

**Understanding the association between Attachment, Interoceptive Awareness
and Unhealthy Eating Behaviours**

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

9165 words

School of Psychology
The University of Adelaide

September 2020

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Abstract

Insecure attachment is known to be associated with many types of psychopathology, this includes eating pathology. Despite this, little is known about the underlying processes, neither cognitive nor emotional, that may assist in explaining why insecure attachment increases the risk of developing unhealthy eating behaviours. Studies have found that many people who show disordered eating behaviours, also report impairments in the ability to perceive and understand internal bodily cues, which is known as ‘interoceptive awareness’ (IA). There is also evidence to suggest that insecurely attached people may struggle to detect and discriminate interoceptive cues, therefore the aim of the present study was to determine whether IA mediated the relationship between insecure attachment and problematic eating behaviour. Participants ($N=216$) completed an online survey that included measures of adult attachment style, interoceptive awareness, eating restraint and emotional eating, along with basic demographic information. Regression analyses were conducted using PROCESS, to determine whether there is an indirect effect of IA on the relationship between attachment insecurity and eating behaviour. No mediation effect was found with the overall scale of IA. The ‘trusting’ subscale of IA was found to mediate the effect of insecure attachment on eating restraint ($p<0.05$). The findings from this study contribute to the development of a deeper understanding of the importance of interoceptive awareness and attachment for unhealthy eating behaviours and eating pathology, specifically the impact of one’s ability to trust interoceptive cues on the relationship between insecure attachment and eating restraint.

Keywords: Interoceptive Awareness, Attachment, Unhealthy Eating Behaviours, Restraint

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.

Signed,

Contribution Statement

In writing this thesis, my supervisor and I collaborated to generate a research topic and design the appropriate methodology. I conducted the literature search, and formed hypotheses accordingly. I completed the ethics application with guidance from my supervisor and wrote the Qualtrics survey. I was responsible for all participant recruitment and data collection, data analysis and thesis write-up. My supervisor reviewed my draft thesis in accordance with guidelines for reviewing honours theses in this course.

Acknowledgements

I would like to thank my supervisor, Dr Amanda Taylor, for her ongoing support and advice that she has provided me over the course of my honours year. Her guidance and words of encouragement has been invaluable throughout my thesis and the challenges of this year.

I would also like to thank my mum for her love, encouragement and support over the years, always inspiring me to follow my dreams, and helping me believe that nothing is impossible if I put my mind to it. Her reassurance, unwavering faith and belief in me have helped me through the year. This thesis would not have been possible without her.

1. Understanding the association between Attachment, Interoceptive Awareness and Unhealthy Eating Behaviours

1.1 Overview

In Australia, an estimated 4-16% of people aged over 15 have diagnosed eating disorders and 67% of the adult population is overweight or obese, a number that is on the rise (ABS, 2019; AIHW, 2018). These conditions have a large economic burden, costing the Australian health system an estimated \$100 million and \$8.6 billion dollars respectively (AIHW, 2017; AIHW, 2018). The health consequences of these conditions are also severe; leading to cancer, organ failure, endocrine system failure, malnutrition, heart disease, diabetes, chronic pain, dementia and even death (AIHW, 2017; Brown, 1985; Skemp-Arlt, 2006).

Eating disorders and obesity largely impact the lives of those with the conditions and those around them. It is often wrongly assumed that eating disorders and obesity are opposing constructs, however they actually share many commonalities (Irving & Neumark-Sztainer, 2002; Skemp-Arlt, 2006). Unhealthy eating behaviours, or disordered eating, such as restraint, binge eating and emotional eating, and poor self-esteem are known to contribute to the development of both eating disorders and obesity (Skemp-Arlt, 2006). It is crucial to reduce the trend of increasing diagnoses, and to do this an understanding is needed of the association with predictive factors in non-clinical samples. This would allow for interventions to be made prior to the behaviours becoming more serious or leading to diagnoses, which would, in turn, reduce the risks to health and wellbeing.

Adult attachment style plays an essential role in wellbeing and mental illnesses, including eating disorders and disordered eating (Faber, Dube, & Knauper, 2018). Impairments in understanding internal signals, or interoceptive awareness, were noted in

people with anorexia, bulimia and in subclinical populations with disordered eating behaviours (Martin, Dourish, Rotshtein, Spetter, & Higgs, 2019). There is also evidence to suggest that insecurely attached people may have compromised mindfulness capacity, and struggle to detect and discriminate interoceptive cues, particularly in the areas of satiety and hunger (Cortes-Garcia, Takkouche, Seoane, & Senra, 2019; Pepping, O'Donovan, Zimmer-Gembeck, & Hanisch, 2015). Studies have found that assessments of a variety of disordered eating behaviours, also report impaired interoception in at least one area, and it is suggested that interoception could be transdiagnostic in relation to disordered eating and eating disorders (Martin et al., 2019). Despite this, no previous study has assessed whether interoceptive awareness mediates the relationship between attachment and unhealthy eating behaviours in a non-clinical sample.

1.2 Attachment

Developmental psychologists have determined that the differences in caregiver attitudes towards rearing cause different outcomes for the emotional and psychosocial development of children; with parents being viewed as a fundamental resource in teaching children cultural values and rules (Akca & Sakar, 2017). The environment created by early caregivers guides the formation of close emotional bonds, and moulds the child's understanding of themselves and the social world around them (Cortes-Garcia et al., 2019; George, 1996; Pietromonaco & Barrett, 2000). It has been proposed by Bowlby that humans have a biological attachment system which evolved to motivate behaviours in infants to seek proximity to caregivers for safety and security (Bowlby, 1982; George, 1996; Hazan & Shaver, 1987; Pepping et al., 2015). Therefore, attachment is described as an emotional, life-long bond that an infant forms with their main caregivers in the first few years of their life (Ainsworth, Blehar, Waters, & Wall, 2015; Hazan & Shaver, 1987). The quality of the

interactions between an infant and their caregiver leads to the development of an internal working model, representing the cognitive-emotional expectations of self and the availability and care received from others in relationships (George, 1996; Hazan & Shaver, 1987). An internal working model assists the child to develop survival promoting behaviours within their environment, such as awareness of danger and establishing a sense of security and safety, and guides their psychosocial functioning throughout their life, including behaviour in relationships (Cortes-Garcia et al., 2019; George, 1996; Mikulincer, Florian, & Weller, 1993; Pietromonaco & Barrett, 2000).

The type of attachment a person develops can have lasting implications, affecting emotional regulation, parenting approaches and health-related behaviours throughout the lifespan (George, 1996; Hazan & Shaver, 1987; Oldroyd, Pasupathi, & Wainryb, 2019). A caregiver's level of support and reliability guides a child's acquisition of belief about their self-worth, which acts as the basis of the formation of other attachment relationships such as with teachers, siblings, peers and romantic partners (Faber et al., 2018). It also influences expectations about future relationships, the quality and outcomes of relationships and impacts cognitions and how one manages distress (Faber et al., 2018; Hazan & Shaver, 1987). Attachment is not limited to child-caregiver relationships, it has enduring implications into adulthood, where similar attachment patterns can be observed in close relationships (Faber et al., 2018; Hazan & Shaver, 1987; Oldroyd et al., 2019).

Attachment style is not fixed, however, and can change throughout a lifetime, where negative life events may change securely attached infants into insecurely attached adults or long-lasting positive life events may support insecurely attached infants to become securely attached adults (Faber et al., 2018).

Consistent and responsive caregivers who are emotionally available provide a solid base for exploration of the world, where the child experiences themselves as loved and valued, and their caregiver represents a safe haven where the child can find comfort and protection during times of distress (Cortes-Garcia et al., 2019; Faber et al., 2018; Oldroyd et al., 2019; Pepping et al., 2015). Infants who consistently experience this type of parenting response tend to develop what is known as a 'secure' attachment style (Faber et al., 2018; Oldroyd et al., 2019; Pepping et al., 2015). Securely attached children tend to be able to better manage anxiety and are more likely to turn to others for assistance in resolving novel, unpredictable or threatening incidents (Ainsworth et al., 2015; Bretherton, 1985; Oldroyd et al., 2019).

When caregivers show inconsistency or respond in rejecting ways to the infant's distress, they do not provide support or assistance during threatening situations or times of distress (Cortes-Garcia et al., 2019; Faber et al., 2018; Oldroyd et al., 2019; Pepping et al., 2015). In these circumstances, it is likely that the infant will develop dysfunctional cognitive strategies or patterns to soothe themselves and/or have inconsistent regulation of their emotions, establishing an insecure attachment, where the child may exaggerate (as with attachment anxiety) or restrict (attachment avoidance) their need for comfort (Bretherton, 1985; Cassidy, 1994; Cortes-Garcia et al., 2019; Faber et al., 2018; Oldroyd et al., 2019; Pepping et al., 2015). Insecure attachment in adults is also conceptualised by two dimensions: attachment avoidance and attachment anxiety (Ainsworth et al., 2015; Faber et al., 2018; Hazan & Shaver; Oldroyd et al., 2019; Pepping et al., 2015). Adults who have an avoidant attachment style have a tendency to deny any need for closeness or intimacy, a low dependency on others, a fear of intimacy within relationships, and an increase in self-reliance; a deactivation of the attachment system (Faber et al., 2018; Hazan & Shaver, 1987; Mikulincer et al., 1993; Oldroyd et al., 2019; Pepping et al., 2015). An anxious attachment

style, on the other hand, relates to an intensified fear of rejection and abandonment, emotional instability, jealousy in relationships, and a tendency to over-appraise situations as threatening; a hyperactivation of the attachment system (Faber et al., 2018; Hazan & Shaver, 1987; Mikulincer et al., 1993; Oldroyd et al., 2019; Pepping et al., 2015).

Insecurely attached individuals are more likely to report negative feelings of self, show interpersonal difficulties and implement maladaptive coping strategies than their securely attached counterparts (Sroufe, 2005). Both attachment anxiety and avoidance have been associated with many psychopathologies, in both clinical and non-clinical samples, such as anxiety, depression, obsessive-compulsive disorder, mild to severe personality disorders including schizophrenia, post-traumatic stress disorder and eating disorders (Mikulincer & Shaver, 2012).

