Adult Attachment Styles and Emotional Regulation: The Role of Interoceptive Awareness and Alexithymia

Isabella Ferraro

This thesis is submitted in partial fulfilment of the Honours degree of Bachelor of Psychological Science

School of Psychology

The University of Adelaide

October 2019

Word Count: 9460

TABLE OF CONTENTS

List of Figures

List of Tables

Abstract

Exposure to adverse childhood experiences, such as disturbances in attachment with primary caregivers, influences how we experience and regulate our emotions in adulthood. Additionally, a conscious perception and understanding of our internal bodily signals – classified as interoceptive awareness – heightens our capacity to recognise changes in emotional arousal, as based upon physiological signalling. The current study explored whether this interoceptive capability functioned as a mediator in the relationship between adult attachment style and emotional regulation, and whether alexithymia – a personality construct characterised by affective impairments – further mediated this relationship. A convenience sample of 219 Australian adults completed an online survey comprised of a sociodemographic questionnaire and four standardised measures that assessed these aforementioned constructs. Results from bivariate correlations and parallel multiple mediation analyses found that anxious and avoidant attachment styles were negatively associated with the perception of bodily sensations and positively associated with difficulties identifying and describing feelings and regulating negative affect. Furthermore, IA and alexithymia were found to partially mediate the relationship between adult attachment insecurity and emotional regulation difficulties. The application of mind-body oriented therapies are suggested as appropriate interventions to enhance awareness of interoceptive states and reduce alexithymic symptomology, thereby improving emotional regulation.

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

Isabella Ferraro

Acknowledgements

I would first and foremost like to thank my supervisor, Dr. Amanda Taylor. I am incredibly grateful for the guidance, wisdom, and encouragement you have given me throughout this process. The knowledge and skills that I have learnt from you are invaluable and will be of immense use during my future endeavours. I feel privileged to have worked with you.

To the honours course coordinators, Dr. Irina Baetu and Dr. Matthew Dry, thank you for your professional advice and for providing me with the resources to navigate my way through this challenging yet rewarding year.

Finally, thank you to my family and friends for continually being my greatest support networks and providing me with infinite patience and love. I could not have gotten through this year without you.

Chapter 1: Introduction

1.1 Overview

Attachment theory frames the individual differences in emotional regulation as a product of the interpersonal relationships formed during early social development (Shaver, Mikulincer, & Chun, 2009). Emotional regulation is important for managing stress responses and in developing the coping strategies an individual will default to when attempting to down-regulate or control negative affect (Karreman & Vingerhoets, 2012). Subsequently, experiencing problems with emotional regulation can considerably impact physiological and psychological functioning (Price & Hooven, 2018). The degree to which we are sensitive and responsive to our emotions is thought to be related to our awareness of bodily sensations (Koole, 2009). Interoception is a construct involving our awareness of internal systems and in particular is related to the somatic markers indicative of emotional experience, such as heartbeat and respiration (Garfinkel, Seth, Barrett, Suzuki, & Critchley, 2015). Alternatively, reductions in emotional awareness and regulation are thought to be associated with alexithymia, a personality trait characterised by impairments in identifying and describing emotions (Thorberg, Young, Sullivan, & Lyvers, 2011). Consequently, understanding how our attachment style is related to our sensitivity of internal processes and our recognition of emotional states may contribute to further elucidating the mechanisms that shape the development of emotional regulation. Such knowledge could inform how we address emotional regulation difficulties and guide the development of interventions to improve emotional regulation and psychological well-being.

1.2 Attachment

Attachment theory is concerned with how close interpersonal relationships originate and how the interaction between environmental (e.g. parental) and genetic factors guide the development of individual differences in attachment behaviour (Ravitz, Maunder, Hunter, Sthankiya, &

Lancee, 2010). Early research on attachment focused on the relationship between an infant and their primary caregiver, suggesting that variations in attachment behaviour are predominantly determined by early interactional experiences. Bowlby (1982) contends that attachment is an innate regulatory system that is activated to protect us from threatening or stressful situations by compelling us to seek proximity to significant others. Depending on our attachment style, these 'attachment figures' can decrease negative arousal by providing a comforting and secure base (Shaver & Mikulincer, 2014). Attachment styles are defined as 'working models' or guidelines that determine how we interact with others. In infanthood, they are differentiated by the amount of responsiveness and supportiveness offered by a primary caregiver and are categorised into two main types: secure and insecure attachment styles (Ainsworth, Blehar, Waters, & Wall, 1978).

Secure attachment is considered a protective factor, characterised by greater interpersonal engagement, adaptive emotional control, and positive internalised perceptions of the self (Clear & Zimmer-Gembeck, 2017; Read, Clark, Rock, & Coventry, 2018). Securely attached individuals function under the expectation that significant others will be physically and emotionally available to provide reassurance and support in times of distress. In infanthood, secure attachment is reinforced by the caregiver comforting the child when they experience and communicate negative emotions, teaching them that their outward expressions of discomfort will be responded to and reduced (Cassidy, 1994). Conversely, insecure attachment is consistent with negative representations of the self and others and is commonly classified beneath two main dimensions: anxious and avoidant attachment (Oskis et al., 2013). Anxiously attached individuals fear abandonment and rejection, yet desire intense closeness and reassurance from significant others (Pietromonaco & Beck, 2019). This style is developed through inconsistent and inattentive parenting, where a child learns to overemphasise their helplessness or vulnerability in an attempt to increase the likelihood of receiving attention (Shaver &

Mikulincer, 2014). Strategies such as crying, begging, and controlling behaviours attempt to elicit a nurturing and attentive response from a caregiver who only selectively responds (Pepping, Davis, O'Donovan, & Pal, 2014). Alternatively, individuals who experience a style of parenting that rejects the attachment bond by presenting as less available and unresponsive to the needs of the child tend to develop an avoidant attachment style (Ainsworth et al., 1978). This is characterised by a fear of intimacy and distrust towards others, alongside the expectation that expressions of discomfort or distress will not be attended to, resulting in a reliance on the self for comfort and soothing (Wearden, Cook, & Vaughan-Jones, 2003). In an attempt to maintain a deactivated attachment system, avoidant individuals seek to suppress emotional states that are incongruent with this goal - specifically fear, distress, anger, and sadness (Shaver & Mikulincer, 2014).

Attachment in adulthood is thought to be motivated by the same attachment behavioural system that determines the relationship between an infant and caregiver (Gillath, Karantzas, & Fraley, 2016). Hazan and Shaver (1987) were the first to transfer Bowlby's conceptualisation of attachment to adult relationships, particularly those that are romantic. They suggested that comparable features overlap between attachment in childhood and later adult relationships, including a sense of security when the attachment figure is available and responsive, engaging in close physical contact, and experiencing distress when the attachment figure is unavailable (Hazan & Shaver, 1987). Importantly, Gillath and colleagues (2016) note the plasticity of adult attachment styles, in particular their capacity to change in response to relationship conflict or major life transitions that challenge the core assumptions an individual holds regarding themselves and others. Similarly, due to the dyadic nature of attachment, the same individual can have different attachment patterns across different relationships throughout their lifespan (Ravitz et al., 2010).

In assessing the covariates of adult attachment, Chopik, Edelstein, and Fraley (2013) found that attachment insecurity was negatively related to age. Early adulthood was consistent with increased attachment anxiety, potentially due to the instability of attachment dynamics during late adolescence, where the emphasis on close relationships and the fulfilment of attachment needs shifts from parents to romantic partners and peers (Chopik et al., 2013). Attachment insecurity has also been associated with relationship status, with young adults who identify themselves as single more likely to be categorised into anxious or fearful-avoidant attachment styles relative to partnered adults (Adamczyk & Bookwala, 2013). In comparing attachment styles across gender, women have a greater likelihood of exhibiting a secure but also an anxious-preoccupied attachment style compared to men, who score higher on a dismissive-avoidant attachment style (Ross, McKim, & DiTommaso, 2006; Simpson, Rholes, Orina, & Grich, 2002). Finally, Del Giudice (2011) found that males were higher in avoidant but lower in anxious attachment compared to females. The magnitude of these gender differences varied across ethnic region, with effect sizes being greater across European and Middle Eastern participants (Del Giudice, 2011).

Ainsworth (1978) first formalised and measured the individual differences in infant attachment using a laboratory paradigm that observed attachment patterns based on how an infant reacted when a primary caregiver was absent and their behaviour upon being reunited (Cassidy & Shaver, 2008). From this procedure, Ainsworth was able to differentiate between secure and insecure attachment patterns, operationalised by the degree of interactive behaviour exhibited between the infant and caregiver (Cassidy & Shaver, 2008). Measures of childhood attachment are distinct from how attachment is assessed in adulthood. Adult attachment measures are typically administered through interviews or self-report questionnaires. Measures that involve self-reflection and personal opinion are suggested to be effective in probing current conscious attitudes and experiences in close relationships including intimacy, dependence, loss,

and separation (Mikulincer & Shaver, 2016). Adult attachment measures commonly classify individuals beneath a secure or insecure attachment style, or their associated subgroup (e.g. dismissive-avoidant, anxious-preoccupied). The implication is that if attachment styles in adulthood and infanthood are stimulated by the same internal system that determines how we navigate interpersonal relationships, they may also share similar consequences for how they influence our cognitions, emotions, and behaviours.

1.3 Emotional Regulation

Emotional regulation (ER) is concerned with how an individual organises their behaviour in response to emotionally arousing stimuli and the processes involved in monitoring and modifying emotional states (Thompson, Meyer, & Jochem, 2008). Gratz & Roemer (2004) conceptualised ER as a multidimensional process involving: (a) emotional awareness and understanding, (b) emotional acceptance, (c) controlling impulsive behaviours that are misaligned with one's goals, and (d) engaging in appropriate emotional regulation strategies (Gratz & Roemer, 2004). Self-regulation is an important process in ER, whereby an individual intentionally manages and adjusts their behaviour in response to emotional experiences (Koole, Van Dillen, & Sheppes, 2016). There are various ways in which this regulation manifests, each with the intention of altering the impact of an emotionally arousing stimuli by increasing, decreasing, or maintaining a level of arousal (Koole, 2009).

Most ER strategies can be classified beneath two broad styles: antecedent-focused and response-focused. Antecedent-focused strategies are considered adaptive as they involve cognitive reappraisal or reformulating the negative meaning of an emotion-eliciting event in a way that minimises its impact (Ecutuli, 2014; Gross & John, 2003). Conversely, response-focused strategies are considered maladaptive, as an individual will attempt to modify their behavioural response by inhibiting or concealing behaviour that is emotionally revealing (Laloyaux, Fantini, Lemaire, Luminet, & Larøi., 2015). Such strategies have been associated

with impulsivity, interpersonal problems, and identity disturbances characterised by an unstable sense of self (Schreiber, Grant, & Odlaug, 2012). These in turn contribute to the development of psychiatric disorders such as borderline personality disorder (BPD) and pathological personality traits including antagonism and detachment (Neacsiu, Herr, Fang, Rodriguez, & Rosenthal, 2014; Pollock, McCabe, Southard, & Zeigler-Hill, 2016).

In comparing ER across demographics, Gross and John (2003) found that participants from African, Asian, and Latino populations indicated a higher tendency to use strategies that inhibit negative emotions. The use of suppression strategies is more commonly observed in men than women, who are alternatively found to rely on attentional deployment, positive reappraisal, and social supports (Gross & John, 2003; Vitulic & Prosen, 2016). Older adults are found to have better emotional clarity and a greater access to ER strategies and goal directed behaviour compared to younger adults, who report difficulties in regulating their emotional responses (Ortega, 2009). Finally, adults with less education (< 12 years) were found to more frequently engage in distraction and escape-avoidance coping strategies such as cognitive suppression compared to adults with a higher education level (e.g. university; Vitulic & Prosen, 2016).

In the context of childhood, ER is influenced by the quality of a child's social interactions with their primary caregivers (Shaver & Mikulincer, 2014). Thompson (1991) suggested that the attachment relationship is the primary extrinsic condition that influences the development of ER. While the secure child learns to expect a consistent response to their emotion signals, the insecure child is taught to expect selective attention from their caregiver when exhibiting these signals (Thompson, 1991). Differences in these expectations are central in dictating how emotional expression and regulation is presented in adulthood. Likewise, Moutsiana et al. (2014) found that the neural substrates of ER in adulthood are shaped by attachment quality in childhood. Participants with a history of secure attachment had greater efficacy in up-regulating positive emotions compared to insecure-avoidant participants, who had over-control of their

negative emotional responses (Moutsiana et al., 2014). Moreover, Karreman and Vingerhoets (2012) established that secure attachment is associated with a greater engagement in adaptive reappraisal of events and an ability to reframe negative events as less emotionally arousing. Conversely, avoidant individuals are inclined to rely on cognitive distancing and emotional disengagement, while anxiously attached individuals engage in strategies that exacerbate negative affect, such as rumination and directing attention toward distress-eliciting stimuli (Shaver et al., 2009). Shaver et al. (2009) proposed that insecurely attachment individuals are unable to access the resources necessary for coping with stress because they did not learn adequate distress regulation during early attachment experiences. A reliance upon suppression strategies to avoid confronting emotion related thoughts is associated with a desire to maintain a deactivated attachment system and inhibit feelings of vulnerability such as fear and sadness (Shaver et al., 2009). Thus, attachment has consistently shown to be related to ER, specifically in demonstrating how the style of attachment developed in infanthood influences emotional expression in adulthood. However, there remains less certainty regarding the processes through which attachment influences ER and whether these processes show associations with ER expression independent of attachment style.

