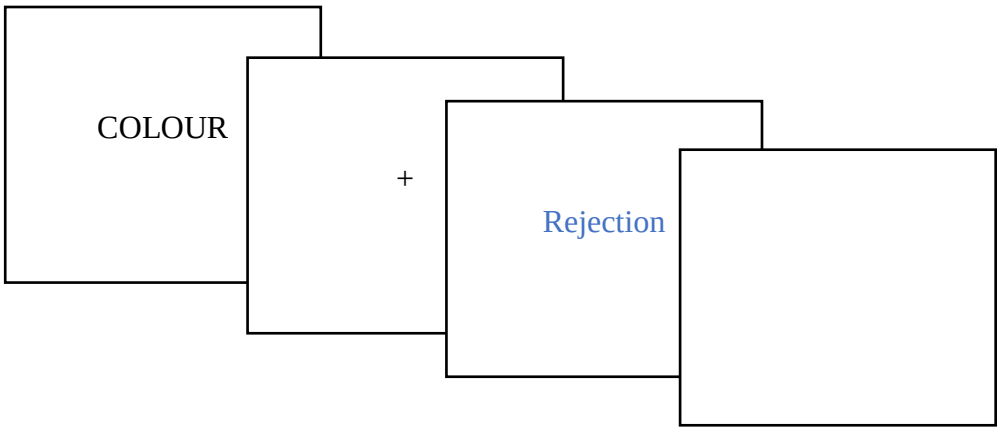

Figure 5. An example of the screen sequence for each trial.

After one block of trials participants were presented with a screen to mark mid-point, which read ‘First part complete! Thank you! Press the space bar to continue the experiment.’ Participants then completed the second and final block of experimental trials. At the end of the task a screen was presented thanking participants for taking part and instructed them to seek the researcher for further details. Participants were then debriefed by the researcher.

2.7. Ethical considerations

Informed consent was sought from all participants, with the use of an information and consent form. Participants were also debriefed following participation using a debrief form. See Appendix J for information, consent and debrief forms. Participants' university e-mail addresses were used as unique identifiers to send stage two invitations to; therefore not all identifiable data could be anonymised. This identifiable information was stored on a password-protected file, within a secure university computer drive. However, once data collection was completed, all data were anonymised before analysis. Participants were given the right to withdraw before a set date, after which point their data were anonymised.

Recruitment was not conducted within clinical services, but participants were not excluded on the basis of a diagnosed mental health problem. Due to the under-researched nature of the research question, and potential issues with attrition rates, it was deemed ethically advantageous to test within a general student population whilst adopting a dimensional approach to measurement.

The research team considered the potential side effects of prescribed medications on cognitive performance. Participants were asked to state prescribed medication(s). However, the team recognised the sensitive nature of this question, so participants were given the option to respond 'prefer not to say'. Prescribed medications were grouped into one variable: medication status. Medications that had known potential side effects, according to the British National Formulary (Joint Formulary Committee, 2016), on cognitive performance were coded as 'Yes'. No individual medications were named to avoid potential breaches of confidentiality in research publications.

3. Data Analysis

3.1. Data screening and analytic methods

The data were analysed using IBM SPSS Statistics version 23 (IBM, 2015). Statistical significance of results was determined using an alpha level of 0.05.

3.1.1. Screening and analytic methods: First aim. Pearson's product-moment coefficients were calculated using stage one data (N = 409) to test hypotheses 1 and 2, and also to explore the relationships between attachment disorganisation and schizotypy. Prospective power analysis indicated that this study was sufficiently powered to test these hypotheses. Effect sizes were interpreted as 0.1 (weak), 0.3 (moderate) and 0.5 (strong) for r values (Field, 2014). Data were checked to ensure all variables met the assumptions of multivariate analysis (i.e., linearity and normality). The Shapiro-Wilk test of normality indicated that the dependent variables (i.e., all attachment and schizotypy scores) were non-normally distributed. However, Field (2014) recommended that for larger sample sizes significance tests of normality should not be used. Alternatively, skewness and kurtosis z-scores[13] and visual data should be interpreted. The z-scores that were greater or lesser than -/+ 3.29 (significant at the p<.001 level) indicated non-normality (Field, 2014). Consequently, attachment disorganisation, unusual experiences, impulsive nonconformity and introvertive anhedonia scores were considered non-normal. Square root transformations were performed (Field, 2014) and follow-up normality tests indicated that data were closer to normal and within limits (-/+ 3.29).

3.1.2. Screening and analytic methods: Second and main aim. Cognitive task data were cleaned, which involved the removal of errors (i.e., inaccurate responses) and outliers (Hughes, Linck, Bowles, Koeth, & Bunting, 2014). Participant reaction times below 200ms were replaced with their mean reaction time for the condition. Therefore,

[13] Skewness and Kurtose z-scores were calculated by dividing the measure value by the std. error value.

data for 1 participant were removed from analysis. Participant reaction times that were three standard deviations above the mean for the condition were replaced with the upper cut-off limit. One participant had a reaction time three standard deviations above the mean. See Table 7 in section 4.3.2 for participant error rates. Subsequently, switch costs for accurate responses were calculated for the attachment-related and nonattachment-related trials[14].

Stage two data were checked to ensure attachment, schizotypy and dependent variables met the assumptions of multivariate analysis. Unlike stage one data, these data were from a smaller sample size (n = 48). Consequently, the Shapiro-Wilk test of normality and inspection of visual data indicated that attachment disorganisation scores and all schizotypy variables scores were non-normal. Therefore, square root transformations were performed and follow-up normality testing indicated that these data were closer to normal. Normality tests for the dependent variables, i.e., switch costs for attachment and non-attachment-related switch costs, indicated that attachment-related switch costs were normally distributed. However, the Shapiro-Wilk W value indicated that the nonattachment-related switch costs were non-normal (p = .040), whilst skewness and kurtosis values did not (<1.96). The visual data seemed close to normal. Therefore, on balance, nonattachment-related switch costs were deemed closer to normal than non-normal.

Subsequently, statistical tests were performed to test the main experimental hypotheses (H_3 and H_4). However, as aforementioned, prospective power analysis indicated that this study was insufficiently powered to test these hypotheses. There were eleven tested variables, including five covariates. Prior to the main analyses, further examination of the covariates were performed to examine the relationship between age and switch costs (i.e., Pearson's correlation), and to compare means between levels of

[14] Switch cost calculation: mean reaction time for switch trial – mean reaction time for non-switch trial.

gender, education and relationship status with differences in attachment and nonattachment-related switch costs (i.e., independent samples t-tests[15]). The data met the assumptions of the independent t-test, i.e., normal data and equality of variances[16]. Effect sizes were interpreted as 0.2 (weak), 0.5 (moderate) and 0.8 (strong) for Cohen's *d* values[17] (Cohen, 1988). However, forty-one participants of the stage two sample stated they were not prescribed medications. Therefore, the means for medication status were not statistically compared, as large differences in sample size would limit the robustness of a one-way ANOVA to violations of homogeneity of variance (Field, 2014).

Pearson's product-moment correlation coefficients were calculated to examine the relationships between attachment and schizotypy variables, as performed for stage one data. Also, the relationships between these variables with attachment-related and nonattachment-related switch costs were examined.

Next, the analytic plan was to perform regression-based mediation to test hypotheses H_3 and H_4. First, hierarchical multiple regression analysis was performed to allow for a fixed order of entry of variables into SPSS, so that the effects of covariates or specific predictors could be controlled whilst testing the effects of other predictors, as outlined in Figure 1 (Field, 2014). Due to the nonsignificant findings following independent t-tests and Pearson's correlation test, the covariates were not included within the hierarchical multiple regression analysis. Therefore model 1 consisted of attachment anxiety and attachment avoidance, and model 2 consisted of the attachment dimensions AND unusual experiences, cognitive disorganisation, introvertive anhedonia and impulsive nonconformity. The dependent variables were attachment-related switch costs and nonattachment-related switch costs.

[15] The agender level ($n = 1$) was removed from these analyses.
[16] Equality of variances was assumed based on a Levene's test nonsignificant *p*-value (>.05)
[17] Calculated as the difference between group means divided by the pooled standard deviation (Field, 2014).

Consequently, as described in section 4.6, hierarchical multiple regression analysis showed that neither model 1 nor model 2 significantly predicted switch costs. Therefore, mediation analyses were not performed (Baron & Kenny, 1986). The limitations of this analytic plan will be further presented within the discussion section of this paper.

4. Results

4.1. First aim: Attachment dimensions and schizotypy characteristics

4.1.1. Demographic variables. Demographic characteristics were provided by the 409 participants who completed stage one of the study (i.e., online questionnaires). These characteristics are presented in Table 1. There were 303 females and 106 males. The mean age of participants was 22 years (*SD* = 6.172).

Table 1.