1.3 Eating behaviours

Eating is often experienced as a pleasurable behaviour which is motivating and inherently rewarding, and can become a conditioned way of managing emotions or discomfort (Faber et al., 2018). Disordered eating and eating pathology are terms referring to a range of unhealthy eating behaviours. These behaviours include disinhibition, emotional eating, external eating, restraint, restriction, purging, binge eating and excessive use of laxatives or diuretics (Coniglio et al., 2018; Katz-Wise et al., 2015; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Richardson, Arsenault, Cates, & Muth, 2015). Emotional eating refers to behaviours of eating in response to negative emotions, such as fear, anger, anxiety or stress, or to defuse said emotions (van Strien, Frijters, Bergers, & Defares, 1986). Restraint, or eating restraint, refers to the conscious decision to regulate food intake to control body weight, lose weight or manipulate body shape (Lindroos et al., 1997). Unhealthy

eating behaviours can lead to serious health issues, such as obesity or eating disorders (Skemp-Arlt, 2006; Talleyrand, 2010).

The term 'eating disorders' refers to a cluster of disorders, associated with a range of unhealthy eating behaviours including insufficient or excessive food intake, restrictive, and compensatory behaviours which are detrimental to one's physical health (Pepping et al., 2015). Common eating disorders include Anorexia Nervosa (AN), Bulimia Nervosa (BN) and Binge Eating Disorder (BED; Elran-Barak et al., 2015). AN is characterised by rigidity towards dietary behaviours, such as limited portion size and low calorie intake, whilst BN and BED are more chaotic with behaviours cycling between excessive uncontrolled food intake and counteracting restrictive practices surrounding weight and shape concern, and compensatory behaviours in BN (Elran-Barak et al., 2015). High levels of restraint are observed in individuals with AN, and significantly lower levels of emotional eating than healthy individuals (van Strien, 2018; Wardle, 1987). High levels of emotional eating and fluctuating levels of restraint are observed in those with BN, and high emotional eating and restraint levels are common in those with BED (Cortes-Garcia et al., 2019; van Strien, 2018; Jane Wardle, 1987). High emotional eating, along with high levels of external eating, are frequent in the obese population (van Strien, 2018). Understanding factors maintaining both obesity and eating disorders is imperative as both have negative health outcomes and bleak prognoses (Faber et al., 2018).

Many individuals still show concerning levels of unhealthy eating behaviours yet do not meet the criteria for an eating disorder (Fairburn & Bohn, 2005). This is of concern due to the potential negative outcomes of these behaviours such as body image issues, significantly reduced overall health and wellbeing, the development of eating disorders, diabetes and other obesity-related health concerns, and their coinciding long-lasting ramifications (Pepping et al., 2015; Skemp-Arlt, 2006; Talleyrand, 2010).

1.4 Attachment and Unhealthy Eating Behaviours

Attachment is recognised as an important contributor to wellbeing (Faber et al., 2018; Pepping et al., 2015). Insecure attachment is known to be associated with a range of physical and mental illnesses, including anxiety, depression, increased experiences of pain and eating pathology (Davies, Macfarlane, McBeth, Morriss, & Dickens, 2009; Faber et al., 2018; Mikulincer et al., 1993; Pepping et al., 2015). Of note, insecure attachment is considered a potential risk factor for developing an eating disorder and may contribute to the maintenance of symptoms (Maxwell et al., 2018). Processes by which this may occur include the development of sensitivity to interpersonal rejection, maladaptive perfectionism and reduced ability to interpret internal body experiences such as fatigue, hunger and satiety, as well as an increase of acceptance of external cues about the body (Monteleone et al., 2017; Monteleone et al., 2019). In terms of attachment avoidance, researchers have found that eating pathology may act as a defence, enabling the person to distract themselves from any attachment-related concerns (Cole-Detke & Kobak, 1996). With anxious attachments, however, research suggests eating pathology is used as an attempt to gain comfort, in the absence of proximity to and security from attachment figures, and to avoid feelings of abandonment and rejection (Pepping et al., 2015). Insecurely attached people have been found to turn to behaviours such as dieting, restriction and binge eating to distract themselves from unpleasant emotions and increase their mood (Cortes-Garcia et al., 2019). A systematic review and meta-analysis by Cortes-Garcia et al. (2019) found that there is a higher prevalence of insecure attachment in those with eating disorders, compared to healthy individuals. It was also determined that insecure attachment is a potential risk factor for the development of disordered eating in non-clinical populations (Cortes-Garcia et al., 2019).

Despite the repeated associations between attachment concerns and eating pathology (Cortes-Garcia et al., 2019; Faber et al., 2018; Pepping et al., 2015), little is known about the

underlying processes that may assist in explaining why insecure attachment is associated with increased risk of developing unhealthy eating behaviours, due to limited research into mediating factors for this association (Pepping et al., 2015). Poor affect regulation has been shown to partially mediate the association between attachment anxiety and eating pathology (Maxwell et al., 2018), although it is also considered that one single mediator will not sufficiently explain the association due to the complexity of attachment and eating behaviours (Pepping et al., 2015). Identifying further factors facilitating the association could have important findings for clinical practice, as it allows for interventions to target the emotional or cognitive factors maintaining the association between attachment insecurity and eating pathology (Pepping et al., 2015). The connection between attachment and the risk factors of eating disorders could be key to understanding and developing treatment processes (Maxwell et al., 2018).

In an Australian based study, it was found that a reduced capacity for mindfulness mediated the relationship between insecure attachment and increased eating pathology in both clinical and non-clinical populations (Pepping et al., 2015). In a separate study, interoceptive awareness has been found to mediate the association between mindfulness and disordered eating behaviours in a non-clinical sample (Lattimore et al., 2017). It is understood that interoceptive awareness plays a key role in many mindfulness interventions, and there is an argument to suggest that interoceptive awareness underpins mindfulness and may be the primary means by which benefits are derived (Gibson, 2019).

1.5 Interoceptive Awareness

Interoceptive awareness (IA) is, put simply, the ability to perceive and interpret internal messages and signals, and is important to maintain a balanced internal state, and to

motivate behaviours and guide decision making (Martin et al., 2019; Sehm & Warschburger, 2015).

Interoception, or IA, is a process where the nervous system senses and interprets bodily signals, and integrates them to provide a moment-by-moment map of the internal body (Martin et al., 2019). IA involves bi-directional communication between body sensations and various levels of cortical oversight, in a process where information regarding internal physiological states are communicated to the brain to support physical and emotional health and wellbeing, including using effective responses to stress such as emotional awareness and regulation (Makris et al., 2008; Price & Hooven, 2018). The ability to be responsive to interoceptive signals allows for an emotional cue to be detected early and for the individual to be able to process and interpret the cue, and can therefore assist in responding adaptively to stressful stimuli or events (Oldroyd et al., 2019; Price & Hooven, 2018).

An individual's IA can be inhibited by stress or unfavourable life experiences, by the negative affect on one's tolerance to, interest in, willingness and practice of giving attention to the body and the cues it provides (Price & Hooven, 2018). Interoceptive awareness and functioning have been connected to several regions of the brain that exhibit extended postnatal development, and thus leaves substantial opportunity for environmental experiences to impact the development of interoception (Oldroyd et al., 2019).

1.6 Interoceptive awareness, attachment and eating behaviours

There are findings to suggest that there is an association between insecure attachment and interoceptive awareness (IA), which indicates that the responsiveness to bodily cues associated with attachment, such as the response to social stimuli, mirrors the awareness and responsivity to interpersonal cues (Oldroyd et al., 2019).

Attachment has been found to impact IA, through the development of the insular cortex; the interoceptive brain centre (Craig, 2004; Oldroyd et al., 2019). Insecure attachment has been linked to a smaller insular cortex, which hinders the development of IA (Lim, Radua, & Rubia, 2014; Oldroyd et al., 2019). The association could also be linked to attachment related processes, such as stress management, using the same anatomical pathway as that which facilitates communication and the interoceptive system (Oldroyd et al., 2019). Those with more anxious attachments may show an increased tendency to notice and worry about their bodily cues, which can lead to hypervigilance and excessive monitoring, and a misidentification of normal bodily symptoms as serious or threatening (Oldroyd et al., 2019; Vrticka & Vuilleumier, 2012). Those with more avoidant attachment may show greater aversion to bodily cues, provide less attention to these cues, and place reduced trust in them (Oldroyd et al., 2019).

Poor IA is a contributing factor to many mental health disorders, including anxiety, depression and panic and eating disorders, which have been observed in populations with subclinical levels of disordered eating behaviours (Martin et al., 2019; Sehm & Warschburger, 2015). There is a well-evidenced connection between impaired IA and eating disorders, believed to relate to the misinterpretation of bodily signals as hunger and satiety cues and ineffective responses, leading to an increase in confusion and potentially maladaptive conditioned responses (Merwin, Zucker, Lacy, & Elliot, 2010). For example, restraint is suggested to be used to avoid feelings of guilt and shame disguised as fullness (Merwin et al., 2010). The evidence also suggests that dysfunctional interoception has been found in non-clinical samples with disordered eating and might be a predisposing factor for the onset of an eating disorder (Martin et al., 2019). A recent systematic review included 20 studies on unhealthy eating behaviours, such as subclinical binge eating, restraint, emotional eating and external eating, and yielded findings, from all of these, demonstrating an

association with IA on at least one subscale (Martin et al., 2019). Recent studies investigating associations between IA and eating disorder symptoms have found differential effects of the differing dimensions of interoceptive awareness, as assessed using the MAIA-2, on eating disorder symptomology. In particular, the dimensions of ‘not distracting’ and ‘trusting’ have specifically been found to show associations with eating restraint in a clinical sample (Brown et al., 2017). Laboratory studies have found that those whose eating behaviours are in response to their internal hunger and satiety cues are less likely to allow their emotional or situational cues to direct their food intake or be preoccupied with food (Augustus-Horvath & Tylka, 2011).

It is argued that both attachment anxiety and attachment avoidance are risk factors for disordered eating behaviours (Pepping et al., 2015), Bamford & Halliwell (2009) acknowledge this connection in non-clinical populations, yet less research has been conducted in the area. Attachment style and interoceptive awareness have a well-established biological and psychological link (Vrticka & Vuilleumier, 2012), whilst Lattimore et al. (2017) demonstrates the connection between interoceptive awareness and non-clinical disordered eating. Despite this, no prior research has investigated the three domains together in a non-clinical population.