1.4 Interoception

The moderation and suppression of affective states requires both awareness of and attention to the internal cues that indicate emotional arousal (Füstös, Gramann, Herbet, & Pollatos, 2013). Interoception relates to the processing of internal signals by the nervous system, which senses and interprets physiological functions including heartbeat, temperature, and respiration (Mehling, Acree, Stewart, Silas, & Jones, 2018). Sensory information from the body's interoceptors will reach consciousness when a predetermined range of 'normal' functioning is surpassed, such as a dramatic increase in heart rate in response to a stressful event (Schulz, 2015). Therefore, interoception may be important in maintaining our body regulation

and influencing our emotional experiences, adaptive responses, and self-regulation (Khalsa et al., 2018).

Interoception can be divided into three dimensions: interoceptive awareness (IA), interoceptive accuracy (IAcc), and interoceptive sensibility (IS). IA has been interpreted as the correspondence between self-reported confidence in interoceptive ability and IAcc (e.g. Garfinkel et al., 2015). IAcc is an objective measure of interoceptive performance that assesses the extent to which an individual can perceive their internal signals (Garfinkel et al., 2015). The heartbeat counting task (HCT) is a frequently used measure of IAcc that compares an individuals subjective perception of their heartbeat against an objective measure (Murphy, Brewer, Hobson, Catmur, & Bird, 2018). The HCT has recently drawn criticism regarding its accuracy in capturing interoceptive ability. One study found that approximately 40% of participants reported no conscious awareness of their heartbeat, suggesting the task is an inappropriate measure, particularly when evaluating lower ranges of interoceptive ability (Murphy et al., 2018). Comparable studies have suggested that the HCT may be influenced by exteroceptive information, such as external touch receptors responding to vibration of the chest wall, or an individuals prior knowledge and beliefs regarding their resting heart rate (Ring, Brener, Knapp, & Mailloux, 2015; 2016; Desmedt, Luminet, & Corneille, 2018; Zamariola, Maurage, Luminet, & Corneille, 2018). Therefore, the HCT may be an insufficient measure of IAcc, and thus interoception in general.

Mehling and colleagues (2018) contend that framing IA as limited solely to the subjective confidence in IAcc is reductionist and fails to consider how psychobiological processes are dictated by interactive functions and shaped by attitudes, expectations, and experiences. Instead, they define IA as a metacognitive ability encompassing the multiple dimensions of interoception that can be consciously perceived and are accessible to self-report (Mehling et al., 2018). This awareness of internal processes allows us to sense the physiological

condition of the body, including emotional states. This definition of IA is closely related to IS, which indexes an individual's subjective belief in their ability to perceive interoceptive states and is measured through self-evaluation (Garfinkel et al., 2015).

IA has been found to decrease with age, accounting for 30% of the variance in accurate heartbeat detection (Khalsa, Rudrauf, & Tranel, 2009). This inverse relationship might be accounted for by a reduced sensitivity in the central nervous system or reduced awareness of the mechanisms that facilitate heartbeat awareness including cardiac rate, blood pressure, and heart rate variability (Khalsa et al., 2009). Using a multidimensional measure of IA, one study found that females are more perceptive to bodily sensations and their relation to emotional states (Grabauskaite, Baranauskas and Griskova-Bulanova, 2017). Conversely, males scored lower on emotional awareness, which aligned with a tendency to not experience or associate emotional distress with physical discomfort.

Studies have identified a bi-directional correspondence between IA and emotional processing, where individuals who scored high on measures of interoception also reported heightened emotional experiences and increased levels of subjective emotional intensity (Garfinkel, Critchley, & Pollatos, 2017; Löffler, Foell, & Bekrater-Bodmann, 2018). As IA facilitates greater awareness and detection of internal signals, it follows that how one interprets and responds to affective states might also be dictated by this degree of sensitivity. In exploring the relationship between IA and negative affect, Füstös and colleagues (2013) found that greater awareness of bodily processes correlated with more successful ER. Specifically, individuals with heightened IA exhibited a greater tendency to engage in reappraisal as a regulation strategy, which in turn aided in the down-regulation of negative affect (Füstös et al., 2013). This has important implications for the role of IA in psychological wellbeing and positive emotions, particularly as a protective factor against negatively arousing stimuli.

Preliminary research has been conducted on the relationship between attachment and IA. Oldroyd, Pasupathi and Wainryb (2019) theorised that an infants' conceptualisation of interoceptive states is reliant upon how their caregiver responds to their behaviours. If an infant experiences discomfort and is not consistently soothed by the appropriate response (e.g. given food when hungry) due to a selectively attentive or unresponsive caregiver, the formation of an accurate detection and interpretation of bodily sensations (e.g. hunger) will be impaired (Oldroyd et al., 2019). In comparing insecure attachment styles against a subjective measure of IA, avoidant individuals reported more impairments in interoceptive functioning compared to anxious individuals, who instead demonstrated enhanced interoceptive capabilities (Oldroyd et al., 2019). Avoidant individuals scored lower on their ability to sustain and regulate attention toward their internal states and perceive their bodily sensations as trustworthy. This is potentially related to the disconnection avoidant individuals possess between bodily markers and physiological responses, resulting from an over-regulation of negative affect that prevents the encoding of experiences perceived as distressing. Conversely, anxious individuals reported greater body consciousness and had a heightened tendency to experience emotional distress when confronted with sensations related to pain or discomfort. This indicates that anxious individuals have greater attentional vigilance for bodily symptoms, particularly in detecting sources of threat. However, such hypervigilance might result in overemphasising or misinterpreting normal functioning as indicative of a serious health concern (Oldroyd et al., 2019).

Despite these findings, there remains limited empirical support for the relationship between attachment and IA. Therefore, it is necessary to contribute to this research, particularly by investigating how the associations between attachment insecurity and IA in adulthood are related to ER difficulties. IA appears important for emotional awareness and positive regulation strategies, whereas attachment insecurity is related to dysregulated emotion. Conclusively, it is

worthwhile to explore IA as a mediator, with the expectation that insecurely attached individuals who possess a greater awareness of internal sensations and an understanding of how these are indicative of emotional arousal might have better control over their responses. Rather than interpreting negative emotions as threats to maintaining a deactivated attachment system, IA might facilitate reappraisal, allowing negative experiences to be perceived as less emotionally threatening.

1.5 Alexithymia

Impaired interoception, involving altered bodily feedback, misinterpretation of internal cues, and reduced emotional awareness, is thought to be associated with alexithymia. Alexithymia is a characterised by poor emotional awareness, with deficits in identifying, processing, and communicating emotional experiences, and a tendency towards externally-oriented thinking (Thorberg et al., 2011). Alexithymia and IA share related functions associated with the processing of internal physiological and emotional signals into self-awareness (Herbert, Herbert and Pollatos, 2011). However, these overlapping associations are inverse, and overall the correlations between IA and alexithymic characteristics are modest, suggesting that although they may share some variance, they remain distinct constructs (Herbert et al., 2011).

Alexithymia is thought to develop from experiences in childhood, where caregivers either withhold their own emotional expressivity or do not appropriately acknowledge their child's emotions when communicated (Wearden et al., 2003). When comparing insecure attachment styles, avoidant individuals are found to experience more negative emotions and have greater difficulty in perceiving and describing these emotions relative to anxious individuals (Wearden et al., 2003). Alexithymia in avoidant individuals might develop from a constrained proximity and constant separation from a primary caregiver, which reduces opportunities to communicate emotional experiences (Oskis et al., 2013). This suggests that experiencing rejection or inconsistency from caregivers inhibits the development of accurate

representations of emotional states. Additionally, as alexithymia is associated with poor management of negative affect, reduced behavioural expressivity, and the use of suppression as a coping strategy, it likely contributes to the development of ER impairments (Swart, Kortekaas, & Aleman, 2009). Current literature suggests that alexithymia originates from early attachment experiences and is important in influencing the development of emotional awareness and regulation. This indicates that alexithymia might mediate the association between attachment insecurity and ER difficulties by accounting for a greater proportion of the variance in ER difficulties independent of both anxious and avoidant attachment. As IA has also been theorised to mediate this relationship, it is necessary to observe the association between these constructs and determine which has a greater mediating influence. Such an understanding is likely to guide the development of interventions for ER difficulties by determining whether therapies that enhance bodily awareness and sensitivity also improve emotional clarity and subsequent regulation.

1.6 A Model of the Relationships Between Insecure Attachment Styles, Emotional Regulation Difficulties, Interoceptive Awareness, and Alexithymia

Löffler and colleagues (2018) developed an integrative theoretical model that proposed the role of impaired interoception in contributing to the psychosocial and emotional deficits that characterise disorders such as BPD. They considered interoceptive deficits to be a function of both negative early life experiences (e.g., difficulties with attachment) and biological vulnerabilities. Such deficits are thought to contribute to reduced emotional awareness, which in turn influences the development of emotional regulation difficulties. The authors accentuated the relationship between interoception and the organisation of emotional states, observing that the conscious perception of internal processes permits the identification of changes in physiological arousal, thus allowing for appropriate regulation of emotional responses (Löffler et al., 2018). They theorised that this association between impaired interoception and reduced

emotional awareness mediates the relationship between adverse childhood experiences and subsequent problems with ER in adulthood (Löffler r et al., 2018). In particular, it was noted that the association between adverse early life experiences and impaired interoception has been insufficiently addressed in current literature, therefore a direct link cannot be assumed.

Though not explicitly included in the model, the authors acknowledged alexithymia as a construct associated with low interoceptive capabilities, reduced emotional awareness, and impaired ER (Löffler et al., 2018). Importantly, this relationship was not considered sequential, in that difficulties with emotional awareness, interpretation, and subsequent regulation is not a consequence of an impaired perception of internal states (Herbert et al., 2011). However, due to these shared associations, a functional relationship between interoception, alexithymia, and emotional regulation is probable (Löffler et al., 2018). The current study utilised the framework of the model proposed by Löffler and colleagues (2018), with a focus on the associations between anxious and avoidant adult attachment styles and difficulties in emotional regulation as mediated by IA and alexithymia. The following adapted model was proposed:

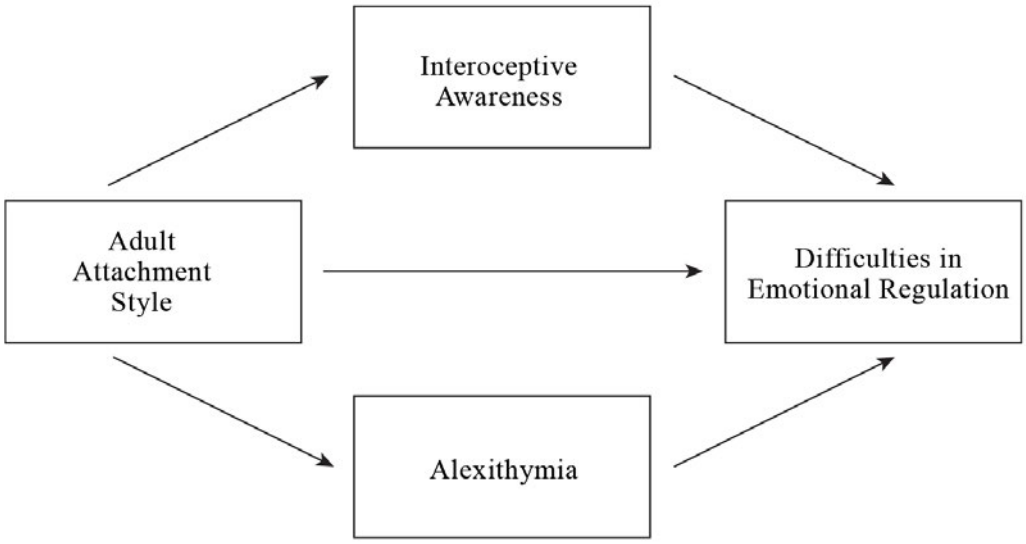

*Figure 1***.** Proposed mediation model for the association between attachment style and emotional regulation as mediated by interoceptive awareness and alexithymia. Adapted from "Interoception and its Interaction with Self, Other, and Emotion Processing: Implications for the

Understanding of Psychosocial Deficits In Borderline Personality Disorder," by A. Löffler, J. Foell, and R. Bekrater-Bodmann, 2018, *Current Psychiatry Reports, 20*, p. 28. Copyright 2018 by *Current Psychiatry Reports.*

1.7 Aims and Hypotheses of the Current Study

There were three mains aims for the present study. The first was to explore how anxious and avoidant attachment in adulthood relates to ER difficulties, IA, and alexithymia respectively. This was motivated by the proposition that if attachment influences how we perceive and respond to affective experiences (Shaver & Mikulincer, 2014), and IA and alexithymia exhibit an inverse relationship with our awareness of these affective experiences, there should be some degree of correlation between these constructs. The second aim was to examine the relationships between ER difficulties, IA, and alexithymia, as research suggests that differences in the degree of bodily sensitivity and/or emotional recognition predicts coping strategies against negative affect (Füstös et al., 2013). The final aim was to determine whether IA and alexithymia mediate the relationship between insecure attachment styles and ER difficulties in adulthood, above what can be explained by covariates. The following four hypotheses were proposed to address these aims:

Hypothesis 1: Anxious attachment and avoidant attachment will positively correlate with difficulties in emotional regulation.