Demographic information for stage one participants (N = 409*).*

Variable	*N* (%)	Mean (SD)
Age	-	21.99 (6.172)
Gender		
Female	303 (74)	-
Male	106 (26)	-
		-
Level of study		
Undergraduate	277 (68)	-
Postgraduate	132 (32)	-
Relationship status		
Partnered	226 (55)	-
Single	183 (45)	-
Medication status		
Prescribed[18]	37 (9)	-
Not prescribed[19]	357 (87)	-
Preferred not to state	15 (4)	

[18] Prescribed medication(s) with side effects that could influence cognitive performance
[19] Or prescribed medication(s) without side effects that could influence cognitive performance

4.1.2. Questionnaire variables. Descriptive data, including reliability analysis, for the attachment and schizotypy variables are presented in Table 2. Separate reliability analyses were performed for each subscale. All Cronbach's alpha coefficients were above .7, which indicated good reliability (Kline, 1999).

Table 2.

Mean scores, standard deviations (SD) and Cronbach's alpha coefficients (α) for the attachment and schizotypy variables.

Variable	Mean score	SD	*α*
ADA scale: Attachment disorganisation	2.71	1.19	.876
ECR scale: Attachment anxiety	3.65	1.08	.903
ECR scale: Attachment avoidance	3.42	1.10	.918
O-LIFE scale: Unusual experiences	8.80	6.34	.884
O-LIFE scale: Cognitive disorganisation	13.76	6.14	.889
O-LIFE scale: Introvertive anhedonia	7.87	5.07	.826
O-LIFE scale: Impulsive nonconformity	8.08	3.93	.724

Note. ADA = Adult Disorganised Attachment; ECR = Experiences in Close Relationships; O-LIFE = Oxford-Liverpool Inventory of Feelings and Experiences.

4.2. Correlation coefficients

Pearson's product-moment correlation coefficients were calculated. Correlation coefficient values, *r*, of ± 0.1, 0.3 and 0.5 indicated weak, moderate and strong effect sizes (Field, 2014).

4.2.1. Associations between attachment and schizotypy variables. Attachment anxiety was positively correlated with unusual experiences, $r(407) = .388$, $p<.001$, cognitive disorganisation, $r(407) = .588$, $p<.001$, introvertive anhedonia, $r(407) = .258$, $p<.001$, and impulsive nonconformity, $r(407) = .292$, $p<.001$. These results

indicated moderate to strong effect sizes, with stronger effect sizes for correlations between attachment anxiety and unusual experiences and cognitive disorganisation.

Attachment avoidance was positively correlated with unusual experiences, $r(407) = .298$, $p<.001$, cognitive disorganisation, $r(407) = .363$, $p<.001$, introvertive anhedonia, $r(407) = .576$, $p<.001$, and impulsive nonconformity $r(407) = .204$, $p<.001$. These results indicated weak to strong effect sizes, with the strongest effect for the correlation between attachment avoidance and introvertive anhedonia.

Attachment disorganisation was positively correlated with unusual experiences, $r(407) = .409$, $p<.001$, cognitive disorganisation, $r(407) = .406$, $p<.001$, introvertive anhedonia, r(407) = .360, $p<.001$, and impulsive nonconformity, $r(407) = .369$, $p<.001$. These results indicated moderate effect sizes for all correlations.

4.2.2. Associations between attachment variables. Attachment disorganisation was positively correlated with attachment anxiety, $r(407) = .496$, $p<.001$, and attachment avoidance, $r(407) = .632$, $p<.001$. These results indicated strong effect sizes. There was a positive correlation between attachment anxiety and attachment avoidance, $r(407) = .380$, $p<.001$. This result indicated a moderate effect size.

4.2.3. Associations between schizotypy variables. Unusual experiences was positively correlated with cognitive disorganisation, $r(407) = .582$, $p<.001$, introvertive anhedonia, $r(407) = .309$, $p<.001$, and impulsive nonconformity, $r(407) = .489$, $p<.001$. These results indicated moderate to strong effect sizes. Cognitive disorganisation was positively correlated with introvertive anhedonia, $r(407) = .402$, $p<.001$, and impulsive nonconformity, $r(407) = .407$, $p<.001$. These results indicated moderate effect sizes. Introvertive anhedonia was positively correlated with impulsive nonconformity, $r(407) = .133$, $p = .007$.

4.3. Second and main aim: Parallel mediator model

4.3.1. Demographic variables. Demographic characterstics were provided by the forty-eight participants who completed stage one and stage two of this study. These characteristics are presented in Table 3. There were thirty-seven females, ten males and one agender[20]. The mean age of participants was 22 years (*SD* = 6.068). Independent samples t-tests showed that the stage one demographic means were not significantly different from the stage two demographic means (excluding the agender participant), i.e., age, t(454) = -.363, *p* = .716; gender, t(454) = -.691, *p* = .490; level of study, t(454) = -.245, *p* = .807; relationship status, t(454) = -1.100, *p* = .272; and medication status, t(454) = -1.502, *p* = .134. Participants' mean scores for attachment and schizotypy dimensions and switch costs are presented in Table 4, which shows that the switch costs were unusually smaller than what might be expected typically (Monsell, 2003). These scores were due to a number of negative switch cost scores on trials, whereby nonswitch trial reaction times (RTs) were larger than switch trial RTs.

Table 3.

Demographic information for stage two participants (N = 48).

Variable	*N* (%)	Mean (SD)
Age	-	22.31 (6.068)
Gender		
Female	37 (77)	-
Male	10 (21)	-
Agender	1 (2)	-
Level of study		
Undergraduate	31 (65)	-
Postgraduate	17 (35)	-
Relationship status		
Partnered	22 (46)	-
Single	26 (54)	-

[20] A participant selected the identity 'male' for stage one, but chose 'agender' for stage two in the laboratory.

Table 3 (continued).

Demographic information for stage two participants (N = 48).

Variable	*N* (%)	Mean (SD)
Medication status		
Prescribed	4 (8)	-
Not prescribed	41 (86)	-
Preferred not to state	3 (6)	-

Table 4.

Mean scores and SD for the attachment, schizotypy and dependent variables (stage two).

Variable	Mean score	*SD*	Mean (in milliseconds)	*SD*
ADA scale: Attachment disorganisation	2.95	1.37	-	-
ECR scale: Attachment anxiety	3.55	1.15	-	-
ECR scale: Attachment avoidance	3.64	1.20	-	-
O-LIFE scale: Unusual experiences	9.04	6.25	-	-
O-LIFE scale: Cognitive disorganisation	12.40	6.71	-	-
O-LIFE scale: Introvertive anhedonia	7.85	5.10	-	-
O-LIFE scale: Impulsive nonconformity	7.42	3.94	-	-
Attachment-related switch costs	-	-	.17	125.50
Nonattachment-related switch costs	-	-	29.54	121.31

Note. ADA = Adult Disorganised Attachment; ECR = Experiences in Close Relationships; O-LIFE = Oxford-Liverpool Inventory of Feelings and Experiences.

4.3.2. Cognitive task mean reaction times and error rates. The mean RTs in milliseconds were calculated for the four conditions (i.e., switch trials and non-switch trials for attachment- and nonattachment-related words). Moreover, error rates were calculated for the four conditions and for the rule type (i.e., colour or prompt). See Tables 5 and 6 for participant mean RTs and error rates. The differences between mean reaction times for the four conditions appeared small, as did error rates. However, error rates were significantly higher for the length rule for attachment-related words, $t(47) = -6.315$, $p<.001$, and nonattachment-related words, $t(47) = -4.751$, $p<.001$. These error rates might reflect that the length rule was more difficult.

Table 5.

Cognitive task mean reaction times.

Variable	Mean RTs (milliseconds)	*SD*
Switch trials		
Attachment-related words	811	347
Nonattachment-related words	837	372
Task repeat trials		
Attachment-related words	813	350
Nonattachment-related words	803	357

Table 6.

Cognitive task error rates.

Variable	Mean % of error rates	Range
Switch trials		
Attachment-related words	15	0-60
Nonattachment-related words	17	0-74
Task repeat trials		
Attachment-related words	14	0-70
Nonattachment-related words	14	0-64
Rule type		
Colour	9	0-70
Length	21	3-57
Attachment words		
Colour	9	0-73
Length	20	0-53
Nonattachment words		
Colour	10	0-67
Length	22	0-60

4.4. Differences between demographic variables for switch costs.

Statistical tests were performed (as outlined in section 3.1.2) to examine the relationship between age and switch costs, and to compare means between levels of gender, education and relationship status with differences in switch cost. Effect sizes were calculated and interpreted as 0.1 (weak), 0.3 (moderate) and 0.5 (strong) for *r* values (Field, 2014) and as 0.2 (weak), 0.5 (moderate) and 0.8 (strong) for Cohen's *d* values[21] (Cohen, 1988).

[21] Calculated as the difference between group means divided by the pooled standard deviation (Field, 2014).

4.4.1. Attachment-related switch costs. There was no statistically significant correlation between age and attachment-related switch costs, $r(46) = .068$, $p = .646$. There were no statistically significant differences between attachment-related switch costs for males (Mean = -25.3, *SD* = 105.31) and females (Mean = 9.5, *SD* = 131.50), t(45) = -.770, $p = .445$, for undergraduates (Mean = .429, *SD* = 128.18) and postgraduates (Mean = -.235, *SD* = 124.14), t(46) = .017 , $p = .986$, $d = .0005$, or for partnered participants (Mean =-7.6, *SD* = 121.10) and single participants (Mean = 6.8, *SD* = 131.10), t(46) = -.394 , $p = .695$, $d = .115$. All effect sizes were weak.