1.7 The current study

This study will investigate the effects of interoceptive awareness (IA) on the relationship between insecure attachment and unhealthy eating behaviours in a non-clinical population. There are many unhealthy eating behaviours, however emotional eating and eating restraint were chosen to be the measures for this study, due to their relationship with eating disorder symptomology and obesity. The covariates for this study were BMI, age, gender and marital status. BMI, age and gender were chosen due to their relationship with

emotional eating and eating restraint (Barrada, van Strien, & Cebolla, 2016; Konttinen, Haukkala, Sarlio-Lahteenkorva, Silventoinen, & Jousilahti, 2009; Mantau, Hattula, & Bornemann, 2018). Findings have shown that women and those with higher BMI have greater levels of emotional eating and eating restraint (Barrada et al., 2016; Konttinen et al., 2009; Mantau et al., 2018). Emotional eating is believed to decrease with age, whilst restraint tends to increase (Barrada et al., 2016; Konttinen et al., 2009). Marital status was selected due to its relationship with attachment, where insecurely attached individuals experience greater levels of divorce (Crowell, Treboux, & Brockmeyer, 2009).

It is believed that this study will fill a gap in the literature regarding the understanding of key factors which affect the influence of attachment on eating behaviours in a non-clinical population. It is also believed that the findings will benefit future research and the development of preventative treatments to reduce the risk of insecurely attached individuals adopting unhealthy eating behaviours, which may lead to the development of eating disorders or other health related concerns.

In the current study, the following hypotheses were proposed:

H1: Insecure attachment (anxiety and avoidance) will be positively associated with eating restraint and emotional eating.

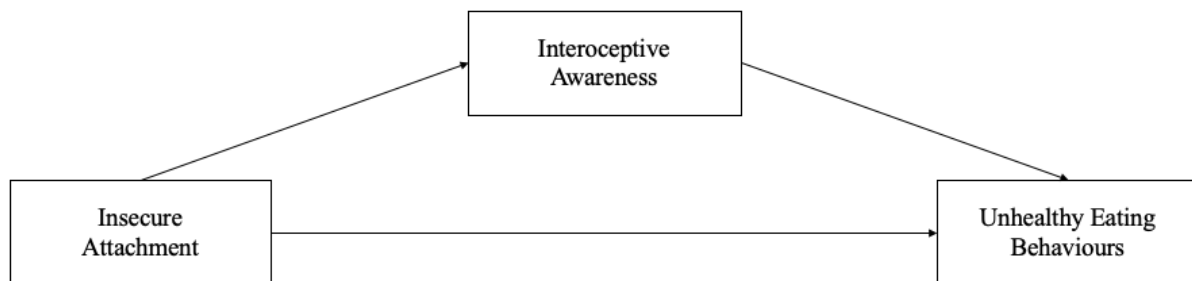
H2: Interoceptive awareness will be negatively associated with insecure attachment (anxiety and avoidance), eating restraint and emotional eating

H3: Interoceptive awareness will mediate the effect of insecure attachment (anxiety and avoidance) on eating restraint.

H4: Interoceptive awareness will mediate the effect of insecure attachment (anxiety and avoidance) on emotional eating (see figure 1).

Figure 1.

Proposed mediation model.



Note. Hypotheses relate to attachment anxiety and avoidance, and emotional eating and eating restraint

Due to the noted associations between specific aspects of interoception and eating restraint, it is also anticipated that the ‘not-distracting’ and ‘trusting’ facets of interoception will mediate the relationship between insecure attachment and eating restraint (H5).

2. Method

2.1 Participants

The survey had 248 responses, however respondents who did not meet the inclusion criteria of currently residing in Australia and being 18 years or older were excluded, along with responses that were completed in less than 5 minutes, and where BMI was considered biologically implausible (Ball, Ford, Russell, Williams, & Hockey, 2002). The final sample consisted of 216 participants. Participants were recruited by social media and word of mouth. Participants were 73.6% female (n=159), and were between 18 and 83 years (M= 30.02 years, SD= 14.75). Participants were of varying weight classes, 8.3% were underweight (BMI less than 18.5), 50.5% were normal/healthy weight (BMI 18.5 – 24.9), 24.1% were overweight (BMI 25 – 29.9), and 17.1% participants were obese (BMI 30.0 or greater). Most

participants self-reported their ethnicity to be Australian (66.7%), with 17.1% Asian, 13.9% European, 0.9% Middle Eastern, 0.5% North American, 0.5% Pacific Islander and 0.5% Latin American or Caribbean Islander participants. Participants were also asked about their marital status and highest attained education level. Participants were 45.4% Single, 24.5% In a relationship, 25.5% Married/Defacto and 4.6% Divorced/Separated. 2.3% of participants had completed Year 10 or below, 44.9% had completed High School, 11.6% had Technical Qualifications, 34.3% had completed a Degree or Diploma and the remaining 6.9% had attained a Postgraduate degree.

2.2 Power Analysis

A priori power analysis was conducted, utilising software G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The parameters for the linear multiple regression model were set at: alpha level 0.05, effect size of 0.1 and power of 0.8. The results indicated that 144 participants were required, therefore, with 216 participants, the present study was considered to have sufficient statistical power.

2.3 Measures

2.3.1 Demographic Information.

Participants were asked basic demographic information including age, gender, ethnicity, education and marital status, as well as height and weight to determine BMI. Marital status, BMI, age and gender were determined to be covariates due to the literature finding these as significant factors in previous studies (Barrada et al., 2016; Crowell et al., 2009).

2.3.2 Adult Attachment Style.

The Revised Adult Attachment Scale (RAAS) was used to measure participants' attachment avoidance and attachment anxiety in close relationships, including parental, platonic and romantic relationships (Collins, 1996). The 18 items are measured on a 5-point Likert scale from 1 (*Not at all characteristic of me*) to 5 (*Very characteristic of me*), such as '*I often wonder whether other people really care about me*'. The attachment anxiety subscale was calculated through the average of 6 items, and the attachment avoidance subscale the average of 12 items; 5 of which are reverse coded. A higher score in either subscale suggests a greater level of attachment anxiety or avoidance. The RAAS has sound psychometric properties, including convergent reliability, internal consistency and test-retest reliability (Burge et al., 1997; Goldman & Anderson, 2007; Thorberg et al., 2011). The internal consistency of the RAAS *anxiety* subscale in the present study was excellent ($\alpha=0.91$), and the RAAS *avoidance* subscale showed good internal consistency ($\alpha=0.84$).

2.3.3 Interoceptive Awareness.

The revised edition of the Multidimensional Assessment of Interoceptive Awareness (MAIA-2) was used to assess interoceptive awareness (Mehling, Acree, Stewart, Silas, & Jones, 2018). The 37 items, such as '*I can stay calm and not worry when I have feelings of discomfort or pain*', were measured on a 6-point Likert scale, ranging from 0 (*never*) to 5 (*always*). The MAIA-2 has improved psychometrics, with acceptable convergent, divergent and construct validity (Brown et al., 2017; Mehling et al., 2018; Mehling et al., 2012). MAIA-2 subscales are calculated through the average of specific items some of which are reverse-coded; *noticing* (4 items), *not distracting* (6 items), *not worrying* (5 items), *attention regulation* (7 items), *emotional awareness* (5 items), *self-regulation* (4 items), *body listening* (3 items) and *trusting* (3 items). In the present study the internal consistency was adequate for

all subscales; noticing ($\alpha=0.71$), not distracting ($\alpha=0.81$), not worrying ($\alpha=0.75$), attention regulation ($\alpha=0.88$), emotional awareness ($\alpha=0.81$), self-regulation ($\alpha=0.79$), body listening ($\alpha=0.79$) and trusting ($\alpha=0.87$).

In the present study, an overall score for the MAIA was also used to broadly capture interoceptive awareness (IA) and its relationships with attachment and eating behaviours. The eight subscales are an indicator of one overall second-order factor, IA (Mehling et al., 2012; Muir, Madill, & Brown, 2017). The MAIA overall score can be calculated by reverse-coding all negatively worded items and adding these items together (Muir et al., 2017). The score for each subscale ranges from 0 to 5, with the MAIA overall score ranging from 0 to 185 points (Muir et al., 2017). The MAIA overall scale had good internal consistency in this study ($\alpha=0.872$). Higher scores on each of the subscales represents higher levels of that dimension, with a higher MAIA overall score indicating higher levels of interoceptive awareness.

2.3.4 Unhealthy Eating Behaviours.

The Dutch Eating Behaviour Questionnaire (DEBQ) was used to measure restrained eating and emotional eating behaviours (van Strien et al., 1986). The 33 items are scored on a 5-point Likert scale from 1 (*never*) to 5 (*very often*), such as '*Do you have the desire to eat when you are depressed or discouraged?*'. The DEBQ measures three areas of unhealthy eating behaviours where higher values represent higher levels of the eating behaviour. The subscales are scored by taking the average of a select number of items; *restraint* (10 items), *emotional eating* (13 items) and *external eating* (10 items, 1 reverse coded). The DEBQ has sound psychometric properties, such as convergent, discriminative, concurrent, and construct validity, and internal and test-retest reliability (Dakanalis et al., 2013; Malesza, 2019; Nagl, Hilbert, Zwaan, Braehler, & Kersting, 2016; van Strien et al., 1986; Wardle, 1987). The

DEBQ also has high external validity, generalisability and cross-language replicability (Malesza, 2019; Wardle, 1987). In the present study, only the restraint and emotional eating subscales were used. The internal consistency was excellent for both restraint ($\alpha=0.93$) and emotional eating ($\alpha=0.95$).

2.4 Procedure

A survey was created incorporating the demographic questions, RAAS, MAIA-2 and DEBQ, hosted using online survey software Qualtrics (see appendix A). Ethics approval was received prior to the survey being distributed on social media and internal university sites; the survey was posted on the *SONA Research Participation System*, which allowed first year University of Adelaide psychology students to obtain course credit for their participation, and an announcement was placed on the University of Adelaide *Unified* student website. Appendix B displays a copy of the social media recruitment post.