Hypothesis 2: Anxious attachment and avoidant attachment will negatively correlate with interoceptive awareness and positively correlate with alexithymia.

Hypothesis 3: Interoceptive awareness will negatively correlate with difficulties in emotional regulation, and alexithymia will positively correlate with difficulties in emotional regulation.

Hypothesis 4: The relationships between anxious and avoidant attachment and difficulties with emotional regulation will be mediated by both interoceptive awareness and alexithymia, while accounting for known covariates (i.e., gender, age, education level, ethnicity, and marital status).

Chapter 2: Method

2.1 Participants

Participants of the current study (N = 269, M_{age} = 26) were Australian adults who were required to be proficient in English. The sample consisted predominantly of first-year psychology students recruited from the University of Adelaide through the SONA *Research Participation System* (RPS). These participants were offered course credit for their participation in the study. The remaining participants were volunteers drawn from the Australian population via Facebook advertising, snowball sampling, and recruitment posters distributed throughout the University. Participants had the opportunity to enter their contact details (email address) to win one of two Coles/Myer gift cards valued at $50. The undergraduates were advised they could not enter this competition if they had elected to receive course credit instead. The study was granted approval by the *University of Adelaide Humans Research Ethics Subcommittee*, approval number *19/35*.

2.2 Power Analysis

A priori power analysis was conducted using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2009). The input parameters for a linear multiple regression model were set to: alpha level of .05, power of .80, and effect size of .1. The results indicated that 179 participants were required, therefore the current study had sufficient statistical power.

2.3 Measures

The present study was completed as part of a larger study investigating associations between IA and psychosocial outcomes. However, only measures relevant to the current study are described and reported below.

2.3.1 Demographic information. Participants were asked to report demographic details of gender, age, highest completed education level, marital status, and ethnicity.

2.3.2 Adult attachment. Attachment was measured using The Revised Adult Attachment Scale (RAAS), an 18-item self-report measure that can calculate attachment dimensions through two different scoring procedures. Three subscales can be computed that relate to comfort with emotional closeness and intimacy (Close; 6 items), capacity to depend on and trust in others (Depend; 6 items), and anxious concern regarding abandonment or rejection by others (Anxiety; 6 items) (Collins, 1996). The alternative procedure computes only two attachment dimensions – Anxiety (6 items) and Avoid (12 items; calculated by combining and reverse-scoring the Close and Depend items). The current study employed the latter procedure to calculate attachment styles. The present study also used the Close Relationships version of the RAAS, which contains minor rewording so that items refer to close rather than romantic relationships, thus expanding their meaning to encompass parents, friends, and partners (e.g. "*I often worry that romantic partners don't really love me*" modified to "*I often worry that other people don't really love me*"). Respondents rated each item on a scale from 1 (*not at all characteristic of me*) to 5 (*very characteristic of me*), and responses were summed to calculate a score for each subscale that ranged from 6 – 30 for anxious attachment and 12 – 60 for avoidant attachment. In the current study, internal consistency for both the anxiety ($\alpha = .90$) and avoid ($\alpha = .87$) dimensions were higher than what has been reported in previous literature ($\alpha = .81$ and $\alpha = .66$ respectively; Andersen, Ravn, Manniche, & O'Neill, 2018).

2.3.3 Emotional regulation difficulties. Emotional regulation was measured by the Difficulties in Emotional Regulation Scale (DERS), a 36-item self-report questionnaire that assesses six related domains of the problems experienced with poor emotional regulation (e.g. Non-acceptance and Impulses; Gratz & Roemer, 2004). Responses to items (e.g. *"I pay attention to how I feel")* are given on a five-point scale from 1 (*almost never; 0-10%)* to 5 (*almost always; 91-100%*) and subscales are computed by summing the score of each corresponding item. The current study used the DERS total score, which ranges from 36 – 180

and is obtained by reverse-coding all negatively worded items and then summing all items or subscales together, with higher scores indicative of greater problems with emotional regulation. The DERS total score has demonstrated high internal consistency in both previous literature (α = .93; Gratz & Roemer, 2004) and the current study (α = .95).

2.3.4 Interoceptive awareness. The Multidimensional Assessment of Interoceptive Awareness, Version 2 (MAIA-2) is a 37-item state-trait questionnaire designed to measure eight domains of bodily awareness based on self-report including self-regulation and body listening (Mehling et al., 2018). Responses to items such as *"I trust my body sensations"* are given on a six-point scale ranging from 0 (*never*) to 5 (*always*), and scores for subscales are obtained by calculating an average of item responses. A total score ranging from 0 – 185 can be computed by reverse-coding all negatively worded items and them summing all 37 items together (Muir, Madill, & Brown, 2017). Only the total score for the MAIA-2 was used for the purposes of the current study in order to broadly capture its relationships with attachment, ER difficulties, and alexithymia. A hierarchical model of the original MAIA was tested to determine whether the eight subscales could support an overall IA construct and found that this second-order factor had similar fit indices to the original first-order CFA (Mehling et al., 2012). The internal consistency for the total score was found to be adequate in the current study (α = .87), and comparable to the total score produced from the MAIA (α = .85; Muir et al., 2017; Mehling et al., 2012).

2.3.5 Alexithymia. Alexithymia was measured using the 20-item Toronto Alexithymia Scale (TAS-20), which assesses a person's ability to understand and describe emotions (Bagby, Parker, & Taylor, 1994). Each item contains a statement (e.g. *"I often don't know why I am angry")* to be rated on a scale from 1 (*not at all*) to 5 (*all the time*). The measure can compute an overall score and three subscale scores concerned with difficulties identifying and describing feelings, and a tendency toward externally oriented thinking. The current study

only used the TAS-20 total score, which ranges from 20 – 100 and can be calculated by reverse-coding all negatively worded items and then summing all items together, with higher scores indicative of a greater tendency toward alexithymia (i.e. increased difficulty in understanding and describing emotions). The high internal consistency of the TAS-20 total score (α = .81; Oskis et al., 2013) was replicated in the present study (α = .86).

2.4 Procedure

Participants accessed the survey though a link to the online survey software *SurveyMonkey*^{TM}. A preamble contained a participant information sheet that summarised the details of the study and a consent form outlined the rights of the participant, including assurance of the anonymity of their responses and confidentiality of the data outside of the researchers. The survey battery was administered to participants following their consent to participate in the study and the average completion time was 25 minutes. No identifying information was required for the purpose of the study. However, participants drawn from the RPS were asked to also include their student ID number as a precaution to ensure students were appropriately credited for their participation. Additionally, participants who entered to win a gift voucher were required to include their email address as a point of contact. This information was used only for this express purpose, and student identification numbers were removed from the dataset to ensure participants remained non-identifiable. Details of mental health support services (e.g. Beyond Blue, Lifeline) were provided at the end of the survey, and participants were encouraged to access these services if they experienced distress while completing the survey.

Chapter 3: Results

3.1 Data Analysis

Statistical analyses were conducted using the statistical package IBM SPSS Statistics version 25.0 (IBM Corp., 2017). The data were initially screened to remove participants who had not completed the key measures (N = 50). An Independent-Samples t-Test was used to compare these participants against those with completed responses (N = 219) to ascertain any demographic differences. In comparing the mean values, there were no systematic differences observed between groups with regard to age, gender, education level, marital status, and ethnicity ($p > .05$). Thus, excluding participants with incomplete responses, the final sample was N = 219.

Mahalanobis Distance, Cook's Distance, and Centered Leverage Value tests were conducted to observe outliers. Although three outliers were identified from this procedure, inspection of their responses established them to be genuine respondents. Separate analyses were conducted with the inclusion/exclusion of these outliers to determine whether they influenced the data. The 5% trimmed mean for each variable showed very minimal deviation from their overall mean. As comparisons from reliability analyses, normality checks, and bivariate correlations with and without the inclusion of outliers further indicated that they did not significantly alter the results, these outliers were retained in the final analyses.

A Kolmogorov-Smirnov (K-S) test was initially used to test the assumption of a normal distribution across each measure. Apart from the MAIA, the K-S statistic for all measures were significant, violating the normality assumption that requires a non-significant K-S test value (Pallant, 2016). However, as the K-S statistic is sensitive to large samples, evaluation of the skewness and kurtosis values were additionally considered. As skewness and kurtosis values were within the range of -1 and +1, they were considered acceptable to conclude that the data were normally distributed (Tabachnick & Fidell, 2013). As this was

also confirmed by visual inspection of Q-Q plots and histograms for each measure, it was considered that the assumption of normality was met. The current study used bootstrapping to $N = 5000$ sample replicates (Hayes, 2017). Bootstrapping is a nonparametric resampling procedure that estimates the indirect effects for mediation models without assuming normality of the sampling distribution. These indirect effects are unstandardised coefficients that are considered significant if the 95% confidence interval does not contain zero (Preacher & Hayes, 2008).

Table 1

Descriptive statistics for participants (N= 219), including: Age group, gender, highest completed education level, marital status, and ethnicity

Variable and Subcategory	***N***	**%**
Age Group		
18-29	170	77.6
30-39	17	7.8
40-49	14	6.4
50-59	11	5
60-69	7	3.2
Gender		
Male	49	76.3
Female	167	22.4
Other	1	0.5
Prefer Not to Specify	2	0.9
Highest Completed Education Level		
Primary School	2	0.9
High School	124	56.6
Technical Qualification (E.G. Certificate III)	18	8.2
Degree or Diploma (E.G. Bachelor's Degree)	65	29.7
Postgraduate Degree (E.G Master’s Degree)	10	4.6
Marital Status		

Single	134	61.2
Married	34	15.5
Defacto	23	10.5
Divorced	1	0.5
Other	27	12.3
Ethnicity		
Caucasian or White	174	79.5
Aboriginal and/or Torres Strait Islander	3	1.4
Asian	27	12.3
African	4	1.8
Other	11	5

Note. *N* = sample size; % = percentage of sample.

Table 2

Descriptive Statistics for Anxious and Avoidant Attachment and the total scores for the Difficulties in Emotional Regulation Scale, Multidimensional Assessment of Interoceptive Awareness-2, and the 20-Item Toronto Alexithymia Scale.

Variable	Mean	*SD*	Min	Max	*alpha*
RAASAnxiety	18.57	6.65	6	30	0.9
RAASAvoid	32.95	8.94	14	57	0.87
DERSTotal	89.73	25.36	40	155	0.95
MAIATotal	102.78	18.46	44	162	0.87
TASTotal	49.89	11.06	26	75	0.86

Note. RAASAnxiety = Revised Adult Attachment Scale Anxiety Dimension , RAASAvoid = Revised Adult Attachment Scale Avoid Dimension , DERSTotal =, MAIATotal = the Multidimensional Assessment of Interoceptive Awareness-2 total score, TASTotal = 20-item Toronto Alexithymia Scale total score. *SD* = Standard Deviation; Min = Minimum; Max = Maximum.

3.2 Descriptive Statistics

Table 1 summarises the descriptive statistics for the participants of the study and Table 2 describes the descriptive statistics for each measure. Pearson's bivariate correlations showed statistically significant associations between age and anxious attachment (r = -.289, p < .001), ER difficulties (r = -.347, p < .001) and alexithymia (r = -.143, p = .035). Statistically significant correlations were also found between education level and anxious attachment (r = -.261, p < .001), avoidant attachment (r = -.180, p < .001), ER difficulties (r = -.332, p < .001), and alexithymia (r = -.216, p = .001).