4.4.2. Nonattachment-related switch costs. There was no statistically significant correlation between age and nonattachment-related switch costs, $r(46) = -.085$, $p = .568$. There were no statistically significant differences between nonattachment-related switch costs for males (Mean = 55.10, *SD* = 93.21) and females (Mean = 26.12, *SD* = 127.97), t(45) = .666, $p = .509$, for undergraduates (Mean = 20.1, *SD* = 122.32) and postgraduates (Mean = 46.8, *SD* = 121.21), t(46) = -.724, $p = .473$, $d = .212$, or for partnered participants (Mean = 28.6, *SD* = 125.45) and single participants (Mean = 30.4, *SD* = 120.20), t(46) = -.051 , $p = .960$, $d = .015$. All effect sizes were weak.

4.5. Associations between variables

Pearson's product-moment correlation coefficients were calculated for stage two data. Correlation coefficient values, *r*, of ± 0.1, 0.3 and 0.5 indicate weak, moderate and strong effect sizes (Field, 2014). Table 7 shows all correlation coeffecient results.

4.5.1. Attachment and schizotypy variables. Attachment anxiety was positively correlated with attachment avoidance, $r(46) = .349$, $p = .012$, attachment disorganisation, $r(46) = .294$, $p = .021$, unusual experiences, $r(46) = .499$, $p<.001$, cognitive disorganisation, $r(46) = .596$, $p<.001$, and introvertive anhedonia, $r(46) = .304$, $p = .018$. Attachment anxiety was weakly correlated with impulsive

nonconformity, $r(46) = .176$, but this was nonsignificant, $p = .115$. Effect sizes for significant results were moderate to strong.

Attachment avoidance was positively correlated with unusual experiences, $r(46) = .326$, $p = .012$, cognitive disorganisation, $r(46) = .253$, $p = .042$, introvertive anhedonia, $r(46) = .652$, $p < .001$. There was a very weak correlation between attachment avoidance and impulsive nonconformity, $r(46) = .080$, which was nonsignificant, $p = .295$. Effect sizes for significant results were moderate to strong.

Attachment disorganisation was significantly correlated with unusual experiences, $r(46) = .457$, $p = .001$, with strong effect. However, *p*-values indicated that weak to moderate effects for correlations between attachment disorganisation and the other schizotypy variables were nonsignificant; cognitive disorganisation, $r(46) = .260$, $p = .074$, introvertive anhedonia, $r(46) = .258$, $p = .077$, and impulsive nonconformity, $r(46) = .203$, $p = .166$.

4.5.2. Attachment, schizotypy and dependent variables. Table 7 shows that only the impulsive nonconformity variable significantly correlated with attachment-related switch costs, $r(46) = -.296$, $p = .020$, and nonattachment-related switch costs, $r(46) = -.314$, $p = .015$. These effect sizes were moderate. Attachment disorganisation negatively correlated with nonattachment-related switch costs, $r(46) = -.240$, $p = .05$. Other results were nonsignificant with weak effect sizes.

4.6. Hierarchical regression analysis

4.6.1. Dependent variable (DV): Attachment-related switch costs. Table 8 provides a summary of the hierarchical regression analysis, with attachment-related switch costs as the DV. The attachment dimensions (attachment anxiety and attachment avoidance) explained 0.8% of variance in attachment-related switch costs, $R^2 = .008$, $F(2, 45) = .173$, $p = .842$; neither made a significant contribution. The addition of the schizotypy dimensions (unusual experiences, cognitive disorganisation, introvertive

anhedonia and impulsive nonconformity) in model 2 did not produce a significant increment in the amount of variance explained, $\Delta R^2 = .01$, $F(4, 41) = 1.154$, $p = .345$, and no predictors (attachment or schizotypy) made a significant contribution. The variables in the final regression equation explained 11% of the variance in attachment-related switch costs, $R^2 = .108$, $F(6,41) = .827$, $p = .556$.

4.6.2. Dependent Variable: Nonattachment-related switch costs. Table 9 provides a summary of the hierarchical regression analysis, with nonattachment-related switch costs as the DV. The attachment dimensions explained 1.2% of variance in nonattachment-related switch costs, $R^2 = .012$, $F(2,45) = .274$, $p = .761$; neither made a significant contribution. The addition of schizotypy dimensions in model 2 did not produce a significant increment in the amount of variance explained, $\Delta R^2 = .139$, $p = .174$. However, impulsive nonconformity made a significant contribution ($p = .015$). The variables in the final regression equation explained 15% of the variance in nonattachment-related switch costs.

Hierarchical regression analysis showed that attachment dimensions did not predict switch costs and, therefore, mediation was not indicated (Baron & Kenny, 1986). Consequently, further mediation analysis were not performed.

Table 7.

Correlations between attachment, schizotypy and dependent variables (stage two).

Variables	ADA	AAx	AAv	UnEx	CogDis	IntAn	ImpCon	AttSC	NonAttSC
ADA	1.00	.294*	.579**	.457**	.260	.258	.203	.047	-.240*
AAx		1.00	.349**	.499*	.596**	.304*	.176	-.001	.081
AAv			1.00	.326*	.253*	.652**	.080	.067	-.058
UnEx				1.00	.481**	.320*	.425**	-.085	.042
CogDis					1.00	.374**	.270*	.017	.015
IntAn						1.00	.086	.028	.001
ImpCon							1.00	-.296*	-.314*
AttSC								1.00	.067
NonAttSC									1.00

Note. * = $p<.05$; ** = $p<.001$; ADA = Adult disorganised attachment; AAx = Attachment anxiety; AAv = Attachment avoidance; UnEx = Unusual experiences; CogDis = Cognitive disorganisation; IntAn = Introvertive anhedonia; ImpCon = Impulsive nonconformity; AttSC = Attachment-related switch costs; NonAttSC = Nonattachment-related switch costs.

Table 8.

Summary of hierarchical regression analyses (DV: attachment-related switch costs)

Variables	B	SE B	β
Model 1			
Attachment anxiety	-3.660	17.296	-.034
Attachment avoidance	9.762	16.615	.093
Model 2			
Attachment anxiety	-4.290	21.595	-.039
Attachment avoidance	14.017	21.166	.134
Unusual experiences	-1.224	21.507	-.011
Cognitive disorganisation	14.864	24.202	.122
Introvertive anhedonia	-7.901	26.295	-.061
Impulsive nonconformity	-56.508	28.808	-.323

Note. Model 1 R^2 = .008, p =.842, Model 2 ΔR^2 = .01, p =.345.

Table 9.

Summary of hierarchical regression analyses (DV: nonattachment-related switch costs)

Variables	B	SE B	β
Model 1			
Attachment anxiety	10.513	16.691	.100
Attachment avoidance	-9.387	16.034	-.093
Model 2			
Attachment anxiety	7.342	20.376	.070
Attachment avoidance	-14.870	19.972	-.147
Unusual experiences	23.262	20.293	.216
Cognitive disorganisation	.264	22.836	.002
Introvertive anhedonia	5.061	24.811	.041
Impulsive nonconformity	-69.327	27.182	-.410

Note. Model 1 R^2 = .012, p = .761, Model 2 ΔR^2 = .139, p = .174.

5. Discussion

The present study had two aims. First, to examine the relationships between adult attachment and schizotypy, and to include dimensional measurement of attachment disorganisation in adulthood. Second, to examine whether schizotypy mediated the relationships between adult attachment and cognitive flexibility. The main study findings will now be discussed, the methods critiqued and the potential theoretical and clinical implications outlined.

5.1. Main study findings

5.1.1. Adult attachment and schizotypy dimensions. Attachment anxiety was strongly correlated with cognitive disorganisation, whereas it moderately correlated with unusual experiences, introvertive anhedonia and impulsive nonconformity. Whilst the relationship between attachment anxiety and unusual experiences was relatively stronger than those for introvertive anhedonia and impulsive nonconformity, these findings do not fully support the hypothesis (H_1) that stronger relationships would be found between attachment anxiety and positive schizotypy dimensions. These findings partially fit with previous evidence (e.g., Easton et al., 2014). The strong relationship between attachment anxiety and cognitive disorganisation, characteristics associated with poor attention and concentration and social anxiety, makes sense given the preoccupied state of mind and hypervigilance that are characteristic of those with attachment anxiety (Myhr, 2014). The moderate relationship between attachment anxiety and unusual experiences fits with the previous suggestion that schizotypy experiences, such as magical thinking and ideas of reference, might be protective and a cognitive method to maintain proximity (Tiliopoulos & Goodall, 2009), particularly as attachment anxiety is associated with fears of abandonment by others, poor self-evaluation and hypervigilance (Myhr, 2014). These findings might further support a conceptual separation of the unusual experiences and cognitive disorganisation

dimensions, rather than both categorised as 'positive schizotypy' (e.g., Berry et al., 2007).