Participation in the study was voluntary and anonymous. Participants were able to access the survey at their convenience, on their own devices and were advised the survey took approximately 10-15 minutes to complete (Median completion time=13.49 minutes). Participants were provided with an information sheet (Appendix C) and asked to provide informed consent prior to partaking in the study (see Appendix D for consent form). Participants were free to withdraw at any time prior to the submission of their responses, where their responses were added to the data set and unable to be identified. As an incentive, participants had the option to enter a draw to win a \$50 gift-card or first year University of Adelaide psychology students could receive course credit. At the conclusion of the survey, participants were provided with contact details of different support services, in the event that any discomfort had arisen.

3. Results

3.1 Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics version 27, with PROCESS Macro 3.5 used to conduct the mediation analysis (Hayes, 2017; IBM, 2020). Recorded responses were checked and cases were excluded where: inclusion criteria wasn't met ($n=28$), survey was completed in less than 5 minutes ($n=3$), and where BMI were considered biologically implausible ($n=1$) (Ball, 2006). The final sample contained $N=216$ participants.

Mahalanobis Distance, Cook's Distance and Centred Leverage Value tests were conducted to test for outliers. One outlier was found. Upon visual inspection, this case appeared to be a genuine response, thus 5% trimmed means were compared and minimal deviation from the mean was observed. As comparisons of reliability and bivariate correlations demonstrated this outlier did not significantly alter the results, the outlier was retained in the dataset.

The variables of interest for the present study were tested for normality using the Kolmogorov-Smirnov Test of Normality. The assumption of normality was met for Attachment Avoidance and Eating Restraint, whilst Attachment Anxiety, Interoceptive Awareness and Emotional Eating violated the assumption with significant statistics ($p<0.05$) (Mishra et al., 2019). Due to the Kolmogorov-Smirnov Test being considered overly sensitive in larger samples, a z -test was used to account for the standard error (Mishra et al., 2019). For normality with a sample size $N=216$, a z score of less than ± 3.29 to be considered normal (Mishra et al., 2019). The z -test found normality for all scales except for Attachment Anxiety, where $z=3.32$. An inspection of histograms and Q-Q plots found all scales to appear approximately normally distributed, with no major deviations from normality.

Bootstrapping is a non-parametric procedure that uses sample replicates to provide an estimation of the indirect effect that does not assume normality in the sampling distribution

(Hayes, 2017). Cortes-Garcia et al. (2019) also identified, in their systematic review and meta-analysis, the need for future mediation analyses to involve bootstrapping to strengthen conclusions and the magnitude of the indirect effect. Bootstrapping was used in the present study to N=5000 sample replicates (Hayes, 2017). If the 95% confidence interval (95%CI) of the indirect effect does not contain zero, the indirect effect is considered statistically significant (Hayes, 2017).

3.2 Descriptive Statistics

The demographic details for participants are presented in Table 1, whilst Table 2 displays the descriptive statistics for the scales used in the study.

Pearson bivariate correlations were used to determine whether participants differed on study variables according to demographic details. Significant positive correlations were found between BMI and the outcome variables of eating restraint ($r=0.226$, $p=0.001$), and emotional eating ($r=0.177$, $p=0.009$). Age was negatively related to Attachment Anxiety ($r=-0.422$, $p<0.001$), Emotional Eating ($r=-0.184$, $p=0.007$), and positively associated with Interoceptive Awareness ($r=0.141$, $p=0.038$). Education level showed a positive association to Interoceptive Awareness ($r=0.155$, $p=0.023$), and a significant negative association with Attachment Anxiety ($r=-0.344$, $p<0.001$).

A Kruskal-Wallis independent samples test was used to determine whether the study variables differed according to marital status. The Kruskal-Wallis test creates ranks from smallest to largest and selects the mean rank (Mr) of each of the ordinal variables for comparison (Hoffman, 2019). The findings indicated differences in marital status across levels of attachment anxiety, $X^2(3) = 23.28$, $p<0.001$. Single participants had the highest levels of attachment anxiety ($Mr=126.57$), and those who were in Married/Defacto

relationships having the lowest ($M_r=77.04$), followed by Divorced/Separated individuals ($M_r=89.00$) and those in a Relationship ($M_r=111.42$).

Table 1

Descriptives for participants (N=216)

Variable and Subcategory	N	%
Age		
18-29	143	66.2
30-39	17	7.9
40-49	25	11.5
50-59	20	9.3
60-69	8	3.7
70-79	2	0.9
80-89	1	0.5
Gender		
Female	159	73.6
Male	53	24.5
Other	3	1.4
Prefer not to say	1	0.5
Ethnicity		
Australian	144	66.7
Pacific Islander	1	0.5
European	30	13.9
North American	1	0.5
Latin American or Caribbean Islander	1	0.5
Asian	37	17.1
Middle Eastern	2	0.9
Marital Status		
Single	98	45.4
In a relationship	53	24.5
Married/Defacto	55	25.5
Divorced/Separated	10	4.6
BMI		
Underweight	18	8.3
Healthy	109	50.5
Overweight	52	24.1
Obese	37	17.1

Variable and Subcategory	N	%
Highest Attained Education		
Year 10 or Below	5	2.3
Completed High School	97	44.9
Technical Qualification	25	11.6
Degree or Diploma	74	34.3
Postgraduate degree	15	6.9

Note. N = number of participants, % = Percentage of participants

Table 2

Descriptives for the Revised Adult Attachment Scale (Anxiety and Avoidance), the Multidimensional Assessment of Interoceptive Awareness-2 and the Dutch Eating Behaviours Questionnaire (Restraint and Emotional Eating).

Variable	Minimum	Maximum	Mean	Standard Deviation
RAAS-Anxiety	1.00	5.00	3.00	1.13
RAAS-Avoidance	1.08	4.58	2.90	0.71
MAIA-Overall	37.00	153.00	99.10	20.05
DEBQ-Restraint	1.00	5.00	2.77	0.98
DEBQ-Emotional Eating	1.00	5.00	2.79	1.03

Note. RAAS-Anxiety = Revised Adult Attachment Scale attachment anxiety subscale;

RAAS-Avoidance = Revised Adult Attachment Scale attachment avoidance subscale;

MAIA-Overall = Multidimensional Assessment of Interoceptive Awareness-2 overall score;

DEBQ-Restraint = Dutch Eating Behaviours Questionnaire restrained eating subscale;

DEBQ-Emotional Eating = Dutch Eating Behaviours Questionnaire emotional eating subscale .

3.3 Correlations

Table 3 shows the bivariate correlations between the scales. There are non-significant relationships between restraint and attachment (both anxiety and avoidance) and

interoceptive awareness, and emotional eating and attachment avoidance and interoceptive awareness, which could suggest that mediation is not possible. However, in 1986, Bollen determined that correlation was not necessary nor sufficient to determine causation (Hayes, 2017). When the direct effect between the predictor and outcome variables is equal to zero, this does not mean that one does not affect the other, rather that when all the paths of influence are combined, the predictor and outcome variable are not linearly related (Hayes, 2017). Mediation can still be possible in these situations due to a suppression effect, where most or all of the relationship is explained by the mediator (Hayes, 2017; MacKinnon, Krull, & Lockwood, 2000).

As seen in Table 3 there was a significant weak-to-moderate positive correlation between attachment anxiety and attachment avoidance, a trend towards a positive correlation between attachment anxiety and restraint, and a significant weak-to-moderate positive correlation between attachment anxiety and emotional eating. There was a significant weak negative correlation between interoceptive awareness and both attachment anxiety and avoidance. Attachment avoidance showed a weak but significant negative correlation with interoceptive awareness, and there was a trend towards a positive correlation between attachment avoidance and emotional eating, and restraint and emotional eating had a significant, however weak, positive correlation. There was no meaningful relationship between attachment avoidance and eating restraint, or interoceptive awareness and either emotional eating or restraint.

As expected by the findings from Mantau et al., (2018), emotional eating and eating restraint were positively correlated, as was BMI with both emotional eating and eating restraint. Gender was not found to be significantly correlated with any of the key variables. Age however was a significant predictor of IA, Emotional Eating and attachment anxiety. Marital status had significant associations with IA and attachment anxiety.

Table 3

Correlations for the Revised Adult Attachment Scale (Anxiety and Avoidance), the Multidimensional Assessment of Interoceptive Awareness-2 and the Dutch Eating Behaviours Questionnaire (Restraint and Emotional Eating).

Variable	RAAS- Anxiety	RAAS- Avoidance	MAIA- Overall	DEBQ- Restraint
RAAS-Anxiety				
RAAS-Avoidance	0.380**			
MAIA-Overall	-0.245**	-0.218**		
DEBQ-Restraint	0.131 [†]	-0.016	-0.016	
DEBQ-Emotional Eating	0.316**	0.131 [†]	-0.100	0.294**

Note. RAAS-Anxiety = Revised Adult Attachment Scale attachment anxiety subscale;

RAAS-Avoidance = Revised Adult Attachment Scale attachment avoidance subscale; MAIA-

Overall = Multidimensional Assessment of Interoceptive Awareness-2 overall score; DEBQ-

Restraint = Dutch Eating Behaviours Questionnaire restrained eating subscale; DEBQ-

Emotional Eating = Dutch Eating Behaviours Questionnaire emotional eating subscale.