Kruskal-Wallis tests were used to compare ordinal variables. Results indicated differences in marital status across anxious attachment $\chi^2(4, 219) = 27.71$, p <. 001, ER difficulties $\chi^2(4, 219) = 33.72$, p < .001, and alexithymia $\chi^2(4, 219) = 10.73$, p = .03. Single participants had the highest median scores *(Md* = 21; *Md* = 36 and *Md* = 51.5 respectively) compared to married participants, who had the lowest median scores (*Md* = 13; *Md* = 31.5 and *Md* = 41.5 respectively).

Table 3

Pearson's Bivariate Correlation Matrix of the Revised Adult Attachment Scale Insecure Dimensions and the Total Scores of the Difficulties in Emotional Regulation Scale, Multidimensional Assessment of Interoceptive Awareness-2, and the 20-Item Toronto Alexithymia Scale

Variable	1	2	3	4
1 RAASANXIETY				
2 RAASAVOID	.59**			
3 DERSTOTAL	.67**	.48**		
4 MAIATOTAL	-.15*	-.25**	-.41**	
5 TASTOTAL	.48**	.50**	.61**	.31**

Note. RAASAnxiety = Revised Adult Attachment Scale Anxiety Dimension , RAASAvoid = Revised Adult Attachment Scale avoid dimension , DERSTotal =, MAIATotal = Multidimensional Assessment of Interoceptive Awareness-2 total score, TASTotal = 20-item Toronto Alexithymia Scale total score.

*$p < .05$, two-tailed **$p < .001$, two tailed.

3.3 Correlations

As evidenced in Table 3, ER difficulties showed a moderate to high positive association with anxious attachment and a moderate positive relationship with avoidant attachment. Moreover, attachment anxiety and attachment avoidance had weak negative associations with IA but moderate positive correlations with alexithymia, both of which were statistically significant.

Table 3 also demonstrates that ER difficulties had a moderate negative correlation with IA and a moderate to high significant positive correlation with alexithymia. Additionally, there was a weak to moderate positive correlation between IA and alexithymia that was significant.

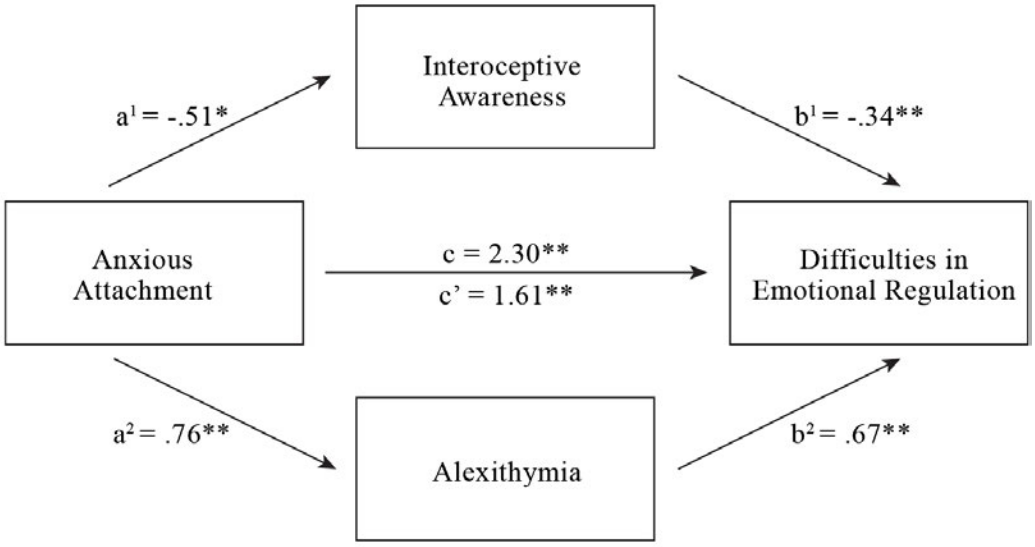

*Figure 2***.** Parallel multiple mediation analysis of the relationship between anxious attachment and difficulties in ER as mediated by IA and alexithymia.

*p < .05, two-tailed **p < .001, two tailed.

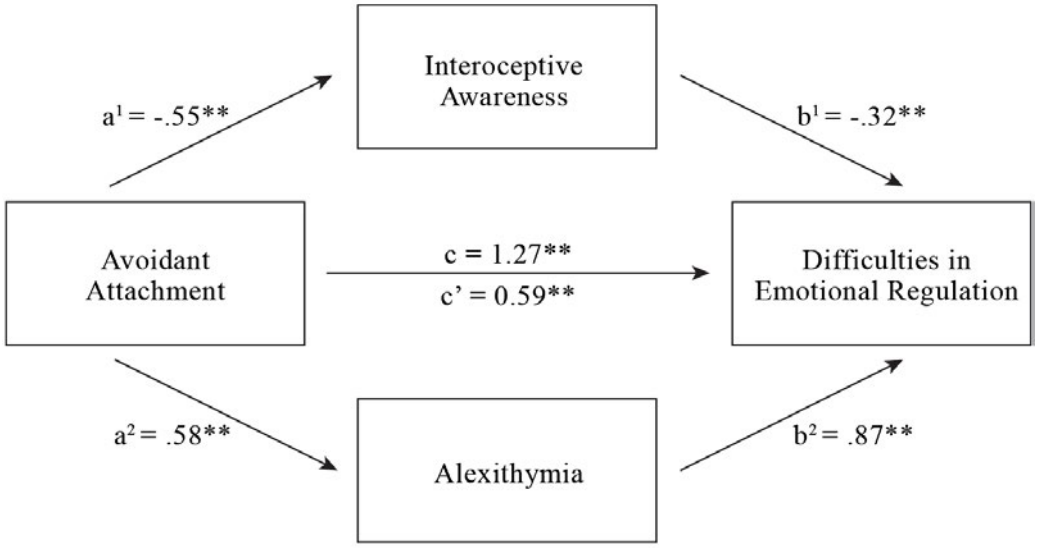

Figure 3: Parallel multiple mediation analysis of the relationship between avoidant attachment and difficulties in ER as mediated by IA and alexithymia.

**p < .001, two tailed.

Table 4

Indirect effects for the associations between anxious and avoidant attachment and ER difficulties as mediated by IA and Alexithymia

Indirect path	Effect	*SE*	95% BC LL	95% BC UL
Attachment Anxiety → IA → ER Difficulties	0.172*	0.081	0.015	0.331
Attachment Anxiety → Alexithymia →ER Difficulties	0.512**	0.127	0.295	0.797
Attachment Avoidance → IA → ER Difficulties	0.175*	0.064	0.064	0.315
Attachment Avoidance → Alexithymia → ER Difficulties	0.507**	0.099	0.331	0.714

Note. IA = interoceptive awareness; ER difficulties = difficulties with emotional regulation; BC LL = bias corrected bootstrap lower limit; BC UL = bias corrected bootstrap upper limit

*$p < .05$, two-tailed **$p < .001$, two tailed.

3.4 Parallel Mediation Analyses

Parallel multiple mediation analyses were performed using Process MACRO version 3.4 (Hayes, 2019) to investigate whether IA and alexithymia mediated the relationships between insecure adult attachment dimensions and ER difficulties. The covariates age, gender, education level, marital status, and ethnicity were controlled for in the models.

Figures 2 and 3 depict a visual representation of the models, including unstandardised regression coefficients for model parameters (see Appendix J for complete proofs). Anxious and avoidant attachment had a significant moderate negative direct effect on IA $b = -.512$, $t(219) = -2.583$, $p = .011$ and $b = -.546$, $t(219) = -3.932$, and a significant moderate positive effect on alexithymia $b = .759$, $t(219) = 7.186$, $p < .001$ and $b = .581$, $t(219) = 7.854$, $p < .001$.

Moreover, in both the anxious and avoidant attachment models, there was a negative direct effect of IA on ER difficulties (b = -.336, t(219) = -5.555, p < .001 and b = -.320, t(219) = -4.669, p < .001 respectively) and a positive direct effect of alexithymia on ER difficulties (b = .675, t(219) = 5.946, p < .001 and b =.872, t(219) = 6.781, p < .001). Table 4 demonstrates that alexithymia exerted a stronger indirect effect on the relationships between anxious and avoidant attachment on ER difficulties compared to IA.

For anxious attachment, the Sobel test was significant for both IA (Z = 2.311, p = .021) and alexithymia (Z = 4.555, p < .001), indicating that the relationship between anxious attachment and ER was mediated by IA and alexithymia. However, this indirect effect was small (partially standardised indirect effect; bias-corrected bootstrap [95%CI] = 0.01 [0.013 - 0.001] and 0.019 [0.031 - 0.012] for IA and alexithymia respectively. The covariates that were significant predictors in this model were age and gender, however, their influence was controlled for in the analysis (see Appendix J for complete proofs).

For avoidant attachment, the Sobel test was significant for IA (Z = 2.968, p = .003) and alexithymia (Z = 5.109, p < .001), suggesting they both mediated the relationship between avoidant attachment and ER difficulties. Again, the effect size for this indirect effect was small (partially standardised indirect effect; bias-corrected bootstrap [95%CI] = 0.009 [0.012 - 0.003] and 0.015 [0.028 - 0.013] for IA and alexithymia respectively. The covariates that were significant predictors in this model were age, gender, and education level, however, their influence was controlled for in the analysis (see Appendix J for complete proofs).

Figure 2 shows a considerable difference between the total effect of anxious attachment on ER (c path) b = 2.296, t(219) = 11.496, p < .001. and the direct effect of the model including both IA and alexithymia as mediators (c’ path) b = 1.612, t(219) = 8.653, p < .001. As the coefficient is reduced in the c’ path, it indicates that additional explanatory power was obtained by including the mediators into the model. Figure 3 shows a difference between

the total effect of avoidant attachment on ER (c path) $b = 1.269$, $t(219) = 7.960$, $p < .001$, and the direct effect of the model (c' path) $b = 0.588$, $t(219) = 3.822$, $p = .002$ including both mediators. Again, the difference between the c and c' path suggest that IA and alexithymia partially mediated this relationship. The total models for both anxious and avoidant attachment, including covariates, explained 49% and 36% of the variance in ER difficulties respectively.

Chapter 4: Discussion

4.1 Overview

The current study aimed to investigate the variables presumed to mediate the relationship between adult attachment insecurity and emotional regulation difficulties. As both anxious and avoidant attachment are constituted by impaired ER and maladaptive coping, IA was explored as a mediator due to its associations with heightened emotional experiences and adaptive coping strategies (Garfinkel et al., 2017; Füstös et al., 2013). Alexithymia was introduced as a second mediator due to its inverse relationship with IA and its relevance to impaired awareness, interpretation, and responsiveness to affective states (Herbert et al., 2011; Swart et al., 2009). Results from the current study supported the hypotheses, demonstrating that attachment insecurity and ER difficulties are negatively correlated with IA and positively correlated with alexithymia. Results from parallel mediation analyses further confirmed the direction of these relationships (i.e. positive or negative). Moreover, IA and alexithymia were found to partially mediate the relationship between attachment insecurity and ER difficulties, with both constructs contributing additional explanatory power to each model. The total effect of attachment on ER difficulties was greater for anxious attachment, and together with the covariates accounted for a greater proportion of the variance compared to avoidant attachment.

4.2 Insecure Attachment and Emotional Regulation Difficulties

Attachment in infanthood has shown to be fundamental in dictating our emotional regulation in adulthood (Shaver & Mikulincer, 2014). To align with previous literature, the current study first hypothesised that anxious and avoidant adult attachment styles would be positively correlated with ER difficulties. The results supported this hypothesis, finding that avoidant attachment had a greater correlation with ER difficulties than anxious attachment. Avoidant individuals have been found to defensively limit the processing of negative emotional material, thereby reducing the likelihood that these emotional experiences will be

consolidated into long-term memory (Dewitte, 2011). These mechanisms are thought to be relatively automatic and occur at the early stage of emotional processing before behavioural responses can become fully activated (Dewitte, 2011). Potentially, this inclination to suppress negative affect contributes to reduced emotional awareness and an inability to accurately label emotional states, explaining why avoidant individuals are more likely to have problems with ER. This coincides with current understandings of emotional suppression in avoidant individuals, who rely on inhibitory or deactivating coping strategies to decrease affective arousal, which is associated with a desire to maintain a deactivated attachment system (Shaver et al., 2009).