Attachment avoidance strongly correlated with introvertive anhedonia, moderately correlated with unusual experiences and cognitive disorganisation, and weakly correlated with impulsive nonconformity. Again, these results do not fully support the hypothesis (H_2) that stronger relationships would be found between attachment avoidance and negative schizotypy but, similar to the relationships between attachment anxiety and schizotypy, partially fit with previous evidence (Easton et al., 2014; Tiliopolous & Goodall, 2009). Given that attachment avoidance has been associated with self-reliance and avoidance of intimacy (Myhr, 2014) it is unsurprising that this dimension strongly correlated with introvertive anhedonia. Introvertive anhedonia is a negative schizotypy dimension associated with asocial aspects of psychosis phenomena (Mason & Claridge, 2006). Conversely, these findings might raise questions about the inclusion of impulsive nonconformity (Mason & Claridge, 2006) particularly as negative schizotypy.

Attachment disorganisation strongly correlated with attachment anxiety and attachment avoidance, but still presented as a distinct dimension. These relationships made sense given that attachment disorganisation has long been considered a distinct phenomenon, interrelated with attachment anxiety and avoidance (Paetzold et al., 2015). This simultaneous distinction and overlap corresponds with the theoretical assertion that disorganised behaviours may involve clinging and distancing, like anxiety and avoidance respectively, but that chaotic and confusing behaviours are also involved. This study's correlation coefficients were very similar to the results reported by Paetzold et al. (2015). Moreover, attachment disorganisation moderately correlated with all schizotypy dimensions, suggestive of an indiscrete pattern of relationships for attachment disorganisation and schizotypy, relative to attachment anxiety and

attachment avoidance. Whilst correlations do not indicate causality, the correlations with all schizotypy dimensions might suggest that attachment disorganisation is related to a stronger occurrence of psychosis phenomena (Sheinbaum et al., 2014).

5.1.2. Adult attachment, schizotypy and cognitive flexibility. As mentioned, RT data have been the predominant measure of attachment-related differences in attentional processes (Shearman et al., in prep.), but previous results have been inconclusive and, therefore, this study focused on cognitive flexibility, using switch cost calculations. RT data were used to calculate switch costs. This study's data showed unusually smaller switch costs than expected (Monsell, 2003). As mentioned, there were negative switch cost scores on attachment- and nonattachment-related trials. These negative scores might have represented, for participants, small benefits of switching or disruptions to nonswitching. Switch trials almost always yield larger RTs than non-switch trials. Therefore, researchers would strongly predict switch RTs to be greater than non-switch RTs, because switch trials include all the basic processing costs of non-switch trials as well cognitively challenging switching rules (Monsell, 2003). Conversely, prominent theory has hypothesised that attachment dimensions can cause further atypical disruption to information processing (Mikulincer et al., 2003; Shaver & Mikulincer, 2002). Thus, an initial interpretation was that these unusual findings were the result of atypical disruption. However, unexpectedly, regression analyses showed that adult attachment dimensions did not predict switch costs and (for the most) neither did schizotypy dimensions. Therefore, not only was it difficult to explain these unusual switch cost scores, mediation analyses were not performed, experimental predictions (H_3 and H_4) were not met and these null findings added to the inconsistent evidence (Shearman et al., in prep). However, study method may have also contributed to these unusual switch cost findings. The switch task was configurated so that two-thirds of experimental trials were switch trials, to ensure adequate testing of cognitive flexibility.

However, this configuration might have atypically disrupted participant RT for nonswitch trials, because participants might have noticed there were more switch trials than non-switch trials. This imbalance of trials could have induced participants' expectations that they would switch on most trials and, therefore, switch trials would be faster, and non-switch trials might have been surprising, hence the unusual results. Alternatively, the attachment-related stimuli might be disruptive of basic cognitive processes, perhaps by inducing ruminations or distractions, hence unusual impact on performance.

The regression coefficients indicated that as attachment anxiety increased, the switch costs decreased for attachment-related words, whereas switch costs increased for nonattachment-related words. These outcomes suggested that attachment anxiety was associated with faster RTs on attachment switch trials, which contradicted predictions. Conversely, as attachment avoidance increased so did switch costs for attachment-related words, whereas switch costs decreased for nonattachment-related words. Again, these outcomes contradicted predictions that attachment avoidance would be associated with faster not slower RTs. There has been previous inconsistency in how data are interpreted to confirm attachment-related differences in information processing. Studies have suggested that the hyperactivating strategies associated with attachment anxiety manifested in faster and slower reaction times, whereas deactivating strategies associated with attachment avoidance also manifested in faster and slower reaction times (Shearman et al., in prep). However, stage two of this study was not adequately powered to detect a medium effect, so these results cannot be considered in greater detail.

5.2. Methodological critique

There were several limitations to this study. First, whilst the study of this population can be readily compared to an evidence base that has predominantly

recruited students to examine the relationships between adult attachment and information processing, the student sample limits the generalisability of findings to clinical populations and practice. Participants were university students, and mostly undergraduates, female and below the age of 30 years. These demographics are comparable to previous research, but further limit applicability to the wider, non-university educated, older populations. The benefit of a dimensional approach, however, was that students who might have accessed clinical services were not excluded. Recruitment from an NHS service user population was thought unethical given that this was an underresearched area, and unnecessary as psychosis phenomena are not exclusive to mental health service users (Beavan et al., 2011).

Second, this study was insufficiently powered to detect a medium effect and, therefore, unable to adequately test the main hypotheses, i.e., H_3 and H_4, (Field, 2014). Consequently, nonsignificant findings might be the result of type II error (Field, 2014). Previously, sample sizes have varied between studies of adult attachment and information processing (Shearman et al., in prep), which might reflect recruitment differences. Four hundred and nine participants completed online questionnaires in this study; however only forty-eight of these participants agreed to complete the switch task within a 3-4 month period. Also, this study's participants were recruited during a university break and examination period. Previous studies were not explicit about recruitment and data collection, so it is harder to draw conclusions about pertinent recruitment factors.

This study introduced a switch task, a measure of switch costs, to examine the relationship between adult attachment and cognitive flexibility. This switch task method diverged from common use of attention tasks, which have relied solely on RT data. However, the switch costs were also calculated from RT data. Mark, Geurdes and Bekker (2012) suggested that reliance on RT data as an outcome variable might be

problematic, because these data are a measure of motor response rather than the time at which a stimulus is attended to. There have also been questions raised about the ecological validity of word stimuli as a natural source of threat (Bradley, Mogg, Millar, Bonham-Carter, Fergusson et al., 1997; Morris, Ohman, & Dolan, 1998). The stimuli within this study might not have been sufficient to cause disruption to information processing. Therefore, cognitive tasks and their stimuli may be insufficient to detect attachment-related differences in information processing; hence the inconclusive and null findings, as previously discussed (e.g., Cooper, Rowe, Penton-Voak, & Ludwig, 2009; Woodward, 2015). Further, the use of this switch task may be inadequate because it could not account for response rate and accuracy in a single score. Other switch tasks scoring methods have been proposed (Hughes et al., 2013). Alternatively, studies have examined attachment-related differences in information processing with brain response amplitudes and have reported attachment-related differences when RT data indicated no differences (Chavis & Kisley, 2012; Lathrop, Davis, & Kisley, 2015; Mark et al., 2012).

This study proposed tests of mediation to examine the indirect effects of schizotypy dimensions on direct relationships between adult attachment and cognitive flexibility. However, regression analyses indicated that there was no direct significant relationship between adult attachment and cognitive flexibility, so further tests of mediation were not performed. Whilst a power analysis suggested that this study was not adequately powered to detect a medium effect, it may be that the proposed parallel mediator model was also inadequate. Previous studies have indicated the moderation effects of variables on the relationship between adult attachment and information processing (e.g., Edelstein & Gillath, 2008). Therefore, it might be that rather than there be a causal sequence, with schizotypy as mediators between two variables (i.e., adult attachment dimension and switch cost), instead schizotypy might influence this relationship as moderators. Alternatively, statistical limitations might have affected

findings. Specifically, Baron and Kenny's (1986) method recommended that step one was achieved, i.e., direct relationships between attachment dimensions and switch costs, to warrant further analyses. However, another statistical mediation method, using the PROCESS macro (Hayes, 2013; Preacher & Hayes, 2008), does not require this first step to be confirmed. The assumption when using the PROCESS macro is that, if full mediation occurs, a direct relationship would not be established (Hayes, 2013). Therefore, this study's statistical method may have been inadequate to show full mediation.