** = significant $p < 0.001$ (two-tailed)

* = significant $p < 0.05$ (two-tailed)

[†] = close to significance ($p < 0.06$)

3.4 Mediation Analyses

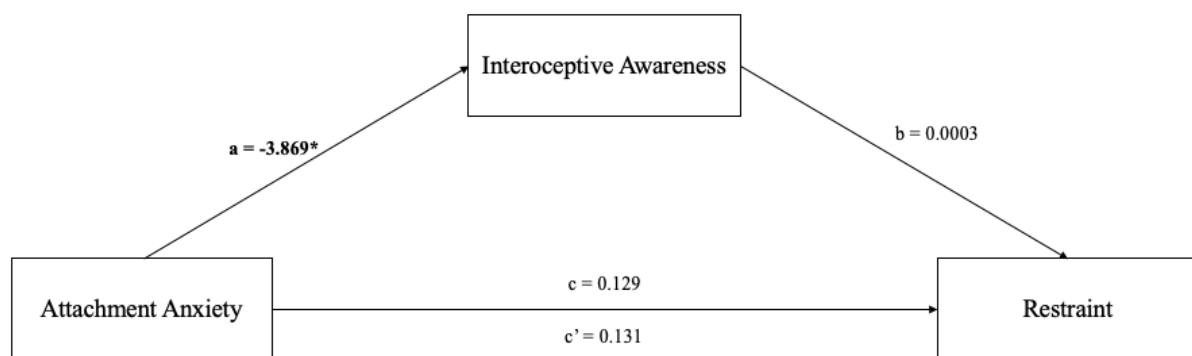
Figures 2, 3, 4 and 5 present a visual depiction of the mediation models. Mediation analyses were conducted using PROCESS v.3.5 (Hayes, 2017). Covariates controlled for in all analyses were marital status, BMI, age and gender, however only BMI was found to be significant ($p < 0.01$) in relation to Emotional Eating. Figure 2 shows a negative significant direct effect of attachment anxiety on IA ($b = -3.87$, $t(210) = -2.94$, $p = 0.004$), as well as very weak positive effects between Restraint and both IA and Attachment Anxiety. Figure 3 also shows a significant negative direct effect of Attachment Anxiety on IA ($b = -3.87$, $t(210) = -$

2.94, $p=0.004$), with a significant positive direct effect between Attachment Anxiety and Emotional Eating ($b=0.23$, $t(209)=3.47$, $p<0.001$). Figure 4 shows a significant negative direct effect of Attachment Avoidance on IA ($b=-5.82$, $t(210)=-3.10$, $p=0.002$), and non-significant effect between Restraint and both IA and Attachment Avoidance. Figure 5 also displays a significant negative relationship between Attachment Avoidance and IA ($b=-5.82$, $t(210)=-3.10$, $p=0.002$), and non-significant effect between Emotional Eating and IA, and a very weak positive relationship with Emotional Eating and Attachment Avoidance.

Table 4 demonstrates that for each of the four mediation models, the 95% CI crossed zero for each of the indirect effects, and therefore significant mediation was not found for these models (Hayes, 2017).

Figure 2.

Mediation analysis of Interoceptive Awareness on Attachment Anxiety and Eating Restraint

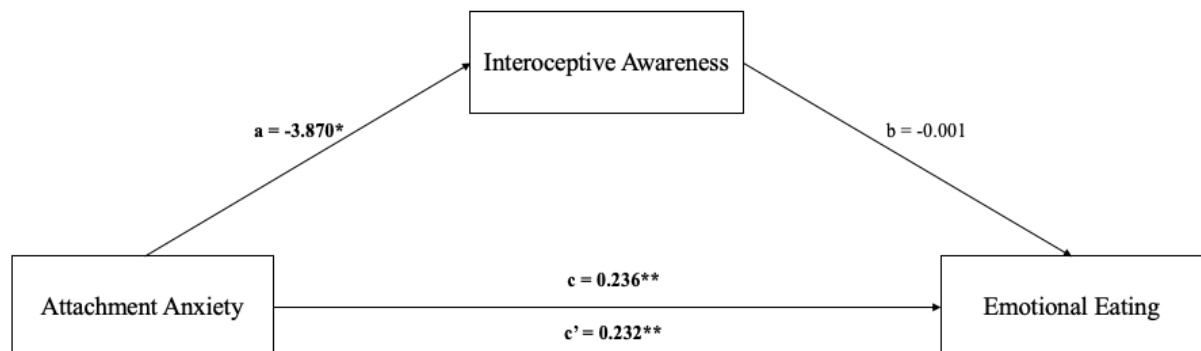


Note. Coefficients depicted in this figure are unstandardised

* = significant $p<0.05$ (two-tailed)

Figure 3.

Mediation analysis of Interoceptive Awareness on Attachment Anxiety and Emotional Eating



Note. Coefficients depicted in this figure are unstandardised

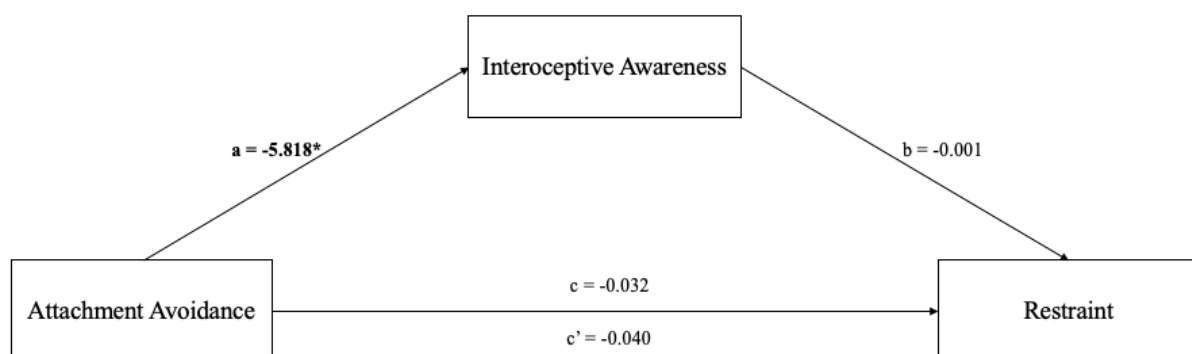
** = significant $p < 0.001$ (two-tailed)

* = significant $p < 0.05$ (two-tailed)

Figure 4.

Mediation analysis of Interoceptive Awareness on Attachment Avoidance and Eating

Restraint

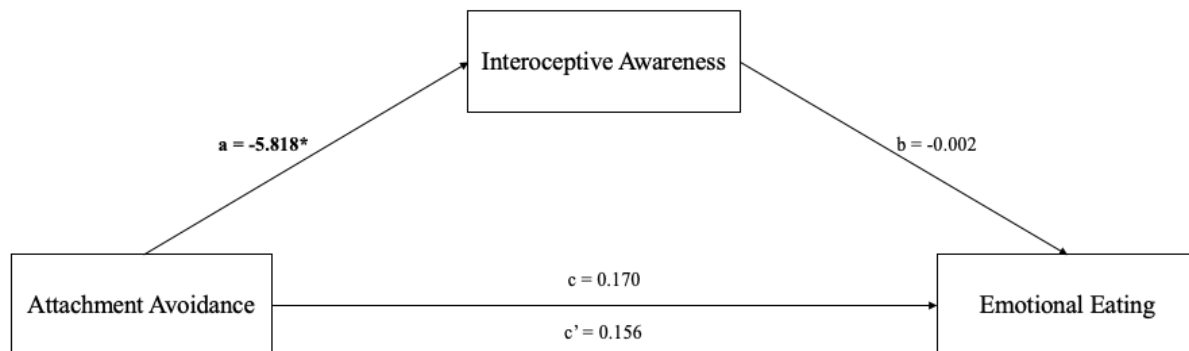


Note. Coefficients depicted in this figure are unstandardised

* = significant $p < 0.05$ (two-tailed)

Figure 5.

Mediation analysis of Interoceptive Awareness on Attachment Avoidance and Emotional Eating



Note. Coefficients depicted in this figure are unstandardised

* = significant $p < 0.05$ (two-tailed)

Table 4

Indirect Effects for the mediation of Interoceptive Awareness on Attachment Anxiety and Avoidance and Eating Restraint and Emotional Eating

Variable	Effect	B SE	95% BC LL	95% BC UL
AttchAnx → IA → Restraint	-0.0013	0.0135	-0.0288	0.0269
AttchAnx → IA → EE	0.0047	0.0134	-0.0201	0.0350
AttchAvo → IA → Restraint	0.0076	0.0215	-0.0309	0.0561
AttchAvo → IA → EE	0.0140	0.0218	-0.0252	0.0628

Note. AttchAnx = attachment anxiety; AttchAvo = attachment avoidance; Restraint = eating restraint; EE = emotional eating; IA = interoceptive awareness; B SE = bootstrap standard error, BC LL = bias corrected bootstrap lower limit; BC UL = bias corrected bootstrap upper limit

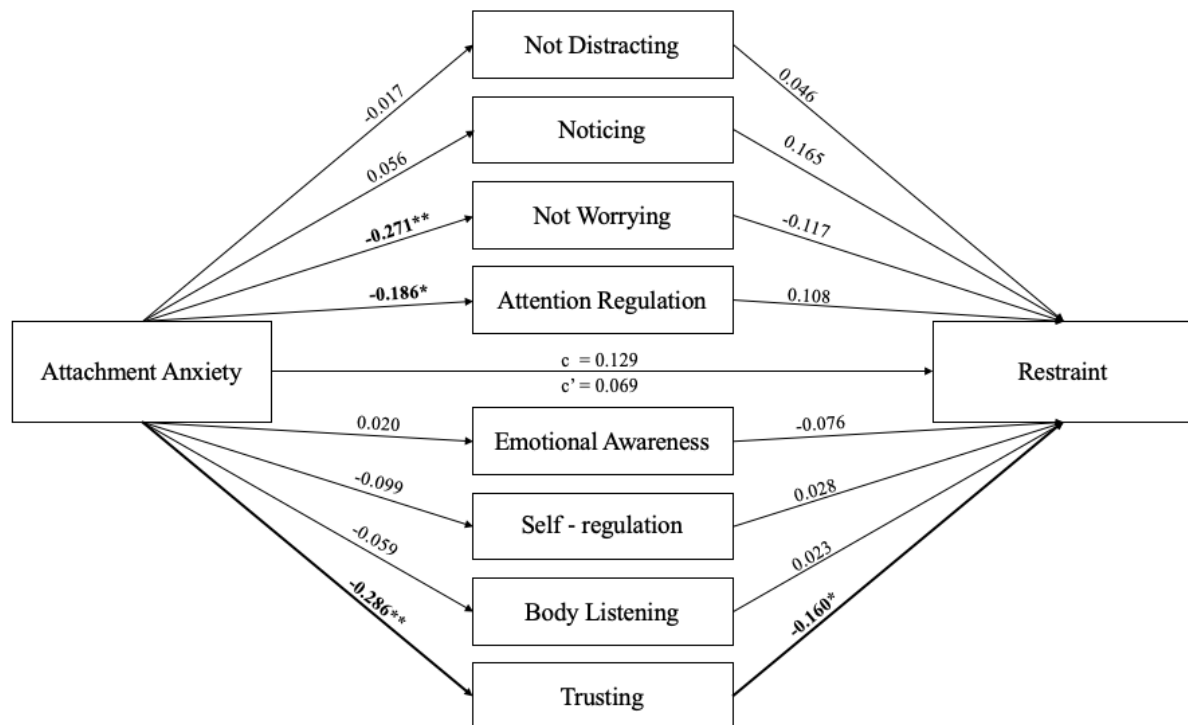
3.5 Parallel Multiple Mediation Analyses

With Brown et al. (2017) finding the trusting and not-distracting subscales of interoceptive awareness (IA) to be specifically associated with eating restraint, it is possible

that the non-significant subscales within the overall IA scale suppressed the effect of these potentially influential subscales. For this reason a parallel multiple mediation analyses, including all eight subscales as mediators, was conducted to test hypothesis five (H5) and determine whether these subscales showed differing effects. The parallel mediation analyses were conducted using PROCESS v3.5 (Hayes, 2017). Covariates were controlled for in these mediation analyses.