4.3 Associations between Insecure Attachment, Interoceptive Awareness, and Alexithymia

Similarly, it was necessary to observe the relationship between insecure attachment and IA, which has been given limited consideration in current literature. Hypothesis 2 proposed that attachment insecurity would negatively correlate with IA. In support of this hypothesis, anxious and avoidant attachment both had weak, negative associations with IA, of which an avoidant attachment style was more strongly correlated. This corroborated the conclusions by Oldroyd and colleagues (2019), who found avoidant individuals to report a greater reduction in interoceptive functioning compared to anxious individuals. Despite small correlations, these present findings contribute to the notion that avoidant individuals harbour a disconnect between bodily arousal and self-reported distress, resulting from a suppressive coping style (Diamond, Hicks, & Otter-Henderson, 2006). However, as the current study focused on attachment in adulthood, it cannot account for the role of childhood attachment experiences in the development of IA, which is potentially important as research suggests that these early socialisation experiences considerably impact the interoceptive network in the

brain (Oldroyd et al., 2019). Therefore, although the present study supported existing findings, research must continue to empirically validate these associations across the lifespan.

It was further hypothesised that anxious and avoidant attachment would positively correlate with alexithymia. As alexithymia is associated with the use of strategies that suppress rather than hyper-activate emotions related to negative affect, it might explain why a higher correlation with avoidant rather than anxious attachment was observed (Laloyaux et al., 2015). However, the observed differences were marginal, with correlations only slightly higher between avoidant attachment and alexithymia.

4.4 Associations between Interoceptive Awareness and Alexithymia on Emotional Regulation Difficulties

In support of Hypothesis 3, ER difficulties were found to be positively correlated with alexithymia and negatively correlated with IA. Potentially, alexithymia had a stronger association with ER difficulties as both constructs are known to share overlapping characteristics including poor emotional awareness and an inability to engage in appropriate coping strategies (Thorberg et al., 2011; Gratz & Roemer, 2004). Theories of emotion processing posit that an understanding and acceptance of emotions, as well as the ability to accurately label emotions, precedes adaptive regulation (Gratz & Roemer, 2004). Considering that alexithymia is characterised by impairments in these capabilities, emotional regulation is likely to be impaired in alexithymic individuals. Indeed, Silva, Vasco, and Watson (2017), propose that because alexithymia reflects deficits in emotional translation and responsiveness, it can be thought of as disordered affect regulation. They note that the influence of alexithymia on emotional awareness might subsequently impair the emotional processing sequence and the selection of regulation strategies (Silva et al., 2017). Conversely, IA has been associated with the tendency to engage in reappraisal as a strategy to down-regulate negative affect, and reappraisal is considered adaptive by contributing to beneficial affect regulation (Füstös et al.,

2013; Gross & John, 2003). Similarly, Garfinkel et al. (2017) found IA to be positively related to heightened emotional experiences, which suggests that individuals with IA do not actively suppress affective arousal. Therefore, given existing research, the negative relationship between IA and ER difficulties demonstrated in the current study was not unexpected.

4.5 Interoceptive Awareness and Alexithymia as Mediators

Parallel mediation analyses were used to investigate Hypothesis 4, which posited that IA and alexithymia would mediate the relationship between attachment insecurity and ER difficulties, while accounting for covariates (i.e., gender, age, education level, ethnicity, and marital status). In support of this hypothesis, it was found that additional explanatory power was obtained by including both mediators into their respective model. For both anxious and avoidant attachment, alexithymia had a greater indirect effect on their association with ER difficulties compared to alexithymia. These findings suggest that the absence of emotional awareness and comprehension and a lack of introspective capacities is more influential in understanding how attachment insecurity is associated with ER difficulties than an impaired perception and interpretation of bodily sensations. Of the covariates, only age and gender were significant negative predictors in both models. This indicates that both males and older adults are less likely to experience ER difficulties compared to younger adults and females. Education was also a significant negative predictor in the model for avoidant attachment, which suggests that individuals with a lower education level are more likely to have ER difficulties compared to individuals with a higher education level.

A possible explanation for why alexithymia accounted for more of the variance than IA is that the outcomes found to be associated with alexithymia considerably overlap with aspects of both attachment insecurity and ER difficulties. For example, alexithymia is associated with interpersonal problems such as socially avoidant behaviours defined by hostility, avoidance and a fear of intimacy (Lyvers, Davis, Edwards, & Thorberg, 2018). Fear of intimacy has been

found to mediate the negative relationship between alexithymia and secure attachment (Lyvers et al., 2018). This avoidance of close relationships might account for the social, familial, and romantic loneliness commonly experienced by alexithymic individuals. Problems with cultivating and maintaining interpersonal bonds, which is indicative of attachment insecurity, is thought to be related to alexithymic individuals having difficulties with accurately recognising and labelling others' facial emotions (Prkachin, Casey, & Prkachin, 2009). A subsequent inability to appropriately respond to another's emotional state might explain why alexithymic individuals have been found to possess low emotional empathy, which may contribute to interpersonal conflict (Grynberg et al., 2012).

Including covariates, anxious attachment accounted for almost half of the variance in the total effect on ER difficulties, while avoidant attachment accounted for just over one third. This suggests that IA and alexithymia influenced a greater proportion of the relationship between attachment avoidance and ER difficulties compared to anxious attachment. This supported initial correlations demonstrating that avoidant attachment had higher associations with both alexithymia and impaired IA, but anxious attachment had a higher association with ER difficulties. Although not addressed in the current study, it is unlikely that this finding can be explained by the differential impact of emotional regulation strategies on the presentation of ER difficulties and psychopathology. Specifically, research suggests maladaptive disengaging coping styles that are more characteristic of an avoidant style, such as emotional suppression and denial, are highly related to symptoms of psychopathology (Compas et al., 2017).

4.6 Strengths

The current study achieved the sample size necessary to detect the desired alpha level, power, and effect size parameters that were specified in an a priori power analysis. Larger samples are thought to improve the precision of the data, provide a smaller margin of error,

and increase the likelihood of detecting meaningful differences (Biau, Kernéis, & Porcher, 2008). Additionally, the instruments used in the current study were well-validated measures of the key variables and had adequate internal consistency. The current study sought to refine previous findings on the associations between attachment insecurity and IA by using the revised version of the MAIA. The MAIA-2 is regarded as an improved assessment of interoceptive ability as it has five additional items compared to the original scale, which were found to improve psychometrics (Mehling et al., 2018). Likewise, the MAIA-2 is considered to be a more accurate indicator of interoceptive capabilities compared to measures that have been commonly implemented in past literature, such as the heartbeat counting task, which has recently faced criticism regarding its validity (Murphy et al., 2018). Measures of IA that rely on self-report are thought to be comprehensive in that they allow for an assessment of multiple dimensions of interoception and evaluate an individual's current beliefs regarding their awareness of and responsiveness to changes in physical states (Mehling et al., 2012).

4.7 Limitations

Several limitations should be considered when interpreting results from the present study. There was a relative degree of bias in the sampling, as a majority of participants were young, female, and university-educated. Relying upon a convenience sample provided only a narrow and defined cross-section of the total population, thus limiting both the external validity and reliability of outcomes. Similarly, due to both time constraints and the attributes of the chosen measures, the cross-sectional nature of the study did not allow for causation to be inferred. This indicates the need for a longitudinal design to allow for a more nuanced understanding of the observed relationships. For example, attachment is not a stable construct and has the potential to change in response to different interpersonal relationships and major life transitions (Ravitz et al., 2010; Gillath et al., 2016). Thus, the attachment style developed

in childhood and its impact on the presentation of IA, alexithymia, and ER difficulties may differ from how these relationships are presented in adulthood.

Additionally, there were no objective measures included in the study, as the constructs were reliant on self-report. Although the anonymity of participation encouraged honest responding, the survey may have been prone to response biases such as social desirability, which has consequences for the validity of the data. However, because participants were assured that they would remain unidentifiable and because none of the measures were assessing overly sensitive or controversial topics, the likelihood of disingenuous responding was limited.

Finally, a methodological consideration is that the current study did not screen for psychological disorders during the data collection stage. Failure to do so has potential implications for the DERS, which has found to be associated with depression, anxiety, and pathological personality traits including negative affectivity, detachment, and psychoticism (Margansaka, Gallagher, & Miranda, 2013; Pollock et al., 2016). Additionally, the TAS-20 has been found to measure constructs that overlap considerably with the Beck Depression Inventory, indicating that there might be a minimal distinction between alexithymia and depression, particularly in clinical populations (Herbert et al., 2011; Hintikka, Honkalampi, Lehtonen, & Viinamäki, 2001). Therefore, it would be of interest for prospective research to account for the differential impact of alexithymia on ER difficulties between clinical and non-clinical populations, and consider the inclusion of control variables (e.g the DASS) if not assessing psychopathology.

4.8 Implications and Future Directions

The present findings have promising theoretical and practical implications to be considered for future research. To the best of our knowledge, the current study is the first attempt to partially justify the theoretical model as proposed by Löffler and colleagues (2018)

on how the interactions between adverse early life experiences, impaired interoception, and poor emotional awareness contribute to the psychosocial deficits that underlie BPD. Findings from the current study provide empirical evidence on how individual differences in bodily and affective awareness are related to how we experience and cope with negative emotional experiences. These findings suggest that attachment processes are to some extent related to representations of the self in both a physiological and cognitive context. It appears that interpersonal relationships distinguished by either an under or over reliance on others for comfort and reassurance are negatively associated with having a conscious perception of internal states and understanding how these sensations might be indicative of emotional states. Furthermore, as alexithymia was found to contribute additional explanatory power in the current study, it indicates that problems with appropriately communicating our needs to significant others is related to problems with identifying and signalling our affective states, which produces ineffective regulation strategies. In the context of the original model, this suggests the need to explore alexithymia as affecting the psychosocial deficits in BPD, particularly as there is evidence that alexithymia is a predictor of BPD and potentially mediates the relationship between attachment insecurity and BPD, due to alexithymia being associated with ER difficulties (Deborde et al., 2012; Webb & McMurran, 2008).

Individuals with heightened IA are thought to have a processing advantage when monitoring emotional situations based on their accuracy in detecting somatic markers such as heartbeat (Pollatos, Traut-Mattausch, Schroeder, & Schandry, 2007). However, there is research questioning whether IA and its relationship with a more accurate awareness of emotional states is necessarily related to adaptive ER. For instance, differences in IA have been found to mediate the relationship between emotional intensity and trait anxiety (Pollatos et al., 2007). Heightened IA might be related to the development of anxiety as the constructs share attributes including bodily sensitivity and increased emotional arousal. Similarly,

Pineles and Mineka (2005) found that individuals with social anxiety have an attentional bias for interoceptive information when evaluating for potential threat, suggesting a preference for internal rather than external cues of physiological arousal. Together, these findings implicate IA in the development of disorders involving a sensitivity toward somatic markers of arousal. Based on the contradictions in current literature, an important consideration is that there may exist an optimal level of IA. Here, an individual has a conscious and accurate perception of their internal sensations and understands how they might reflect emotional states, but is not hypervigilant of this information in a way that overstimulates emotional arousal. Research is needed in clarifying whether IA moderates how emotional intensity is related to regulation strategies and psychiatric disorders - specifically whether IA is only beneficial for individuals who experience low emotional intensity. Alexithymia should be considered alongside IA, as research suggests an interaction between heightened IA and misattributions concerning the source of arousal in maintaining anxiety disorders (Dunn et al., 2010). Alternatively, as alexithymia is associated with affective impairments and a lack of emotional clarity, it would be worthwhile to determine whether it is related to low emotional intensity and thus mediates the development of psychiatric disorders characterised by a sensitivity to bodily sensations. It might be appropriate to explore these relationships in the context of secure attachment, to reduce the role of interpersonal problems in the presentation of ER difficulties.

Another important consideration derived from the present findings is that a focus on bodily awareness may be important when designing interventions to address problems with ER. Mindfulness is thought to be an important aspect of IA as it is related to maintaining attention to the present-moment and to the perception of thoughts, feelings, and physiological sensations (Pepping, Davis, & O'Donovan, 2013). Therefore, mind-body therapies might be beneficial for the treatment of clinical conditions associated with interoceptive impairments, including generalised anxiety and panic disorders (Khalsa et al., 2018). A therapeutic

approach called mindful awareness in body-oriented therapy (MABT) is designed to develop IA skills concerning identification, accessing, and appraisal of internal bodily signals (Price & Hooven, 2018). These components have been identified as fundamental for ER as they seek to improve emotional awareness and reduce distress (Price & Hooven, 2018).