5.3. Theoretical and clinical implications

This study failed to find attachment-related differences in cognitive flexibility, but did find significant relationships between specific adult attachment dimensions and schizotypy dimensions. First, the findings partially supported previous evidence that showed attachment anxiety was associated with positive schizotypy. These data are consistent with one theoretical interpretation. Schizotypy characteristics, such as cognitive disorganisation (e.g., poorer attention and social anxiety) and unusual experiences (e.g., ideas of reference), resemble the preoccupation and hypervigilance associated with attachment anxiety. However, the difference in effect sizes might support an argument that schizotypy characterstics should not be combined. For example, cognitive disorganisation and unusual experiences should remain distinct factors rather than categorised as 'positive schizotypy' (Mason & Claridge, 2006). Second, the findings partially supported previous evidence that showed attachment avoidance was associated with negative schizotypy; also consistent with one theoretical interpretation. Schizotypy characteristics, such as introvertive anedonia (e.g., social withdrawal and lack of social enjoyment), resemble the self-reliance and distancing associated with attachment avoidance (Myhr, 2014). However, perhaps the findings for attachment avoidance and impulsive nonconformity (i.e., weak correlation) suggests

that assumptions about impulsive nonconformity as negative schizotypy, and therefore associated with attachment avoidance, were incorrect. Findings suggested that impulsive nonconformity was more strongly correlated with attachment disorganisation.

As aforementioned, attachment disorganisation moderately correlated with all four schizotypy dimensions, which indicated an indiscrete pattern. Also, impulsive nonconformity (e.g., impulsive behaviours and lack of self-control) was more correlated with attachment disorganisation than with attachment anxiety and attachment avoidance. This finding might fit with evidence that has suggested disorganisation is associated with unstable, contradictory and risky presentations (e.g., Holmes, 2004).

Clinical implications are limited, because this study recruited a non-clinical, student sample. Moreover, students were predominantly female, undergraduates and below 30 years of age. The switch task that was employed was experimental, in contrast to neuropsychological tests of cognitive flexibility used in clinical practice (Louise et al., 2015), and conducted in a controlled situation. Therefore the ecological validity might be an issue. However, findings supported the reliability of dimensional measurement of schizotypy. Clinical guidance has argued for an overhaul of how psychosis phenomena and experiences are conceptualised and formulated, and has promoted a dimensional approach rather than a quasi-categorical approach (Cooke, 2014). This study has confirmed that there are relationships between adult attachment dimensions and schizotypy. Therefore, service users along with clinical psychologists may choose to explore and make sense of schizotypy characteristics in order to formulate the potential function/relevance of these characteristics, e.g., protective (Claridge, 1997; Tiliopoulos & Goodall, 2009).

Moreover, this study's main predictions were not confirmed. Clinicians should be aware that these results may be due to methodological limitations, and also that these

results add to an inconsistent evidence base for adult attachment and information processing.

5.4. Future research

This study raises potential issues with theory and method. This study has provided further null findings to an inconclusive evidence base, which continues to challenge whether theoretically posited attachment-related differences in information processing exist (Mikulincer et al., 2003). However, as accepted, there are methodological limitations with this study, which have limited the ability to test theory adequately.

Future studies could try to test hypotheses using larger samples. However, there is a strong argument to reconsider the scientific methods that are used. As discussed, tasks that have relied on RT data have been criticised and shown inconsistent evidence to support links between adult attachment and information processing. Conversely, there is evidence to support the use of event-related potential (i.e., brain amplitudes) measurement to detect attachment-related differences in information processing. Therefore, future research may consider the use of such methods to test for attachment-related differences in information processing. The ongoing use of dimensional measurement may minimise the need to recruit from clinical services, whilst also enabling mental health services users to participate in research, at least until a clearer picture emerges.

Moreover, whilst the attachment dimensions (i.e., anxiety and avoidance) and schizotypy dimensions were found to be stable within a previous experiment, even during times of exam stress (Easton et al., 2014), there have been arguments for the implementation of longitudinal designs to test mediation models. The reasons for this argument are: that causal processes are considered to unfold over time (so multiple time points are necessary); a longitudinal design allows for more rigourous inferences about

causal relationships to be made; and cross sectional data can create bias (Cole & Maxwell, 2003; Maxwell, Cole, & Mitchell, 2007). Whilst it has been argued that priming could ensure the activation of the attachment system at time of testing (Baldwin & Fehr, 1995), future research might consider the stability of the tested variables and revise designs according to these arguments.

6. Conclusion

This study examined the relationships between adult attachment dimensions and schizotypy, and provided partial evidence for specific relationships that have continued to emerge within the literature, and is the first to have included a measure of attachment disorganisation in adulthood. This study also examined the relationships between adult attachment and cognitive flexibility in order to test a parallel mediator model, with schizotypy dimensions as a mediator of these relationships. However, clinicians should be aware that the methodological issues with the study (particularly small *n* for stage two) limited the power of the study to detect a medium effect and subsequent conclusions that could be made. This study produced null findings, within the context of an inconclusive evidence base. Future research should reconsider the adequacy of tasks that rely on RT data to detect attachment-related differences in information processing.

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Appendix D: University of Sheffield ethical approval letter

The University Of Sheffield.

Downloaded: 18/05/2016
Approved: 18/05/2016

Nathan Shearman
Registration number: 140109311
Psychology
Programme: Doctorate in Clinical Psychology

Dear Nathan

PROJECT TITLE: Examining the relationships between adult attachment styles, schizotypy dimensions and executive function skills using regression and correlational analyses
APPLICATION: Reference Number 007672

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 18/05/2016 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 007672 (dated 20/04/2016).
- Participant information sheet 1017211 version 1 (18/04/2016).
- Participant information sheet 1015295 version 4 (14/04/2016).
- Participant consent form 1015296 version 4 (14/04/2016).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Thomas Webb
Ethics Administrator
Psychology

Appendix E: G*Power output for first and second aims

Primary aim:

Exact - Correlation: Bivariate normal model

Options:	exact distribution	
Analysis:	A priori: Compute required sample size	
Input:	Tail(s)	= Two
	Correlation ρ H1	= 0.3
	α err prob	= 0.05
	Power (1-β err prob)	= 0.8
	Correlation ρ H0	= 0
Output:	Lower critical r	= -0.2145669
	Upper critical r	= 0.2145669
	Total sample size	= 84
	Actual power	= 0.8003390

Secondary and main aim:

F tests - Linear multiple regression: Fixed model, R^2 increase

Analysis:	A priori: Compute required sample size	
Input:	Effect size f^2	= 0.15
	α err prob	= 0.05
	Power (1-β err prob)	= 0.8
	Number of tested predictors	= 6
	Total number of predictors	= 11
Output:	Noncentrality parameter λ	= 14.7000000
	Critical F	= 2.2059357
	Numerator df	= 6
	Denominator df	= 86
	Total sample size	= 98
	Actual power	= 0.8017019

Appendix F: Experiences in Close Relationships (ECR) scale

Instructions:

The following statements ask you to rate how you feel and behave in your closest relationships. Please respond with how you feel and behave **generally** in these relationships. Please indicate the extent to which you agree with the following statements.

Items:

Item	Question	Score 1 = strongly disagree 2 3 4 = neutral/mixed 5 6 7 = strongly agree
1	I prefer not to show people close to me how I feel deep down.	1 2 3 4 5 6 7
2	I worry about being abandoned.	1 2 3 4 5 6 7
3	I am very comfortable being close to others. (R)	1 2 3 4 5 6 7
4	I worry a lot about my relationships.	1 2 3 4 5 6 7
5	Just when people start to get close to me I find myself pulling away.	1 2 3 4 5 6 7
6	I worry that people won't care about me as much as I care about them.	1 2 3 4 5 6 7
7	I worry a fair amount about losing my relationships.	1 2 3 4 5 6 7
8	I get uncomfortable when people want to be very close.	1 2 3 4 5 6 7
9	I don't feel comfortable opening up to others.	1 2 3 4 5 6 7
10	I often wish that my loved ones' feelings for me were as strong as my feelings for him/her.	1 2 3 4 5 6 7
11	I want to get close to others, but I keep pulling back.	1 2 3 4 5 6 7
12	I often want to merge completely with others, and this sometimes scares them away.	1 2 3 4 5 6 7
13	I am nervous when others get too close to me.	1 2 3 4 5 6 7
14	I worry about being alone.	1 2 3 4 5 6 7
15	I feel comfortable sharing my private thoughts and feelings with others I am close to. (R)	1 2 3 4 5 6 7
16	My desire to be very close sometimes scares people away.	1 2 3 4 5 6 7
17	I try to avoid getting too close to others.	1 2 3 4 5 6 7
18	I need a lot of reassurance that I am loved by those close to me.	1 2 3 4 5 6 7
19	I find it relatively easy to get close to others. (R)	1 2 3 4 5 6 7

20	Sometimes I feel that I force others to show more feeling, more commitment.	1 2 3 4 5 6 7
21	I find it difficult to allow myself to depend on others.	1 2 3 4 5 6 7
22	I do not often worry about being abandoned. (R)	1 2 3 4 5 6 7
23	I prefer not to be too close to others.	1 2 3 4 5 6 7
24	If I can't get others close to me to show interest in me, I get upset or angry.	1 2 3 4 5 6 7
25	I tell those close to me just about everything. (R)	1 2 3 4 5 6 7
26	I find that others don't want to get as close as I would like.	1 2 3 4 5 6 7
27	I usually discuss my problems and concerns with those close to me (R).	1 2 3 4 5 6 7
28	When I'm not involved in a relationship, I feel somewhat anxious and insecure.	1 2 3 4 5 6 7
29	I feel comfortable depending on others.	1 2 3 4 5 6 7
30	I get frustrated when those I am close to aren't around me as much as I would like.	1 2 3 4 5 6 7
31	I don't mind asking romantic partners for comfort, advice, or help.	1 2 3 4 5 6 7
32	I get frustrated if those close to me are not available when I need them.	1 2 3 4 5 6 7
33	It helps to turn to others in times of need. (R)	1 2 3 4 5 6 7
34	When those close to me disapprove of me, I feel really bad about myself.	1 2 3 4 5 6 7
35	I turn to others for many things, including comfort and reassurance. (R)	1 2 3 4 5 6 7
36	I resent it when those I am close to spend time away from me.	1 2 3 4 5 6 7

Scoring guidelines:

Items with (R) next to them need reversing when scored. Even-numbered items 2-36 (18 items) measure attachment anxiety. Odd-number items 1-35 (18 items) measure attachment avoidance. Mean scores are calculated for each subscale.