Figure 6 shows the results of the mediation analyses of MAIA subscales on attachment anxiety and restraint. Significant direct effects were found between attachment anxiety and not worrying ($b=-0.271$, $t(210)=-4.95$, $p<0.001$), attention regulation ($b=-0.186$, $t(210)=-2.94$, $p<0.05$) and trusting ($b=-0.286$, $t(210)=-3.58$, $p<0.001$). A significant direct effect was also found between trusting and restraint ($b=-0.160$, $t(202)=-2.46$, $p<0.05$). A significant indirect effect was shown for the subscale of ‘trusting’ for the relationship between attachment anxiety and eating restraint (indirect effect=0.46, SE=0.26, 95% CI [0.006, 0.108]). The Sobel test for this mediation was also significant ($Z=-1.99$, $p<0.05$). See Appendix E for parallel multiple mediation table.

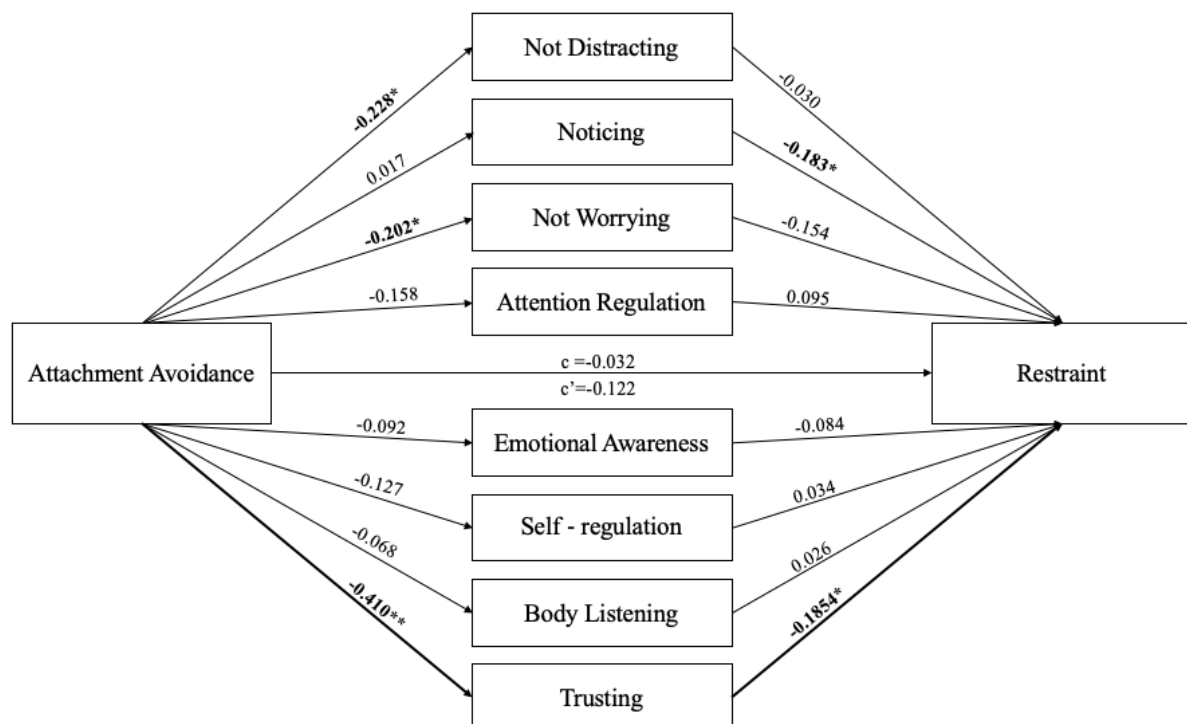
Figure 7 shows the results of the mediation analyses of MAIA subscales on attachment avoidance and restraint. Significant direct effects were found between attachment avoidance and not worrying ($b=-0.202$, $t(210)=-2.49$, $p<0.05$), not distracting ($b=-0.228$, $t(210)=-2.69$, $p<0.01$) and trusting ($b=-0.410$, $t(210)=-3.59$, $p<0.001$), noticing and restraint ($b=0.183$, $t(202)=1.99$, $p<0.05$) and trusting and restraint ($b=-0.185$, $t(202)=-2.86$, $p<0.01$). A significant indirect effect was shown between attachment avoidance and restraint, through the IA dimension of ‘trusting’ (indirect effect=0.08, SE=0.04, 95% CI [0.016, 0.157]). The Sobel test for this mediation was also significant ($Z=-2.57$, $p=0.01$). See Appendix F for parallel multiple mediation table.

Figure 6.*Parallel Mediation Analysis for Attachment Anxiety and Restraint*

Note. Coefficients depicted in this figure are unstandardised

** = significant $p < 0.001$ (two-tailed)

* = significant $p < 0.05$ (two-tailed)

Figure 7.*Parallel Mediation Analysis for Attachment Avoidance and Restraint*

Note. Coefficients depicted in this figure are unstandardised

** = significant $p < 0.001$ (two-tailed)

* = significant $p < 0.05$ (two-tailed)

4. Discussion

4.1 Overview

The current study aimed to investigate the impact of interoceptive awareness (IA) on the relationship between insecure attachment and unhealthy eating behaviours. This study is believed to have both clinical and theoretical implications. The findings from this study build on the growing literature on IA, however has preliminary findings for the impact of IA on the relationship between insecure attachment and unhealthy eating behaviours in a non-clinical population. Theoretically, this study creates guidance for future research in this area,

demonstrating strengths and weaknesses in the relationships, whilst clinically it provides guidance as to a new perspective for interventions targeting eating restraint in insecurely attached individuals.

Results from the current study yielded mixed results. The findings were not in full support of the hypotheses, and no significant mediation was found for overall IA with insecure attachment and either eating restraint or emotional eating. The Trusting subscale of IA was found to mediate the effects of both attachment anxiety and avoidance on eating restraint. The mediation effect was greater for the association between avoidance and restraint than, anxiety and restraint, however both effects were small.

4.2 The association between Insecure Attachment and Unhealthy Eating Behaviours, and Interoceptive Awareness

Previous research has found that a small-to-moderate effect between attachment and unhealthy eating behaviours in the general population, such that the higher the insecure attachment the more likely unhealthy eating behaviours would be displayed and the more secure the less unhealthy the eating behaviours (Faber et al., 2018). In alignment with previous research, the current study first hypothesised that insecure attachment, both anxiety and avoidance, would be positively associated with eating restraint and emotional eating. The results, surprisingly, provided only partial support of the hypothesis. While emotional eating and attachment anxiety were significantly positively correlated, emotional eating and attachment avoidance showed a trend towards positive association, as with restraint and attachment anxiety, both $p < 0.06$. No significant relationship was shown between attachment avoidance and eating restraint.

Similarly, research has demonstrated that attachment processes and interoceptive awareness are associated and suggest that there is a relationship between the responsiveness to one's bodily cues and interoceptive cues (Oldroyd et al., 2019). There is also a well-established link between interoceptive awareness (IA) and unhealthy eating behaviours, such that when IA is impaired, hunger and satiety cues are not as easily interpreted and can lead to an increase in unhealthy eating behaviours (Myers & Crowther, 2008). The second hypothesis of the study anticipated that interoceptive awareness would be negatively associated with insecure attachment, both anxiety and avoidance, eating restraint and emotional eating. The results supported the negative association, however there was no significant relationship between the overall measure IA and emotional eating or restraint. Attachment anxiety and avoidance both had significant negative correlations with IA, supporting the already established literature where increased attachment insecurity is related to decreased interoceptive awareness (Oldroyd et al., 2019).

4.3 The role of Interoceptive Awareness on Insecure Attachment and Unhealthy Eating Behaviours

Despite the literature indicating a potential connection, the third hypothesis, which predicted that interoceptive awareness would mediate the effect of insecure attachment (anxiety and avoidance) on eating restraint, was not supported. This was surprising due to the consistent findings of eating restraint being related to a decreased sensitivity to hunger and satiety cues, such that decreased levels of hunger and increased levels of satiety are experienced (Ogden & Wardle, 1990). The findings from this study could be as a result of the non-clinical level of eating pathology, or the current global situation of the pandemic which may have impacted the results due to undue levels of stress (Yau & Potenza, 2013).

Contrary to expectations, Interoceptive awareness was not found to mediate the effect of insecure attachment (anxiety and avoidance) on emotional eating. The majority of the literature supports the association, however a study conducted by van Strien et al. (1986) also found that the relationship between interoceptive awareness and emotional eating to not be significant in a non-clinical population. The findings of Young et al. (2017) suggest emotional eaters have heightened levels of interoceptive cues, however a reduced level of awareness. This contrast may impact the ability to accurately measure the variable with the overall MAIA-2 scale, with the differences being more easily observed in subscales (Young et al., 2017).

4.4 The role of Not-Distracting and Trusting on Insecure Attachment and Restraint

A recent study conducted by Brown et al. (2017) investigated the associations between interoceptive awareness (IA) subscales and eating disorder symptomology in a clinical sample. It was found that ‘not distracting’, ‘self-regulation’ and ‘trusting’ were most relevant for those with eating disorders, with ‘not distracting’ and ‘trusting’ being significantly associated with Restraint (Brown et al., 2017).