Although further research is required to better understand the association between alexithymia and IA, the current study demonstrated that the two constructs are positively correlated, albeit weakly. Comparable to the findings by Herbert et al. (2011), this indicates that although these constructs remain distinct, they share overlapping characteristics. The implication is that therapies intended to enhance bodily awareness and the ability to perceive and regulate emotions might also improve emotional identification and interpretation. Indeed, a systematic review found that mindfulness-based interventions may be an effective treatment in reducing alexithymia by enhancing the neural processes associated with the recognition of bodily sensations (Norman, Marzano, Coulson, & Oskis, 2018). Interventions such as a mindfulness-based stress reduction programme, contemplative mental training, and mindful meditation were found to be successful in reducing alexithymia. However, these conclusions were based on a small number of available studies, suggesting the need for more research to empirically validate these findings (Norman et al., 2018).

4.9 Conclusion

In conclusion, it was found that both interoceptive awareness and alexithymia partially mediated the relationships between insecure adult attachment dimensions and difficulties in emotional regulation. Avoidant attachment had higher correlations with both alexithymia and ER difficulties compared to anxious attachment. However, the parallel mediation models suggested that the total effect of anxious attachment on ER difficulties, including known covariates, accounted for a greater proportion of the variance than the total effect of avoidant attachment on ER difficulties. The current study provides further empirical support for the

inverse relationship between insecure attachment styles and IA on ER, demonstrating that individuals who are more perceptive to their internal bodily sensations are more likely to have better control of their emotional experiences. These findings make important contributions to understanding emotional regulation and the constructs that influence it. Further research is needed in clarifying the interaction between IA and ER to determine whether a curvilinear model of IA exists, where at extremes (i.e. intensely heightened or impaired) it can increase the risk for psychopathology, particularly when co-occurring with other vulnerability factors such as alexithymia. Potentially, the use of therapeutic mind-body interventions such as MABT to enhance bodily awareness may be pertinent not only for individuals with low interoceptive capabilities, but also for alexithymic populations, to help them better identify and describe their feelings on the basis of their internal physiological sensations.

References

Adamczyk, K., & Bookwala, J. (2013). Adult attachment and single vs. partnered relationship status in Polish university students. *Psychological Topics, 22*(3), 481-500.

Ainsworth, M.D.S., Blehar, M.C., Waters, E., & Wall S. (1978). Patterns of attachment. Hillsdale (NJ): Erlbaum.

Andersen, T. E., Ravn, S. L., Manniche, C., & O'Neill, S. (2018). The impact of attachment insecurity on pain and pain behaviors in experimental pain. *Journal of Psychosomatic Research, 111*, 127-132. doi:10.1016/j.jpsychores.2018.06.002

Bagby, R. M., Parker, J. D. A., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale—I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research*, 38(1), 23-32. doi:10.1016/0022-3999(94)90005-1

Biau, D., Kernéis, S., & Porcher, R. (2008). Statistics in brief: The importance of sample size in the planning and interpretation of medical research. *Clinical Orthopaedics and Related Research, 466*(9), 2282-2288. doi:10.1007/s11999-008-0346-9

Bowlby, J. (1982). Attachment and loss: Vol. 1. Attachment (2nd ed.). New York: Basic Books. (Original work published 1969)

Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. *Monographs of the Society for Research in Child Development*, 59(2-3), 228-249. doi:10.1111/j.1540-5834.1994.tb01287.x

Cassidy, J., & Shaver, P. R. (2008). *Handbook of attachment theory, research, and clinical applications* (2nd ed. ed.). New York: Guilford Press.

Chopik, W. J., Edelstein, R. S., & Fraley, R. C. (2013). From the cradle to the grave: Age differences in attachment from early adulthood to old age. *Journal of Personality, 81*(2), 171-183. doi:10.1111/j.1467-6494.2012.00793.x

Clear, S. J., & Zimmer-Gembeck, M. J. (2017). Associations between attachment and emotion-specific emotion regulation with and without relationship insecurity priming. *International Journal of Behavioral Development, 41*(1), 64-73. doi:10.1177/0165025415620057

Collins, N. L. (1996). Working models of attachment: Implications for explanation, emotion, and behavior. *Journal of Personality and Social Psychology*, 71(4), 810-832. doi:10.1037/0022-3514.71.4.810

Compas, B. E., Jaser, S. S., Bettis, A. H., Watson, K. H., Gruhn, M. A., Dunbar, J. P., . . . Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A Meta-Analysis and Narrative Review. *Psychological Bulletin, 143*(9), 939-991. doi:10.1037/bul0000110

Deborde, A.S., Miljkovitch, R., Roy, C., Dugré-Le Bigre, C., Pham-Scottez, A., Speranza, M., & Corcos, M. (2012). Alexithymia as a mediator between attachment and the development of borderline personality disorder in adolescence. *Journal of personality disorders, 26*(5), 676. doi:10.1521/pedi.2012.26.5.676

Del Giudice, M. (2011). Sex differences in romantic attachment: A meta-analysis. *Personality and Social Psychology Bulletin, 37*(2), 193-214. doi:10.1177/0146167210392789

Desmedt, O., Luminet, O., & Corneille, O. (2018). The heartbeat counting task largely involves non-interoceptive processes: Evidence from both the original and an adapted counting task. *Biological Psychology, 138*, 185-188. doi:10.1016/j.biopsycho.2018.09.004

Dewitte, M. (2011). Adult attachment and attentional inhibition of interpersonal stimuli. *Cognition and Emotion, 25*(4), 612-625. doi:10.1080/02699931.2010.508683

Diamond, L. M., Hicks, A. M., & Otter-Henderson, K. (2006). Physiological evidence for repressive coping among avoidantly attached adults. *Journal of Social and Personal Relationships, 23*(2), 205-229. doi:10.1177/0265407506062470

Dunn, B. D., Stefanovitch, I., Evans, D., Oliver, C., Hawkins, A., & Dalgleish, T. (2010). Can you feel the beat? Interoceptive awareness is an interactive function of anxiety- and depression-specific symptom dimensions. *Behaviour Research and Therapy, 48*(11), 1133-1138. doi:10.1016/j.brat.2010.07.006

Ecutuli, D. (2014). Cognitive reappraisal and expressive suppression strategies role in the emotion regulation: An overview on their modulatory effects and neural correlates. *Frontiers in Systems Neuroscience, 8*. doi:10.3389/fnsys.2014.00175

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G * Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160. doi:10.3758/BRM.41.4.1149

Füstös, J., Gramann, K., Herbert, B. M., & Pollatos, O. (2013). On the embodiment of emotion regulation: Interoceptive awareness facilitates reappraisal. *Social Cognitive and Affective Neuroscience, 8*(8), 911-917. doi:10.1093/scan/nss089

Garfinkel, S. N., Critchley, H. D., & Pollatos, O. (2017). The interoceptive system: Implications for cognition, emotion, and health. In J.T. Cacioppo, L.G. Tassinary, & G.G. Bernston, *Handbook of Psychophysiology* (pp. 427-443). Cambridge, UK: Cambridge University Press.

Garfinkel, S. N., Seth, A. K., Barrett, A. B., Suzuki, K., & Critchley, H. D. (2015). Knowing your own heart: Distinguishing interoceptive accuracy from interoceptive awareness. *Biological Psychology, 104*, 65-74. doi:10.1016/j.biopsycho.2014.11.004

Gillath, O., Karantzas, G. C., & Fraley, R. C. (2016). *Adult Attachment: A Concise Introduction to Theory and Research*. Cambridge, Massachusetts: Academic Press.

Grabauskaite, A., Baranauskas, M., & Griskova-Bulanova, I. (2017). Interoception and gender: What aspects should we pay attention to? *Consciousness and Cognition, 48*, 129. doi:10.1016/j.concog.2016.11.002

Gratz, K., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41-54. doi:10.1023/B:JOBA.0000007455.08539.94

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348-362. doi:10.1037/0022-3514.85.2.348

Grynberg, D., Chang, B., Corneille, O., Maurage, P., Vermeulen, N., Berthoz, S., & Luminet, O. (2012). Alexithymia and the processing of emotional facial expressions (EFEs): systematic review, unanswered questions and further perspectives. *PLoS ONE, 7*(8). doi:10.1371/journal.pone.0042429

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford Press.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, 52(3), 511-524. doi:10.1037/0022-3514.52.3.511

Herbert, B. M., Herbert, C., & Pollatos, O. (2011). On the relationship between interoceptive awareness and alexithymia: Is interoceptive awareness related to emotional awareness?. *Journal of Personality*, 79(5), 1149-1175. doi:10.1111/j.1467-6494.2011.00717.x

Hintikka, J., Honkalampi, K., Lehtonen, J., & Viinamäki, H. (2001). Are alexithymia and depression distinct or overlapping constructs?: A study in a general population. *Comprehensive Psychiatry*, 42(3), 234. doi:10.1053/comp.2001.23147

Karreman, A., & Vingerhoets, A. J. J. M. (2012). Attachment and well-being: The mediating role of emotion regulation and resilience. *Personality and Individual Differences*, 53(7), 821-826. doi:10.1016/j.paid.2012.06.014

Khalsa, S. S., Adolphs, R., Cameron, O. G., Critchley, H. D., Davenport, P. W., Feinstein, J. S., . . . Paulus, M. P. (2018). Interoception and mental health: A roadmap. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, 3(6), 501-513. doi:10.1016/j.bpsc.2017.12.004

Khalsa, S. S., Rudrauf, D., & Tranel, D. (2009). Interoceptive awareness declines with age. *Psychophysiology*, 46(6), 1130-1136. doi:10.1111/j.1469-8986.2009.00859.x

Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition and Emotion, 23*(1), 4-41. doi: 10.1080/02699930802619031

Koole, S.L., van Dillen, L.F., & Sheppes, G. (2016). The self-regulation of emotion. In K.D. Vohs, & R.F. Baumeister, *The handbook of self-regulation, Third edition: Research, theory, and applications*. New York, NY: Guilford Press.

Laloyaux, J., Fantini, C., Lemaire, M., Luminet, O., & Larøi, F. (2015). Evidence of contrasting patterns for suppression and reappraisal emotion regulation strategies in alexithymia. *The Journal of Nervous and Mental Disease, 203*(9), 709-717. doi:10.1097/NMD.0000000000000353

Löffler, A., Foell, J., & Bekrater-Bodmann, R. (2018). Interoception and its interaction with self, other, and emotion processing: Implications for the understanding of

psychosocial deficits in borderline personality disorder. *Current Psychiatry Reports, 20*(4), 1-9. doi:10.1007/s11920-018-0890-2

Lyvers, M., Davis, S., Edwards, M. E., & Thorberg, F. A. (2018). Alexithymia, Attachment and Fear of Intimacy in Young Adults. *IAFOR Journal of Psychology & the Behavioral Sciences, 3*(2), 1-11. doi:10.22492/ijpbs.3.2.01

Margansaka, A., Gallagher, M., & Miranda, R. (2013). Adult attachment, emotion dysregulation, and symptoms of depression and generalized anxiety disorder. *American Journal of Orthopsychiatry, 83*(1), 131-141. doi:10.1111/ajop.12001

Mehling, W. E., Acree, M., Stewart, A., Silas, J., & Jones, A. (2018). The multidimensional assessment of interoceptive awareness, version 2 (MAIA-2). *PLoS ONE, 13*(12), 1-12. doi:10.1371/journal.pone.0208034

Mehling, W. E., Price, C., Daubenmier, J. J., Acree, M., Bartmess, E., & Stewart, A. (2012). The Multidimensional Assessment of Interoceptive Awareness (MAIA). *PLoS ONE, 7*(11), doi:10.1371/journal.pone.0048230

Mikulincer, M., & Shaver, P. R. (2016). *Attachment in adulthood, Second Edition*: *Structure, Dynamics, and Change*. New York: NY: Guilford Publications.

Moutsiana, C., Fearon, P., Murray, L., Cooper, P., Goodyer, I., Johnstone, T., & Halligan, S. (2014). Making an Effort to feel positive: Insecure attachment in infancy predicts the neural underpinnings of emotion regulation in adulthood. *Journal of Child Psychology and Psychiatry*, 55(9), 999-1008. doi:10.1111/jcpp.12198

Muir, K., Madill, A., & Brown, C. (2017). Individual differences in emotional processing and autobiographical memory: Interoceptive awareness and alexithymia in the fading affect bias. *Cognition and Emotion*, 31(7), 1392-1404. doi:10.1080/02699931.2016.1225005

Murphy, J., Brewer, R., Hobson, H., Catmur, C., & Bird, G. (2018). Is alexithymia characterised by impaired interoception? Further evidence, the importance of control variables, and the problems with the Heartbeat Counting Task. *Biological Psychology, 136*, 189-197. doi:10.1016/j.biopsycho.2018.05.010

Neacsiu, A. D., Herr, N. R., Fang, C. M., Rodriguez, M. A., & Rosenthal, M. Z. (2015). Identity disturbance and problems with emotion regulation are related constructs across diagnoses. *Journal of Clinical Psychology, 71*(4), 346-361. doi:10.1002/jclp.22141

Norman, H., Marzano, L., Coulson, M., & Oskis, A. (2019). Effects of mindfulness-based interventions on alexithymia: A systematic review. *Evidence Based Mental Health, 22*(1), 36. doi:10.1136/ebmental-2018-300029

Oldroyd, K., Pasupathi, M., & Wainryb, C. (2019). Social Antecedents to the development of interoception: Attachment related processes are associated with interoception. *Frontiers in Psychology*, 10. doi:10.3389/fpsyg.2019.00712

Oskis, A., Clow, A., Hucklebridge, F., Bifulco, A., Jacobs, C., & Loveday, C. (2013). Understanding alexithymia in female adolescents: The role of attachment style. *Personality and Individual Differences, 54*(1), 97-102. doi:10.1016/j.paid.2012.08.023

Orgeta, V. (2009). Specificity of age differences in emotion regulation. *Aging & Mental Health*, 13(6), 818-826. doi:10.1080/13607860902989661

Pallant, J. F. a. (2016). *SPSS survival manual : A step by step guide to data analysis using IBM SPSS* (6th ed.). Sydney: Allen & Unwin.