Appendix G: Adult Disorganised Attachment (ADA) scale

Instructions:

The following statements ask you to rate how you feel and behave in your closest relationships. Please respond with how you feel and behave **generally** in these relationships. Please indicate the extent to which you agree with the following statements.

Items:

Item	Question	1 = strongly disagree… 7 = strongly agree
1	Fear is a common feelings in close relationships	1 2 3 4 5 6 7
2	I believe that people in close relationships often try to take advantage of each other	1 2 3 4 5 6 7
3	I never know who I am with close others	1 2 3 4 5 6 7
4	I find close others to be rather scary	1 2 3 4 5 6 7
5	It is dangerous to trust close others	1 2 3 4 5 6 7
6	It is normal to have traumatic experiences with the people you feel close to	1 2 3 4 5 6 7
7	Strangers are not as scary as people you feel close to	1 2 3 4 5 6 7
8	I could never view close others as totally trustworthy	1 2 3 4 5 6 7
9	Compared with most people, I feel generally confused about close relationships	1 2 3 4 5 6 7

Scoring guidelines:

To obtain a disorganised attachment score a mean value for items 1-9 is calculated. Higher scores mean higher levels of disorganisation.

Appendix H: Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) scale

Instuctions:

This questionnaire contains questions that may relate to your thoughts, feelings, experiences and preferences. There are no right or wrong answers or trick questions so please be as honest as possible. Please answer either "Yes" or "No". Do not spend too much time deliberating any question but put the answer closest to your own. Please do not discuss the questionnaire with anyone who may also complete it as this may affect their answers. It is best completed in private, without the need to hurry.

Items:

Item	Question	Response (Yes or No)	Positive or negative
1 (UnEX)	Do you believe in telepathy?	Yes No	Positive
2	Do you ever feel sure that something is about to happen, even though there does not seem to be any reason for you thinking that?	Yes No	Positive
3	Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?	Yes No	Positive
4	Do you often have days when indoor lights seem so bright that they bother your eyes?	Yes No	Positive
5	Does your sense of smell sometimes become unusually strong?	Yes No	Positive
6	Have you felt as though your head or limbs were somehow not your own?	Yes No	Positive
7	Have you sometimes sensed an evil presence around you, even though you could not see it?	Yes No	Positive
8	Have you wondered whether the spirits of the dead can influence the living?	Yes No	Positive
9	On occasions, have you seen a person's face in front of you when no one was in fact there?	Yes No	Positive
10	When in the dark do you often see shapes and forms even though there's nothing there?	Yes No	Positive
11	When you look in the mirror does your face sometimes seem quite different from usual?	Yes No	Positive
12	Are your thoughts sometimes so strong that you can almost hear them?	Yes No	Positive
13	Can some people make you aware of them just by thinking about you?	Yes No	Positive
14	Do ideas and insights sometimes come to you so fast that you cannot express them all?	Yes No	Positive
15	Do the people in your daydreams seem so true to life that you sometimes think they are real?	Yes No	Positive
16	Do you sometimes feel that your accidents are caused by mysterious forces?	Yes No	Positive
17	Do you think you could learn to read other's minds if you wanted to?	Yes No	Positive
18	Does it often happen that nearly every thought immediately and automatically suggests an enormous number of ideas?	Yes No	Positive
19	Does a passing thought ever seem so real it frightens you?	Yes No	Positive
20	Does your voice ever seem distant or faraway?	Yes No	Positive

21	Have you ever felt that you have special, almost magical powers?	Yes	No	Positive
22	Is your hearing sometimes so sensitive that ordinary sounds become uncomfortable?	Yes	No	Positive
23	Do you ever have a sense of vague danger or sudden dread for reasons that you do not understand?	Yes	No	Positive
24	Do you feel so good at controlling others that it sometimes scares you?	Yes	No	Positive
25	Have you ever thought you heard people talking only to discover that it was in fact some nondescript noise?	Yes	No	Positive
26	Have you felt that you might cause something to happen just by thinking too much about it?	Yes	No	Positive
27	Have you occasionally felt as though your body did not exist?	Yes	No	Positive
28	Have you sometimes had the feeling of gaining or losing energy when certain people look at your or touch you?	Yes	No	Positive
29	Are the sounds you hear in your daydreams really clear and distinct?	Yes	No	Positive
30	Do your thoughts sometimes seem as real as actual events in your life?	Yes	No	Positive
31 (CogDis)	Are you easily distracted when you read or talk to someone?	Yes	No	Positive
32	Do you ever feel that your speech is difficult to understand because the words are all mixed up and don't make sense?	Yes	No	Positive
33	Do you often experience an overwhelming sense of emptiness?	Yes	No	Positive
34	Do you often feel lonely?	Yes	No	Positive
35	Is it hard for you to make decisions?	Yes	No	Positive
36	Are you a person whose mood goes up and down easily?	Yes	No	Positive
37	Are you easily hurt when people find fault with you or the work you do?	Yes	No	Positive
38	Are you sometimes so nervous that you are 'blocked'?	Yes	No	Positive
39	Do you dread going into a room by yourself where other people have already gathered and are talking?	Yes	No	Positive
40	Do you easily lose your courage when criticised or failing in something?	Yes	No	Positive
41	Do you find it difficult to keep interested in the same thing for a long time?	Yes	No	Positive
42	Do you frequently have difficulty in starting to do things?	Yes	No	Positive
43	Do you often feel that there is no purpose to life?	Yes	No	Positive
44	Do you often have difficulties in controlling your thoughts?	Yes	No	Positive
45	Do you often worry about things you should not have done or said?	Yes	No	Positive
46	Do you worry about awful things that might happen?	Yes	No	Positive
47	No matter how hard you try to concentrate do unrelated thoughts creep into your mind?	Yes	No	Positive
48	When in a crowded room do you have difficulty following a conversation?	Yes	No	Positive

49	Are you easily confused if too much happens at the same time?	Yes	No	Positive
50	Are you easily distracted from work by daydreams?	Yes	No	Positive
51	Do you often feel 'fed up'?	Yes	No	Positive
52	Do you worry too long after an embarrassing experience?	Yes	No	Positive
53	Would you call yourself a nervous person?	Yes	No	Positive
54	Do you often hesitate when you are going to say something in a group of people whom you more or less know?	Yes	No	Positive
55 (IntAn)	Can you usually let yourself go and enjoy yourself at a lively party?	Yes	No	Negative
56	Do people who try to get to know you better usually give up after a while?	Yes	No	Positive
57	Do you feel that making new friends isn't worth the energy it takes?	Yes	No	Positive
58	Do you find the bright lights of a city exciting to look at?	Yes	No	Negative
59	Do you like going out a lot?	Yes	No	Negative
60	Do you prefer watching television to going out with other people?	Yes	No	Positive
61	Do you usually have very little desire to buy new kinds of food?	Yes	No	Positive
62	Is it fun to sing with other people?	Yes	No	Negative
63	Are people usually better off if they stay aloof from emotional involvements with people?	Yes	No	Positive
64	Are there very few things that you have ever really enjoyed doing?	Yes	No	Positive
65	Are you too independent to really get involved with other people?	Yes	No	Positive
66	Are you rather lively?	Yes	No	Negative
67	Can just being with friends make you feel really good?	Yes	No	Negative
68	Do you have many friends?	Yes	No	Negative
69	Do you like mixing with people?	Yes	No	Negative
70	Do you think having close friends is not as important as some people say?	Yes	No	Positive
71	Does it often feel good to massage your muscles when they are tired or sore?	Yes	No	Negative
72	Has dancing or the idea of it always seemed dull to you?	Yes	No	Positive
73	Have you often felt uncomfortable when your friends touch you?	Yes	No	Positive
74	Is trying new foods something you have always enjoyed?	Yes	No	Negative
75	On seeing a soft thick carpet have you sometimes had the impulse to take off your shoes and walk barefoot on it?	Yes	No	Negative
76	When things are bothering you do you like to talk to other people about it?	Yes	No	Negative
77	Do you feel very close to your friends?	Yes	No	Negative
78	Do you love having your back massaged?	Yes	No	Negative
79	Have you had very little fun from physical activities like walking, swimming, or sports?	Yes	No	
80	Do you enjoy many different kinds of play and recreation?	Yes	No	Negative
81	Is it true that your relationships with other people never get very intense?	Yes	No	Positive