Hypothesis 5, predicted the ‘not distracting’ and ‘trusting’ facets of interoception would mediate the relationship between insecure attachment (anxiety and avoidance) and eating restraint. *Not distracting* indicates the tendency to distract oneself from or ignore sensations of discomfort or pain, with a lower score suggesting a greater tendency and lower IA (Mehling et al., 2018). In a parallel multiple mediation analysis, the current study found no mediation for ‘not distracting’ on the relationship between insecure attachment and eating restraint. Brown et al.’s (Brown et al.) findings were based on a clinical sample, which could justify this difference as the current study uses a non-clinical sample. Another consideration for the difference in findings is the acknowledgement that the internal consistency of the ‘not

distracting' subscale was questionable in the clinical study and that it needed to be replicated to verify the findings (Brown et al., 2017). The findings from this study suggest that for insecurely attached individuals, the level of awareness and acceptance of discomfort does not impact the levels of eating restraint.

The parallel multiple mediation analysis was also used to investigate the effects of 'trusting' on insecure attachment (anxiety and avoidance) and eating restraint. *Trusting* refers to one's ability to trust and believe interoceptive cues (Mehling et al., 2012). The hypothesis was supported; 'trusting' mediated the relationship between eating restraint and both attachment anxiety and avoidance. The effect was found to be small but significant. Due to the small effect size, there was an increased risk of Type I error. The Sobel test is a conservative measure which can be used to assess mediation, however is not recommended as it can fail to recognise small effects, increasing the risk of type II error, and has low test power (Hayes, 2017). The Sobel test found significant mediation for 'trusting' on the association between both attachment anxiety ($p < 0.05$) and avoidance ($p < 0.05$) and eating restraint. The Sobel test was used as an additional safe-guard against Type I error, demonstrating the presence of the small effect even with a conservative measure. This is an important finding for eating disorder symptomology literature, as the findings demonstrates that the ability to trust interoceptive cues impacts eating restraint in a non-clinical sample, the same way it does a clinical sample (Brown et al., 2017).

These findings demonstrates that trusting interoceptive cues can mediate the effect of insecure attachment on eating restraint, in a non-clinical sample. This is an exciting preliminary finding for this area of research, allowing for greater understanding of the potential factors affecting the development of eating restraint in insecurely attached individuals. Further research is needed in this area, to determine the replicability of these findings, however it is believed that these findings have important theoretical and clinical

implications. The development of strategies and interventions which increase the levels of trust placed in interoceptive cues, to support individuals with insecure attachment to better manage feelings of insecurity and avoid eating restraint, could have potentially life changing outcomes. Through preventing the development of eating restraint, the risk of developing eating disorders is reduced, as well as that of other non-clinical eating restraint related health concerns; such as decreased bone density and health, and disturbances in ovulation and menstruation cycles in females (McLean & Barr, 2003; Nickols-Richardson, Beiseigel, & Gwazdauskas, 2006).

4.5 Strengths

The current study achieved the required sample size to detect the desired power, alpha level and effect size, as stipulated by the a priori power analysis. The power and sample size mitigated the risk of a type II error, and the risk of type I error was also able to be reduced through the use of the conservative Sobel mediation test. The current study also utilised well-validated instruments to measure key variables, which all had adequate internal consistency. Additionally, the study had a broad demographic ranging in ages from 18-83 years, with varying education levels and BMI. The demographics of this study allow for greater external validity.

4.6 Limitations and Recommendations for Future Research

Several limitations should be considered when interpreting the findings from this study. Firstly it should be acknowledged that whilst gender was not a significant predictor of the key variables, the majority of participants were female. Many participants also identified their ethnic background to be Australian, not allowing for cross-cultural differences to be identified. Due to the cross-sectional design of the study, causation cannot be implied, nor

could the changes in attachment from infancy to adulthood be measured, or the potential impact this has on interoceptive awareness (IA). Attachment is not a fixed construct and can develop throughout a lifetime (Faber et al., 2018), and thus the relationship between insecure attachment, IA and unhealthy eating behaviours may not be accurately represented in this study; for example, an insecurely attached infant, with impaired IA, has developed a secure attachment as an adult however may still experience the lasting impairments in IA.

All the measures used in this study were self-report, and do not contain any objective measures, due to the constructs relying on inward experiences and cannot accurately be measured by external sources. Despite the anonymity of participation encouraging honesty, self-report measures do incur the risk of bias, such as social desirability bias where participants answer the questions in a way that presents a favourable image of themselves, either consciously or subconsciously (van de Mortel, 2008). Nonetheless, participants were informed that their responses would not be identifiable and as the measures do not evaluate controversial or overly sensitive issues, the risk of disingenuous responses was minimised.

Methodologically, a limitation in this study regards the lack of enquiry about psychological disorders, which could result in the non-clinical sample containing participants who have diagnosed eating disorders, or other diagnoses such as anxiety and depressive disorders which are known to impact IA (Dunn et al., 2010).

Finally, due to the cross-sectional nature of this study it is not able to be determined the impact that COVID-19 lockdowns and restrictions may have on the results of this study. The data collection for this study occurred during the pandemic in Australia, at a time where rapidly increasing case numbers had plateaued, state and national borders were closed, people were restricted to their homes, social distancing was enforced, 76% of Australian parents kept their children home from school resulting in 73% of them changing work arrangements, job losses were widely experienced (over 33% in some industries), non-essential services were

closed, the supermarkets were experiencing stock shortages and economic uncertainty was widely experienced (ABS, 2020). It is well documented in the media (e.g. Iati, 2020; Miller, 2020; Warren, 2020) the impact the global pandemic and restrictions have had on mental health and people's health choices; it is reasonable to believe that levels of emotional eating and restraint have changed in the general population during this time of great stress and uncertainty (Yau & Potenza, 2013). Whilst levels of emotional eating are found to increase in times of great stress due to the stress-induced elevation of emotions and the rewarding properties of food, levels of eating restraint tend to differ (Yau & Potenza, 2013). Usually unrestrained eaters have been found to increase levels of restraint in times of great stress, whilst restrained eaters show reduced levels of dietary restraint (Yau & Potenza, 2013). This effect of undue stress (Yau & Potenza, 2013) was not able to be accounted for in the current study due to the cross-sectional study design, which could greatly affect the findings. thus, the findings from the current study are less generalisable, due to the data being collected during the global pandemic and therefore less representative of the general, or rather non-clinical, population under normal circumstances.

The findings from this study have promising practical and theoretical implications for consideration of future research. To the best of our knowledge, this is the first study to explore the relationship between attachment, IA and unhealthy eating behaviours in a non-clinical sample. The findings demonstrate a small mediation of 'trusting' between attachment and eating restraint which, with further study, may allow for interventions to be implemented for people with insecure attachment designed to improve trust in interoceptive cues and reduce behaviours of restraint prior to them developing into eating disorders or other health-related concerns. It is advised that a similar study be conducted after the pandemic to

determine the replicability and reliability of these findings, with the addition of a clinical diagnoses question in the demographic section.

One potential intervention of interest is mindfulness. It is recommended that future studies in this area investigate the effects of mindfulness practices on the development of trust of interoceptive cues. The skill of mindfulness is integral to the development of interoceptive awareness, specifically the ability to pay attention to the present-moment with openness and self-compassion (Price & Hooven, 2018). Mindfulness practices and training, such as awareness of breath and body scanning, as well as yoga and mindfulness meditation, are used to develop and enhance interoceptive awareness, through the teaching of listening to one's body and bodily sensations; and how to receive and value internal physiological messages (Francis, Shawyer, Cayoun, Enticott, & Meadows, 2020; Oswald, Chapman, & Wilson, 2017). This intervention appears to target the ability to trust internal messages, by requiring individuals to pay attention to these messages and developing skills to better understand them. Teaching these practices to insecurely attached individuals, could provide not only a positive way of dealing with unpleasant emotion and distress (Faber et al., 2018), but improve one's ability to understand interoceptive cues and avoid unhealthy eating behaviours.

The current study's unexpected results, finding no mediation effect of overall IA on insecure attachment and eating restraint and emotional eating, create avenues to further explore the key variables in relation to each other and other potential factors. One of these being the impact of stress on the association between attachment, IA and unhealthy eating, which could not be accounted for in this study. Another consideration for future research could be to investigate interpersonal interaction as a mediator between attachment and unhealthy eating behaviours. Interpersonal behaviour, like IA, is regulated by the insular

cortex (Garfinkel & Critchley, 2013), of which the development is affected by attachment style, as previously stated. IA is suggested to affect the emotional experiences in daily life and experiences of social fear, and the ability to interpret cues has been found to relate to personality traits (Terasawa, Shibata, Moriguchi, & Umeda, 2013). The emotional state and understanding of bodily condition, through interpretation of cues, is associated with personality and impacts interpersonal interactions (Garfinkel & Critchley, 2013). The sensitivity to experience of emotion is associated with unhealthy eating behaviours (Mantau et al., 2018). This relationship between IA and interpersonal behaviour, allows for the findings of IA on the relationship between insecure attachment and unhealthy eating behaviours to be expanded upon, to determine if the variance is better explained by a concept broader than, yet inclusive of, IA.

Another area of future research in relation to insecure attachment and unhealthy eating behaviours is that of embodiment. Embodiment refers to the awareness of bodily sensations related to internal and external conditions, which provide a sense of one's physical and physiological circumstances (Buldeo, 2015; Herbert & Pollatos, 2012). These signals are associated with survival and wellbeing, and shape emotions, cognitive processes and behaviour (Fustos, Gramann, Herbert, & Pollatos, 2013; Herbert & Pollatos, 2012). IA is fundamental to embodiment, responsible for the comprehension of emotional experiences (Herbert & Pollatos, 2012). Previous studies have found that embodiment mediates the relationship between insecure attachment and clinically diagnosed eating disorders (Monteleone et al., 2017), and with the relationship with IA, embodiment may mediate the relationship between insecure attachment and unhealthy eating behaviours in a non-clinical sample.

The findings from this study also demonstrate the importance of the MAIA-2 subscales. The MAIA overall score was not able to demonstrate a mediation effect of IA between insecure attachment and eating restraint, which was present in the data through the trusting subscale. These findings suggest that the overall score should be used with caution as a sole measure of IA in future studies, and it is advised that the subscales be calculated to determine if there are any suppression effects.