Pepping, C. A., Davis, P. J., & O'Donovan, A. (2013). Individual differences in attachment and dispositional mindfulness: The mediating role of emotion regulation. *Personality and Individual Differences, 54(*3), 453. doi:10.1016/j.paid.2012.10.006

Pepping, C. A., Davis, P. J., O'Donovan, A., & Pal, J. (2014). Individual Differences in self-compassion: The role of attachment and experiences of parenting in childhood. *Self and Identity*, *14*(1), 1-14. doi:10.1080/15298868.2014.955050

Pietromonaco, P. R., & Beck, L. A. (2019). Adult attachment and physical health. *Current Opinion in Psychology*, *25*, 115-120. doi:10.1016/j.copsyc.2018.04.004

Pineles, S. L., & Mineka, S. (2005). Attentional biases to internal and external sources of potential threat in social anxiety. *Journal of Abnormal Psychology, 114*(2), 314-318. doi:10.1037/0021-843X.114.2.314

Pollatos, O., Traut-Mattausch, E., Schroeder, H., & Schandry, R. (2007). Interoceptive awareness mediates the relationship between anxiety and the intensity of unpleasant feelings. *Journal of Anxiety Disorders*, *21*(7), 931-943. doi:10.1016/j.janxdis.2006.12.004

Pollock, N. C., McCabe, G. A., Southard, A. C., & Zeigler-Hill, V. (2016). Pathological personality traits and emotion regulation difficulties. *Personality and Individual Differences, 95*, 168-177. doi:10.1016/j.paid.2016.02.049

Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879-891.

Price, C. J., & Hooven, C. (2018). Interoceptive awareness skills for emotion regulation: Theory and approach of mindful awareness in body-oriented therapy (MABT). *Frontiers in Psychology*, *9*(MAY). doi:10.3389/fpsyg.2018.00798

Prkachin, G. C., Casey, C., & Prkachin, K. M. (2009). Alexithymia and perception of facial expressions of emotion. Personality and Individual Differences, 46(4), 412-417. doi:10.1016/j.paid.2008.11.010

Ravitz, P., Maunder, R., Hunter, J., Sthankiya, B., & Lancee, W. (2010). Adult attachment measures: A 25-year review. *Journal of Psychosomatic Research, 69*(4), 419-432. doi: 10.1016/j.jpsychores.2009.08.006

Read, D. L., Clark, G. I., Rock, A. J., & Coventry, W. L. (2018). Adult attachment and social anxiety: The mediating role of emotion regulation strategies.(Research Article)(Report). *PLoS ONE, 13*(12), e0207514. doi:10.1371/journal.pone.0207514

Ring, C., Brener, J., Knapp, K., & Mailloux, J. (2015). Effects of heartbeat feedback on beliefs about heart rate and heartbeat counting: A cautionary tale about interoceptive awareness. *Biological Psychology*, 104, 193-198. doi:10.1016/j.biopsycho.2014.12.010

Ross, L. R., McKim, M. K., & DiTommaso, E. (2006). How do underlying "self" and "other" dimensions define adult attachment styles? *Canadian Journal of Behavioural Science, 38*(4), 294-310. doi:10.1037/cjbs2006016

Schreiber, L. R. N., Grant, J. E., & Odlaug, B. L. (2012). Emotion regulation and impulsivity in young adults. *Journal of Psychiatric Research, 46*(5), 651-658. doi:10.1016/j.jpsychires.2012.02.005

Schulz, A. (2015). Interoception. In J.D. Wright, *International Encyclopedia of the Social & Behavioral Sciences (2nd ed.)* (pp. 614-620). Amsterdam, Netherlands: Elsevier.

Shaver, P. R., & Mikulincer, M. (2014). Adult attachment and emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 237-250). New York, NY: Guilford Press

Shaver, P. R., Mikulincer, M., & Chun, D. S. (2009). Adult Attachment Theory, Emotion Regulation, and Prosocial Behavior. In M. Vandekerckhove, C. von Scheve, S. Ismer, S. Jung, S. Kronast, & C. von Scheve (1st Ed.), *Regulating emotions: Culture, social necessity, and biological inheritance* (pp. 121-145). Hoboken: NJ: John Wiley & Sons Incorporated.

Silva, A. N., Vasco, A. B., & Watson, J. C. (2017). Alexithymia and Emotional Processing: A Mediation Model. Journal of Clinical Psychology, 73(9), 1196-1205. doi:10.1002/jclp.22422

Simpson, J. A., Rholes, W. S., Orina, M. M., & Grich, J. (2002). Working models of attachment, support giving, and support seeking in a stressful situation. *Personality & Social Psychology Bulletin, 28*(5), 598. doi:10.1177/0146167202288004

Swart, M., Kortekaas, R., & Aleman, A. (2009). Dealing with feelings: Characterization of trait alexithymia on emotion regulation strategies and cognitive-emotional processing (alexithymia and emotion), *PLoS ONE, 4*(6), 1-8. doi:10.1371/journal.pone.0005751

Tabachnick, B. G., & Fidell, L.S. (2013). *Using multivariate statistics* (6th ed.). Boston: Pearson Education.

Thompson, R. (1991). Emotional regulation and emotional development. *Educational Psychology Review, 3*(4), 269-307. doi:10.1007/BF01319934

Thompson, R. A., Meyer, S., & Jochem, R. (2008). Emotion Regulation. In M.M. Haith, & J.B. Benson, *Infant and Early Childhood Development* (pp. 431 - 441). Cambridge, Massachusetts: Academic Press.

Thorberg, F. A., Young, R. M., Sullivan, K. A., & Lyvers, M. (2011). Parental bonding and alexithymia: A meta-analysis. *European Psychiatry, 26*(3), 187-193. doi:10.1016/j.eurpsy.2010.09.010

Vitulic, H., & Prosen, S. (2016). Coping and emotion regulation strategies in adulthood: Specificities regarding age, gender and level of education. *Drustvena Istrazivanja*, 25(1), 43-62. doi:10.5559/di.25.1.03

Wearden, A., Cook, L., & Vaughan-Jones, J. (2003). Adult attachment, alexithymia, symptom reporting, and health-related coping. *Journal of psychosomatic research, 55*(4), 341. doi:10.1016/S0022-3999(02)00635-9

Webb, D., & McMurran, M. (2008). Emotional intelligence, alexithymia and borderline personality disorder traits in young adults. *Personality and Mental Health, 2*(4), 265-273. doi:10.1002/pmh.48

Zamariola, G., Maurage, P., Luminet, O., & Corneille, O. (2018). Interoceptive accuracy scores from the heartbeat counting task are problematic: Evidence from simple bivariate correlations. *Biological Psychology, 137,* 12-17. doi:10.1016/j.biopsycho.2018.06.006

Appendices

Appendix A

Social Media Post

Would you like to be a part of a research project in psychology?

If so, then the University of Adelaide invites you to join a study exploring the links between interoceptive awareness (the ability to detect and interpret bodily sensations), self-compassion, attachment styles, emotional regulation and body appreciation.

If you are aged 18 or over, have around 30-40 minutes to spare, and are interested in being a part of this research, then please visit the following link for more information on how to participate: _____

Participants will have the opportunity to go into the draw to **win one of 2 x $50 Coles/Myer gift vouchers!**

Please feel free to share this information with your family, friends and other networks – it will assist researchers in understanding the roles of interoceptive awareness, self-compassion and attachment styles on emotional regulation and body appreciation. This will enable us to better understand how people recognise and cope with emotions, and potentially help develop practices and interventions for more positive and sustainable wellbeing outcomes.

Appendix B

Recruitment Poster

THE UNIVERSITY of ADELAIDE

Would you like to take part in a research project in Psychology?

The University of Adelaide invites you to participate in a study that will form the basis for three Honours projects being conducted by _____ under the supervision of _____. These projects are interested in investigating how we understand our body-based experience of emotion (interoceptive awareness), and how this may link to other factors like our relationships, how we appreciate our bodies, and how we understand and cope with feelings.

If you are a current Australian resident aged 18+, have proficient English literacy and comprehension skills, and are interested in being part of this research, then please visit the following link for more information on how to participate:

www(.)surveymonkey(.)com/r/67NN9Z7

The study is an online questionnaire-based survey and should not take longer than 45 minutes to complete. Please feel free to share this information with your family, friends, and other networks – it will assist these researchers in contributing to knowledge in the scientific and wider community.

Participants will have the opportunity to go into the draw to win **one of two $50 Coles/Myer gift vouchers!**

Appendix C

Participant Information Sheet

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: Exploring Associations Between Multidimensional Interoceptive Awareness And Attachment, Body Image, And Emotional Regulation.
HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: [redacted]
PRINCIPAL INVESTIGATOR:
STUDENT RESEARCHER:
STUDENT'S DEGREE: Honours Degree Bachelor of Psychological Science

Dear Participant,

You are invited to participate in a project being conducted by the School of Psychology at the University of Adelaide.

What is the project about?
Interoceptive awareness, the ability to understand and utilize body cues as markers of emotion, has been identified as a potential precursor to many positive and negative psychological outcomes. However, it has only relatively recently been understood as a multidimensional construct. The present study aims to explore its association with relevant psychological outcomes, and investigate factors that may contribute to and explain these relationships.

The following survey combines the measures that are being used in three respective thesis projects.

Who is undertaking the project?
This project is being conducted by _____. This research will form the basis of the thesis component for an Honours Degree of Bachelor of Psychological Science at the University of Adelaide under the supervision of _____.

Why am I being invited to participate?
Adults aged 18+ who are fluent in English and currently living in South Australia are eligible to participate in this study.

What am I being invited to do?
We are seeking your consent to complete a questionnaire based online survey. The survey may be completed at your convenience and at a location of your choosing.

How much time will my involvement in the project take?
The survey is expected to take no more than one 45 minute session to complete, with no follow up participation required at the completion and submission of the survey. Subjects drawn from the first year undergraduate psychology cohort will receive one (1) course credit for their participation to contribute to their research participation requirements in Psych 1A or 1B.

Are there any risks associated with participating in this project?
There are no foreseeable risks, side effects, emotional distress, or inconveniences expected to arise from the study either immediately or following participation. However, if you at any point you begin to feel upset or uncomfortable while completing the survey, you should cease working on it. The

contact details of the primary researcher and student researchers, along with various mental health support services will be included at the end of the survey.

What are the potential benefits of the research project?
We hope the results produced from this study will contribute to knowledge seeking to understand interoceptive awareness and related psychological outcomes. Outcomes of this research have the potential to inform or contribute to future research and interventions.

Can I withdraw from the project?
Participation in this project is completely voluntary. If you agree to participate, you can withdraw from the study at any time without consequence up til the submission of the survey. Should you no longer wish to participate, the survey can be exited simply by closing the web browser. Course credit for first year psychology participants can only be provided to those that have submitted their survey.

What will happen to my information?
This study will not be using any identifying information in its findings or in any subsequent publications, ensuring your confidentiality. Additionally, the data collected from this study will not be made accessible to any persons other than the researchers as per the University requirements, except as required by law.

Who do I contact if I have questions about the project?
If you have any questions about the research, please contact the primary researcher via email: or phone:

What if I have a complaint or any concerns?
The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number [redacted] and will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research 2007 (Updated 2018).

If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then please contact the Principal Investigator Dr. Amanda Taylor (contact details above). If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:
Phone: [redacted]
Email: hrec@adelaide.edu.au
Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000
Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?
Please continue to the following page, where you will be directed to a consent form. After you have given your consent, you will be directed through to the online survey.