82 (ImpCon)	Do people who drive carefully annoy you?	Yes	No	Positive
83	Do you often feel like doing the opposite of what other people suggest, even though you know they are right?	Yes	No	Positive
84	Do you often feel the impulse to spend money which you know you can't afford?	Yes	No	Positive
85	Do you often have an urge to hit someone?	Yes	No	Positive
86	Do you sometimes talk about things you know nothing about?	Yes	No	Positive
87	Are you usually in an average sort of mood, not too high and not too low?	Yes	No	Negative
88	Do you sometimes have an urge to do something harmful or shocking?	Yes	No	Positive
89	Do you ever have the urge to break or smash things?	Yes	No	Positive
90	Do you often change between intense liking and disliking of the same person?	Yes	No	Positive
91	Do you stop to think things over before doing anything?	Yes	No	Negative
92	Do you think people spend too much time safeguarding their future with savings and insurance?	Yes	No	Positive
93	Have you ever blamed someone for doing something you know was really your fault?	Yes	No	Positive
94	Have you ever cheated at a game?	Yes	No	Positive
95	Have you felt the urge to injure yourself?	Yes	No	Positive
96	When in a group of people do you usually prefer to let someone else be the centre of attention?	Yes	No	Negative
97	When you catch a train do you often arrive at the last minute?	Yes	No	Positive
98	Would being in debt worry you?	Yes	No	Negative
99	Would you take drugs which may have strange or dangerous effects?	Yes	No	Positive
100	Do you consider yourself to be pretty much an average kind of person?	Yes	No	Negative
101	Have you ever taken advantage of someone?	Yes	No	Positive
102	Would you like other people to be afraid of you?	Yes	No	Positive
103	Do you often overindulge in alcohol or food?	Yes	No	Positive
104	Would it make you nervous to play the clown in front of other people?	Yes	No	Negative

Scoring guidelines:

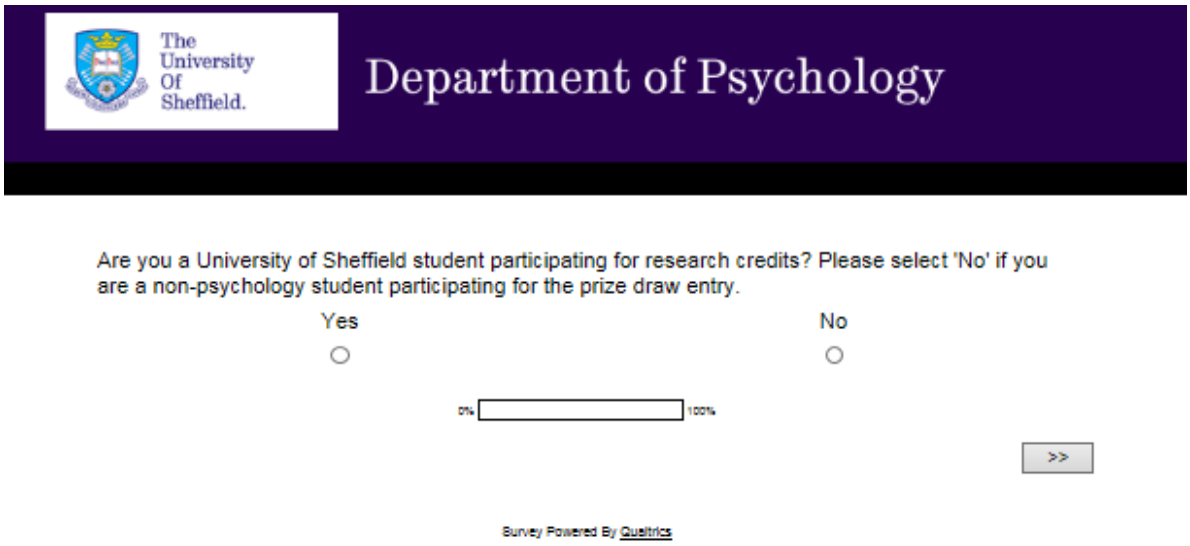
All positive items are scored +1 for 'yes' and 0 for 'no'. All negative items are scored 0 for 'yes' and +1 for 'no' (reversed items).

Appendix I: Practice and experimental trials stimuli

Practice words	Attachment-related words	Non-attachment matched words
Chair	Rejecting	Poisonous
Topic	Thoughtless	Diseased
Thermometer	Unsupportive	Starving
Cushion	Hurtful	Unwell
Vegetable	Distant	Polluted
Conservatory	Uncaring	Destitute
Computer	Unloving	Ignorant
Display	Unaffectionate	Abducted
	Insensitive	Squalid
	Destructive	Abysmal
	Passionless	Obscene
	Adulterous	Terrified
	Dispassionate	Harassed
	Detached	Unemployed
	Disloyal	Addicted

Appendix J: Information, consent and debrief forms for stages one and two

First, participants complete this screen:



Participants were then redirected to the relevant information sheet.

Stage one Information Sheet (psychology students):

Study Information

Researcher details
Lead researcher: Nathan Shearman (nshearman1@sheffield.ac.uk)
Research supervisors: Dr Abigail Millings (a.millings@sheffield.ac.uk) and Dr Daniel Carroll (d.carroll@sheffield.ac.uk)

Study information
We are interested in examining the links between general experiences in close relationships and psychological characteristics, which will contribute towards a doctoral thesis and publication.

What does this study involve?
This study involves the completion of an online questionnaire about your thoughts and feelings in relationships and everyday life, that takes around 25 minutes to complete. There is a second part to this study, which some participants will be asked to take part in. This second part will involve a small computer task at the University of Sheffield's psychology department. Before you begin the online questionnaires you will be asked to provide your university e-mail address. This will be your unique identification code should you wish to withdraw your data at a later date. **Providing your consent to take part in this study means you are agreeing for us to contact you to participate in the second part to this study.**

Can I change my mind?
You can withdraw from this study at any stage with no questions asked and no consequences up until the point of analysis. However, after your data has been analysed, it will no longer be possible to withdraw your data. Data will be analysed at the end of the data collection period (01.03.2017). Please e-mail the lead researcher with your unique identification code before this date if you wish to withdraw your data.

Is my information kept anonymous?
Yes, at all times. Your data is kept confidential, secure and only available to the research team. Please keep this information sheet as a reminder of the relevant details.

Are there any risks or benefits in taking part?
We anticipate no risks. You may be able to claim university credits for taking part in this study through the Online Research Participation System (ORPS) if you are registered.

Can I have a copy of my individual results?
This will not be possible, but if you would like a copy of overall study results then please give your contact details to the lead researcher.

What if I am not happy with my experience of this study?
You can contact the research supervisors (above) or Dr Andrew Thompson, Research Director, at the Clinical Psychology Unit (a.r.thompson@sheffield.ac.uk). If you are not satisfied with the outcome then you can contact the University Registrar at The Registrar and Secretary's Office, University of Sheffield, Firth Court, Western Bank, Sheffield S10 2TN, UK, (Tel: 0114 222 1100; E-mail: registrar@sheffield.ac.uk).

So what now?
If you have any questions or would like a hard copy of this information sheet then please e-mail the lead researcher. If not, then please select 'Go to consent form'.

○ **Go to consent form**

0% 100%

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Survey Powered By Qualtrics

Stage one Information Sheet (volunteer list students):

Study Information

Researcher details
Lead researcher: Nathan Shearman (nshearman1@sheffield.ac.uk)
Research supervisors: Dr Abigail Millings (a.millings@sheffield.ac.uk) and Dr Daniel Carroll (d.carroll@sheffield.ac.uk)

Study information
We are interested in examining the links between general experiences in close relationships and psychological characteristics, which will contribute towards a doctoral thesis and publication.

What does this study involve?
This study involves the completion of an online questionnaire about your thoughts and feelings in relationships and everyday life, that takes around 25 minutes to complete. There is a second part to this study, which some participants will be asked to take part in. This second part will involve a small computer task at the University of Sheffield's psychology department. Before you begin the online questionnaires you will be asked to provide your university e-mail address. This will be your unique identification code should you wish to withdraw your data at a later date. **Providing your consent to take part in this study means you are agreeing for us to contact you to participate in the second part to this study.**

Can I change my mind?
You can withdraw from this study at any stage with no questions asked and no consequences up until the point of analysis. However, after your data has been analysed, it will no longer be possible to withdraw your data. Data will be analysed at the end of the data collection period (01.03.2017). Please e-mail the lead researcher with your unique identification code before this date if you wish to withdraw your data.

Is my information kept anonymous?
Yes, at all times. Your data is kept confidential, secure and only available to the research team. Please keep this information sheet as a reminder of the relevant details.

Are there any risks or benefits in taking part?
We anticipate no risks. You will be automatically entered into a prize draw where you will have the chance to win a £50 Amazon voucher.

Can I have a copy of my individual results?
This will not be possible, but if you would like a copy of overall study results then please give your contact details to the lead researcher.