Appendix D

Participant Consent Form

Human Research Ethics Committee (HREC)

CONSENT FORM

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Exploring Associations Between Multidimensional Interoceptive Awareness And Attachment, Body Image, And Emotional Regulation.
Ethics Approval Number:	[redacted]

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.

3. Although I understand the purpose of the research project is to improve the quality of health/medical care, it has also been explained that my involvement may not be of any benefit to me.

4. I agree to participate in the activities as outlined in the participant information sheet.

5. I understand that as my participation is anonymous, I can withdraw any time up until submission of the survey. I am aware that if I decide to withdraw this will not affect medical advice in the management of my health, now or in the future.

6. I have been informed that the information gained in the project may be published in a journal article, thesis, and conference presentation.

7. I have been informed that in the published materials I will not be identified and my personal results will not be divulged.

8. I agree to my information being used for future research purposes as follows:
   - Research undertaken by these same researcher(s) Yes ☐ No ☐
   - Related research undertaken by any researcher(s) Yes ☐ No ☐
   - Any research undertaken by any researcher(s) Yes ☐ No ☐

9. I understand my information will only be disclosed according to the consent provided, except where disclosure is required by law.

10. I am aware that I should keep a copy of this Consent Form, when completed, and the participant Information Sheet.

Appendix E

Online Survey

Demographics Questionnaire

What is your gender?

◯ Female

◯ Male

◯ Other

◯ Prefer not to specify

What is your age? (In whole years)

[ ]

What is the highest level of education you have completed?

◯ Completed Primary School

◯ Completed High School

◯ Technical qualification (e.g., Certificate III)

◯ Degree or diploma (e.g., Bachelors degree, Graduate diploma)

◯ Postgraduate degree (e.g., Masters, Doctorate)

What is your marital status?

◯ Single

◯ Married

◯ Defacto

◯ Divorced

◯ Other

What is your ethnicity?

◯ Caucasian or White

◯ Aboriginal and/or Torres Strait Islander

◯ Asian

◯ African

◯ Other (please specify) .....

The Multidimensional Assessment of Interoceptive Awareness – 2

Below you will find a list of statements. Please indicate how often each statement applies to you generally in daily life.

	Circle one number on each line					
	Never					Always
1. When I am tense I notice where the tension is located in my body.	0	1	2	3	4	5
2. I notice when I am uncomfortable in my body.	0	1	2	3	4	5
3. I notice where in my body I am comfortable.	0	1	2	3	4	5
4. I notice changes in my breathing, such as whether it slows down or speeds up.	0	1	2	3	4	5
5. I ignore physical tension or discomfort until they become more severe.	0	1	2	3	4	5
6. I distract myself from sensations of discomfort.	0	1	2	3	4	5
7. When I feel pain or discomfort, I try to power through it.	0	1	2	3	4	5
8. I try to ignore pain	0	1	2	3	4	5
9. I push feelings of discomfort away by focusing on something	0	1	2	3	4	5
10. When I feel unpleasant body sensations, I occupy myself with something else so I don't have to feel them.	0	1	2	3	4	5
11. When I feel physical pain, I become upset.	0	1	2	3	4	5
12. I start to worry that something is wrong if I feel any discomfort.	0	1	2	3	4	5
13. I can notice an unpleasant body sensation without worrying about it.	0	1	2	3	4	5
14. I can stay calm and not worry when I have feelings of discomfort or pain.	0	1	2	3	4	5
15. When I am in discomfort or pain I can't get it out of my mind	0	1	2	3	4	5
16. I can pay attention to my breath without being distracted by things happening around me.	0	1	2	3	4	5
17. I can maintain awareness of my inner bodily sensations even when there is a lot going on around me.	0	1	2	3	4	5
18. When I am in conversation with someone, I can pay attention to my posture.	0	1	2	3	4	5

The Difficulties in Emotional Regulation Scale

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1	2	3	4	5
almost never (0-10%)	sometimes (11-35%)	about half the time (36-65%)	most of the time (66-90%)	almost always (91-100%)

_____ 1) I am clear about my feelings.
_____ 2) I pay attention to how I feel.
_____ 3) I experience my emotions as overwhelming and out of control.
_____ 4) I have no idea how I am feeling.
_____ 5) I have difficulty making sense out of my feelings.
_____ 6) I am attentive to my feelings.
_____ 7) I know exactly how I am feeling.
_____ 8) I care about what I am feeling.
_____ 9) I am confused about how I feel.
_____ 10) When I'm upset, I acknowledge my emotions.
_____ 11) When I'm upset, I become angry with myself for feeling that way.
_____ 12) When I'm upset, I become embarrassed for feeling that way.
_____ 13) When I'm upset, I have difficulty getting work done.
_____ 14) When I'm upset, I become out of control.
_____ 15) When I'm upset, I believe that I will remain that way for a long time.
_____ 16) When I'm upset, I believe that I will end up feeling very depressed.
_____ 17) When I'm upset, I believe that my feelings are valid and important.
_____ 18) When I'm upset, I have difficulty focusing on other things.
_____ 19) When I'm upset, I feel out of control.
_____ 20) When I'm upset, I can still get things done.
_____ 21) When I'm upset, I feel ashamed at myself for feeling that way.
_____ 22) When I'm upset, I know that I can find a way to eventually feel better.
_____ 23) When I'm upset, I feel like I am weak.
_____ 24) When I'm upset, I feel like I can remain in control of my behaviors.
_____ 25) When I'm upset, I feel guilty for feeling that way.
_____ 26) When I'm upset, I have difficulty concentrating.
_____ 27) When I'm upset, I have difficulty controlling my behaviors.
_____ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.
_____ 29) When I'm upset, I become irritated at myself for feeling that way.
_____ 30) When I'm upset, I start to feel very bad about myself.
_____ 31) When I'm upset, I believe that wallowing in it is all I can do.
_____ 32) When I'm upset, I lose control over my behavior.
_____ 33) When I'm upset, I have difficulty thinking about anything else.
_____ 34) When I'm upset I take time to figure out what I'm really feeling.
_____ 35) When I'm upset, it takes me a long time to feel better.
_____ 36) When I'm upset, my emotions feel overwhelming.

The Revised Adult Attachment Scale – Close Relationships Version

The following questions concern how you ***generally*** feel in ***important close relationships in your life***. Think about your past and present relationships with people who have been especially important to you, such as family members, romantic partners, and close friends. Respond to each statement in terms of how you ***generally*** feel in these relationships.

Please use the scale below by placing a number between 1 and 5 in the space provided to the right of each statement.

1----------2----------3----------4----------5

Not at all characteristic of me — **Very characteristic of me**

1) I find it relatively easy to get close to people. _____

2) I find it difficult to allow myself to depend on others. _____

3) I often worry that other people don't really love me. _____

4) I find that others are reluctant to get as close as I would like. _____

5) I am comfortable depending on others. _____

6) I don't worry about people getting too close to me. _____

7) I find that people are never there when you need them. _____

8) I am somewhat uncomfortable being close to others. _____

9) I often worry that other people won't want to stay with me. _____

10) When I show my feelings for others, I'm afraid they will not feel the same about me. _____

11) I often wonder whether other people really care about me. _____

12) I am comfortable developing close relationships with others. _____

13) I am uncomfortable when anyone gets too emotionally close to me. _____

14) I know that people will be there when I need them. _____

15) I want to get close to people, but I worry about being hurt. _____

16) I find it difficult to trust others completely. _____

17) People often want me to be emotionally closer than I feel comfortable being. _____

18) I am not sure that I can always depend on people to be there when I need them. _____

The 20-Item Toronto Alexithymia Scale

Please answer the following questions, using the scale provided:

(1) Completely disagree
(2) Disagree
(3) Neutral
(4) Agree
(5) Completely agree

1.	I am often confused about what emotion I am feeling.	1 – 2 – 3 – 4 – 5
2.	It is difficult for me to find the right words for my feelings.	1 – 2 – 3 – 4 – 5
3.	I have physical sensations that even doctors don't understand.	1 – 2 – 3 – 4 – 5
4.	I am able to describe my feelings easily.	1 – 2 – 3 – 4 – 5
5.	I prefer to analyze problems rather than just describe them.	1 – 2 – 3 – 4 – 5
6.	When I am upset, I don't know if I am sad, frightened, or angry.	1 – 2 – 3 – 4 – 5
7.	I am often puzzled by sensations in my body.	1 – 2 – 3 – 4 – 5
8.	I prefer to just let things happen rather than to understand why they turned out that way.	1 – 2 – 3 – 4 – 5
9.	I have feelings that I can't quite identify.	1 – 2 – 3 – 4 – 5
10.	Being in touch with emotions is essential.	1 – 2 – 3 – 4 – 5
11.	I find it hard to describe how I feel about people.	1 – 2 – 3 – 4 – 5
12.	People tell me to describe my feelings more.	1 – 2 – 3 – 4 – 5
13.	I don't know what's going on inside me.	1 – 2 – 3 – 4 – 5
14.	I often don't know why I am angry.	1 – 2 – 3 – 4 – 5
15.	I prefer talking to people about their daily activities rather than their feelings.	1 – 2 – 3 – 4 – 5
16.	I prefer to watch "light" entertainment shows rather than psychological dramas.	1 – 2 – 3 – 4 – 5
17.	It is difficult for me to reveal my innermost feelings, even to close friends.	1 – 2 – 3 – 4 – 5
18.	I can feel close to someone, even in moments of silence.	1 – 2 – 3 – 4 – 5
19.	I find examination of my feelings useful in solving personal problems.	1 – 2 – 3 – 4 – 5
20.	Looking for hidden meanings in movies or plays distracts from their enjoyment.	1 – 2 – 3 – 4 – 5

Appendix F

Parallel Multiple Mediation Tables

Mediation analysis for anxious attachment (RAASAnxiety) and difficulties with emotional regulation (DERS), with mediators of IA (MAIA) and alexithymia (TAS-20), controlling for covariates (gender, age, education level, marital status, and ethnicity)

		M_1 (IA)				M_2 (Alexithymia)				*Y* (ER Difficulties)		
Variable		**Coefficient**	***SE***	***p***		**Coefficient**	***SE***	***p***		**Coefficient**	***SE***	***p***
X(RAASAnxiety)	a_1	-0.512	0.198	.105	a_2	0.759	0.106	<.001	c'	1.612	0.186	<.001
M_1		-	-	-		-	-	-	b_1	-0.336	0.06	<.001
M_2		-	-	-		-	-	-	b_2	0.675	0.114	<.001
C_1 (age)		-0.174	0.117	.139		0.045	0.062	.472		-0.342	0.099	<.001
C_2 (gender)		2.031	2.471	.413		1.145	1.317	.385		-4.17	2.092	.048
C_3 (education)		1.541	1.37	.291		-1.141	0.729	.119		-2.243	1.161	.055
C_4 (marital)		-1.517	0.935	.106		-0.241	0.498	.629		0.23	0.794	.772
C_5 (ethnicity)		0.531	1.157	.647		1.102	0.616	.075		-0.076	0.984	.939
		R^2= 0.053 $F(6, 219)$ =1.957 , p=.073				R^2= 0.252 $F(6, 219)$ =11.913, p<.001				R^2= 0.648 $F(8, 219)$ = 48.302, p<.001		

Note. Coefficients are represented as unstandardised regression coefficients

Mediation analysis for avoidant attachment (RAASAvoid) and emotional regulation (DERS), with mediators of IA (MAIA) and alexithymia (TAS-20), controlling for covariates (gender, age, education level, marital status, and ethnicity)

		M_1 (IA)				M_2 (Alexithymia)				*Y* (DERS)		
Variable		**Coefficient**	***SE***	***P***		**Coefficient**	***SE***	***P***		**Coefficient**	***SE***	***P***
X(RAASAvoid)	a_1	-0.546	0.139	<.001	a_2	0.581	0.074	<.001	c'	1.612	0.186	<.001
M_1		-	-	-		-	-	-	b_1	-0.32	0.685	<.001
M_2		-	-	-		-	-	-	b_2	0.872	0.127	<.001
C_1(age)		-0.093	0.112	.408		-0.066	0.06	.27		-0.545	0.109	<.001
C_2(gender)		2.506	2.425	.303		0.543	1.292	.675		-5.366	2.353	.024
C_3(education level)		1.119	1.346	.407		-1.004	0.717	.163		-2.617	1.308	.047
C_4 (martial status)		-1.617	0.915	.079		-0.273	0.488	.576		-0.186	0.893	.836
C_5 (ethnicity)		0.732	1.134	.516		0.844	0.604	.164		-0.71	1.104	.521
		R^2= 0.089 $F(6, 219) = 3.455$, p=.003				R^2= 0.28 $F(6, 219) = 32.531$, p<.001				R^2= 0.553 $F(8, 219) = 20.245$, p<.001		

Note. Coefficients are represented as unstandardised regression coefficients