What if I am not happy with my experience of this study?
You can contact the research supervisors (above) or Dr Andrew Thompson, Research Director, at the Clinical Psychology Unit (a.r.thompson@sheffield.ac.uk). If you are not satisfied with the outcome then you can contact the University Registrar at The Registrar and Secretary's Office, University of Sheffield, Firth Court, Western Bank, Sheffield S10 2TN, UK, (Tel: 0114 222 1100; E-mail: registrar@sheffield.ac.uk).

So what now?
If you have any questions or would like a hard copy of this information sheet then please e-mail the lead researcher. If not, then please select 'Go to consent form'.

○ **Go to consent form**

0% 100%

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Survey Powered By Qualtrics

Stage one Consent Form:

I confirm that I have read and understood the information sheet explaining the research project led by Nathan Shearman and I have had the opportunity to ask questions about the project:

○ I confirm

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences, up until 01.03.2017:

○ I understand

I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research:

○ I understand

I give my full consent to take part:

○ Yes

○ No

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Survey Powered By Qualtrics

Stage one Demographic Form:

Please enter your university e-mail address (this will be used to identify your data and contact you):

What is your gender?

Male ○ Female ○ Prefer not to say ○

How old are you?

What is your current level of study?

Undergraduate ○ Postgraduate ○

Currently, are you in a romantic relationship?

Yes ○ No ○

Currently, are you taking any prescribed medications?

Yes ○ No ○ Prefer not to say ○

If yes, please state what medication(s):

0% 100%

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Survey Powered By Qualtrics

Stage one Debrief Form:

Research Debrief Form

Thank you for taking part in this study. As we mentioned in the information sheet we anticipated no risks to you as result of participating. However, we recognise individuals may respond differently to the many questions we have asked.

We asked you about your general experiences in close relationships, also known as attachment styles, and psychological characteristics, called 'schizotypy', which are thought to be found within the general population.

There has been an interest in the relationships between two adult attachment styles, i.e., 'attachment anxiety' and 'attachment avoidance', and schizotypy. A clear pattern is emerging in the literature that shows attachment anxiety and attachment avoidance correlate with different aspects of schizotypy. This study will contribute to these findings. Moreover, there is no published research examining the relationships between a third adult attachment style ('disorganisation') and schizotypy, due to a lack of tools to measure disorganisation. However, a new measure of disorganisation has been developed, which means that this study can examine these relationships also.

If you did find any of these questions distressing or problematic then there are a range of services that may be able to support you, outside of family and friends. These include:

(1) The University of Sheffield has anonymous and supportive student counselling services. You can find useful information, including contact details and online registration, at www.sheffield.ac.uk/ssid/counselling.

(2) The organisation MIND provides guidance and support on mental health concerns and can be accessed at www.mind.org.uk.

(3) The organisation Relate offers counselling, support and information for all relationships and can be accessed at www.relate.org.uk.

(4) Your GP may also be able to provide assistance. If you are not registered with a GP and would like to then the University of Sheffield Health Service (at 53 Gell Street) can be contacted on (0114) 22 22 100, or an e-mail sent to health.service@sheffield.ac.uk
Also, if you would like to know more about attachment theory and schizotypy then the following resources may be useful:

Book: Danquah, A. N., & Berry, K. (Ed.). (2013). *Attachment theory in adult mental health: A guide to clinical practice*. New York, NY: Routledge.

Journal article: Korver-Nieberg, N., Berry, K., Meijer, C. J., & de Haan, L. (2014). Adult attachment and psychotic phenomenology in clinical and non-clinical samples: A systematic review. *Psychology and Psychotherapy: Theory, Research and Practice, 87*, 127-154.

Once again, thank you participating in part one of this study. The lead researcher will be in contact shortly to let you know if you are selected for part two. If you would like overall study results then please provide your contact details to the e-mail address nshearman1@sheffield.ac.uk.

If you have any further questions then please contact the lead researcher. Remember you have the right to withdraw from this study at any stage up until the 1st March 2017.

Stage two Information Sheet:

The University Of Sheffield.

Clinical Psychology Unit
University of Sheffield
Western Bank
S10 2TN

Date:

Research Information Sheet

Researcher details
Lead researcher: Nathan Shearman (nshearman1@sheffield.ac.uk)
Research supervisors: Dr Abigail Millings (a.millings@sheffield.ac.uk) and Dr Daniel Carroll (d.carroll@sheffield.ac.uk)

Study information
We are interested in examining the links between general experiences in close relationships, psychological characteristics and cognitive performance on a lab based task, which will contribute towards a doctoral thesis and publication.

What does this study involve?
As you are aware part one involved an online questionnaire. You have been invited to participate in part two of the study. Part two is a 5 to 10 minute computer task situated in the psychology building. Full instructions will be provided before starting this task, once you have read this information sheet.

Can I change my mind?
You can withdraw from this study at any stage with no questions asked and no consequences. However, after your data has been anonymised, it will no longer be possible to withdraw your data. Data will be anonymised at the end of the data collection period (01.03.2017). You can withdraw by e-mailing the lead researcher stating your unique participant ID number (your university e-mail address) and wish to withdraw. You do not have to provide reasons.

Is my information kept anonymous?
Yes, at all times. Your data is kept secure and only available to the research team. Please keep this information sheet.

Are there any risks or benefits in taking part?
We anticipate no risks. If you are an undergraduate student then you may be able to claim university credits for taking part in this study, through the ORPS.

Can I have a copy of my individual results?
This will not be possible, but if you would like a copy of overall study results then please give your contact details to the lead researcher.

What if I am not happy with my experience of this study?
You can contact the research supervisors (above) or Dr Andrew Thompson, Research Director, at the Clinical Psychology Unit (a.r.thompson@sheffield.ac.uk). If you are not satisfied with the outcome then you can contact the University Registrar at The Registrar and Secretary's Office, University of Sheffield, Firth Court, Western Bank, Sheffield S10 2TN, UK. (Tel: 0114 222 1100; E-mail: registrar@sheffield.ac.uk).

So what now?
If you have any questions, then please ask the lead researcher now before you begin the task.

Stage two Consent Form:

The University Of Sheffield.

Clinical Psychology Unit
University of Sheffield
Western Bank
S10 2TN

Date:

University e-mail address:_____

Demographic details

Please provide your gender: _____
Please provide your age: _____
Are you an undergraduate or postgraduate: _____
Are you currently taking any medications (yes, no or prefer not to say): _____
If yes, please name the medications:_____ (use back of sheet if required)
In a relationship (yes or no):_____

Lead researcher: Nathan Shearman
Research supervisors: Dr Abigail Millings and Dr Daniel Carroll

1. I confirm that I have read and understand the information sheet explaining the research project led by Nathan Shearman and I have had the opportunity to ask questions about the project. Please provide your initials below to confirm:

   ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences, up until 01.03.2017. Please provide your initials below to confirm:

   ☐

3. I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research. Please provide your initials below to confirm:

   ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Lead Researcher	Date	Signature

Stage two Debrief Form:

The University Of Sheffield.

Clinical Psychology Unit
University of Sheffield
Western Bank
S10 2TN

Date:

Research debrief form: Part two of the study

Thank you for taking part in both parts of this study. This study is examining the links between general experiences in romantic relationships, also known as attachment styles, specific psychological characteristics, called 'schizotypy', which are thought to be found within the general population, and cognition.

No published research has examined the links between adult attachment styles, schizotypy and cognition (e.g., processing of emotional information) in one design. There are clearer patterns in the relationships between attachment styles (i.e., 'attachment anxiety' and 'attachment avoidance') and schizotypy, and schizotypy and executive function.

However, the findings for relationships between attachment styles and cognition are inconsistent and inconclusive. We predict that we will find significant relationships between attachment styles and cognition in the presence of schizotypy (i.e., a mediator model).

As mentioned in the last debrief form, if you did find any of the questions distressing or problematic then there are a range of services that may be able to support you, outside of friends and family. These include:

The University of Sheffield has anonymous and supportive student counselling services. You can find useful information, including contact details and online registration, at www.sheffield.ac.uk/ssid/counselling.

The organisation MIND provides guidance and support on mental health concerns and can be accessed at www.mind.org.uk.

The organisation Relate offers counselling, support and information for all relationships and can be accessed at www.relate.org.uk.

Your GP may also be able to provide assistance. If you are not registered with a GP and would like to then the University of Sheffield Health Service (at 53 Gell Street) can be contacted on (0114) 22 22 100, or an e-mail sent to health.service@sheffield.ac.uk

Also, if you would like to know more about what executive function is then the following website may be useful. Headway is a brain injury association that provides

useful information on executive function. This information can be found at the following link:
https://www.headway.org.uk/about-brain-injury/individuals/effects-of-brain-injury/executive-dysfunction/

Once again, thank you participating in part two of this study. If you would like a copy of the overall study results and have not provided your details then please provide your contact details to the e-mail address nshearman1@sheffield.ac.uk if you have not done so already.

If you have any further questions then please contact the lead researcher. Remember you have the right to withdraw from this study at any stage up until the 1st March 2017.