Due to participant burden, intuitive eating was removed from the initial study design. Intuitive eating is defined as eating in alignment with physiological hunger and satiety cues as opposed to responsively to emotional states or situational cues (Oswald et al., 2017; Tylka & Wilcox, 2006). Intuitive eating provides unconditional permission to eat when hungry, and does not deny or place restriction on type or quantity of food eaten (Oswald et al., 2017; Tylka & Wilcox, 2006). Intuitive eating requires trust of interoceptive cues. Further studies in this area could investigate the impact of IA on attachment and healthy eating behaviours, such as intuitive eating, to determine if IA has a greater impact on positive eating behaviours rather than the unhealthy ones. And in turn, investigate the effects of improved intuitive eating on pre-established emotional eating and restraint. There is very limited research on attachment insecurity and healthy eating behaviours, however preliminary research suggests that attachment avoidance is associated with a lesser likelihood of adopting healthy eating behaviours and lower intuitive eating scores (Faber et al., 2018). With the finding of the current study demonstrating the relationship between insecure attachment, trust of interoceptive cues and eating restraint, it is believed that intuitive eating, along with IA, should be investigated as a potential mediator between insecure attachment and the development of unhealthy eating behaviours in a non-clinical population.

5. Conclusion

In conclusion, no mediation effect was found for overall IA between insecure attachment and unhealthy eating behaviours. A mediation effect was found, however, for IA ‘trusting’ in the relationships between both attachment anxiety and avoidance, and eating restraint, thus establishing the importance of trust of interoceptive cues on this relationship. The findings from this study provide empirical evidence for the impact of aspects of IA on attachment and eating restraint in a non-clinical sample, demonstrating that higher levels of insecure attachment are related to lower levels of IA ‘trusting’ and increased levels of eating restraint. These findings make an important contribution to understanding the association between attachment, IA and unhealthy eating behaviours. Further research is needed to better understand the relationship between IA and restraint in non-clinical samples. Potentially, the use of IA based, mind-body therapies may develop trust of interoceptive cues and decrease eating restraint in insecurely attached individuals.

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Appendices

Appendix A

Qualtrics Survey

Demographics Questionnaire

Please select your gender

- Female
- Male
- Other
- Prefer not to say

Please state your age in years _____

Please specify your current height in centimetres _____

Please specify your current weight in kilograms _____

What is your ethnicity?

- Australian
- Australian Aboriginal, Torres Strait Islander or Tiwi Islander
- New Zealander
- Maori
- Pacific Islander
- European
- North American
- Latin American or Caribbean Islander
- Asian
- Middle Eastern
- African

What country do you currently reside in?

- Australia
- Other (please specify) _____

What is your highest attained level of education?

- Year 10 or below
- Completed High School
- Technical qualification (e.g. Certificate iii, Apprenticeship)
- Degree or Diploma (e.g. Bachelor's degree, Graduate Diploma)
- Postgraduate degree (e.g. Masters, Doctorate)

What is your marital status?

- Single
- In a relationship
- Married/Defacto
- Divorced/Separated
- Widowed

The Multidimensional Assessment of Interoceptive Awareness

Please note: Questionnaire in original form by Mehling et al. (2018), due to copyright.

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

How often does each statement apply to you generally in daily life? Circle one number on each line

	Neve r				Alwa ys	
19. I can return awareness to my body if I am distracted.	0	1	2	3	4	5
20. I can refocus my attention from thinking to sensing my body.	0	1	2	3	4	5
21. I can maintain awareness of my whole body even when a part of me is in pain or discomfort.	0	1	2	3	4	5
22. I am able to consciously focus on my body as a whole.	0	1	2	3	4	5
23. I notice how my body changes when I am angry.	0	1	2	3	4	5
24. When something is wrong in my life I can feel it in my body.	0	1	2	3	4	5
25. I notice that my body feels different after a peaceful experience.	0	1	2	3	4	5
26. I notice that my breathing becomes free and easy when I feel comfortable.	0	1	2	3	4	5
27. I notice how my body changes when I feel happy / joyful.	0	1	2	3	4	5
28. When I feel overwhelmed I can find a calm place inside.	0	1	2	3	4	5
29. When I bring awareness to my body I feel a sense of calm.	0	1	2	3	4	5
30. I can use my breath to reduce tension.	0	1	2	3	4	5
31. When I am caught up in thoughts, I can calm my mind by focusing on my body/breathing.	0	1	2	3	4	5
32. I listen for information from my body about my emotional state.	0	1	2	3	4	5
33. When I am upset, I take time to explore how my body feels.	0	1	2	3	4	5
34. I listen to my body to inform me about what to do.	0	1	2	3	4	5
35. I am at home in my body.	0	1	2	3	4	5
36. I feel my body is a safe place.	0	1	2	3	4	5
37. I trust my body sensations.	0	1	2	3	4	5

Revised Adult Attachment Scale

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 relationships and close friends. Respond to each statement in terms of how you generally feel in these relationships.

Please indicate how characteristic each statement is for you (1=Not at all characteristic of me, 5=Very characteristic of me)

	Not at all characteristic of me = 1	2	3	4	Very characteristic of me = 5
I find it relatively easy to get close to people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to allow myself to depend on others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often worry that other people don't really love me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find that others are reluctant to get as close as I would like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable depending on others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't worry about people getting close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find that people are never there when you need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am somewhat uncomfortable being close to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often worry that other people won't want to stay with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I show my feelings for others, I am afraid they will not feel the same about me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often wonder whether other people really care about me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable developing close relationships with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am uncomfortable when anyone gets too emotionally close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know that people will be there when I need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to get close to people, but I worry about being hurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to trust others completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People often want me to be emotionally closer than I feel comfortable being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not sure that I can always depend on people to be there when I need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not at all characteristic of me = 1	2	3	4	Very characteristic of me = 5
I find it relatively easy to get close to people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to allow myself to depend on others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often worry that other people don't really love me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find that others are reluctant to get as close as I would like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable depending on others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't worry about people getting close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find that people are never there when you need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am somewhat uncomfortable being close to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often worry that other people won't want to stay with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I show my feelings for others, I am afraid they will not feel the same about me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often wonder whether other people really care about me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable developing close relationships with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am uncomfortable when anyone gets too emotionally close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know that people will be there when I need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to get close to people, but I worry about being hurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to trust others completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People often want me to be emotionally closer than I feel comfortable being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not sure that I can always depend on people to be there when I need them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Dutch Eating Behaviours Questionnaire

Please select the answer which best reflects your behaviours and attitudes

	Never	Seldom	Sometimes	Often	Very often
If you have put on weight, do you eat less than you usually do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you try to eat less at mealtimes than you would like to eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you refuse food or drink offered because you are concerned about your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you watch exactly what you eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you deliberately eat foods that are slimming?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When you have eaten too much, do you eat less than usual the following days?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you deliberately eat less in order not to become heavier?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you try not to eat between meals because you are watching your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the evening do you try not to eat because you are watching your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you take into account your weight with what you eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are irritated?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you have nothing to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are depressed or discouraged?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are lonely?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when somebody lets you down?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are cross?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are approaching something unpleasant to happen?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you get the desire to eat when you are anxious, worried or tense?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Never	Seldom	Sometimes	Often	Very often
Do you have the desire to eat when things are going against you or when things have gone wrong?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are frightened?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are disappointed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are emotionally upset?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are bored or restless?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If food tastes good to you, do you eat more than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If food smells and looks good, do you eat more than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you see or smell something delicious, do you have a desire to eat it?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you have something delicious to eat, do you eat it straight away?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you walk past the baker do you have the desire to buy something delicious?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you walk past a snackbar or café, do you have the desire to buy something delicious?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you can see others eating, do you also have the desire to eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can you resist eating delicious food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you eat more than usual, when you see others eating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When preparing a meal, are you inclined to eat something?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you have put on weight, do you eat less than you usually do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you try to eat less at mealtimes than you would like to eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you refuse food or drink offered because you are concerned about your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you watch exactly what you eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you deliberately eat foods that are slimming?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Never	Seldom	Sometimes	Often	Very often
When you have eaten too much, do you eat less than usual the following days?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you deliberately eat less in order not to become heavier?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you try not to eat between meals because you are watching your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the evening do you try not to eat because you are watching your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you take into account your weight with what you eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are irritated?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you have nothing to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are depressed or discouraged?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when you are lonely?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when somebody lets you down?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are cross?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are approaching something unpleasant to happen?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you get the desire to eat when you are anxious, worried or tense?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have the desire to eat when things are going against you or when things have gone wrong?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are frightened?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are disappointed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are emotionally upset?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you have a desire to eat when you are bored or restless?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If food tastes good to you, do you eat more than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If food smells and looks good, do you eat more than usual?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Never	Seldom	Sometimes	Often	Very often
If you see or smell something delicious, do you have a desire to eat it?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you have something delicious to eat, do you eat it straight away?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you walk past the baker do you have the desire to buy something delicious?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you walk past a snackbar or café, do you have the desire to buy something delicious?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you can see others eating, do you also have the desire to eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can you resist eating delicious food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you eat more than usual, when you see others eating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When preparing a meal, are you inclined to eat something?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Closing remarks

If you have any questions, you are welcome to contact the research team to discuss the project:

Dr Amanda Taylor - xxxxxxxx

Thank you very much for your participation, your time and responses are very much appreciated.

Finally, please select one of the following options (your data will remain anonymous):

- I would like to receive a summary of findings from this study (Please enter email address)
- I would like to enter the draw to win a \$50 gift card (Please enter email address)
- I would like to receive a summary of the findings and enter the draw to win a \$50 gift card (Please enter email address)
- No thank you, I do not wish to receive any information on the findings or enter the draw

If you are a University of Adelaide student participating for course credit, please note that you are not eligible to win the gift card. Your course credit will be added as soon as possible after you have completed the survey

Survey completion and support services

We thank you for your time spent taking this survey.
Your response has been recorded.

If you have experienced any discomfort or distress during or after the survey, please consult your GP or contact a support service (some details are provided below):

University of Adelaide Counselling Support Service
1300 167 654 - University Crisis Line
<https://www.adelaide.edu.au/counselling/access-counselling-support>

Lifeline - Crisis Support and Suicide Prevention
13 11 14
<https://www.lifeline.org.au>

1800RESPECT - National sexual assault, domestic and family violence counselling service
1800 737 732
<https://www.1800respect.org.au>

Butterfly Foundation - Support for eating disorders and body image issues
1800 334 673
<https://www.thebutterflyfoundation.org.au>

MensLine Australia - Emotional health and relationship support for men
1300 789 978
<https://mensline.org.au>

Appendix B

Social Media Recruitment Post

*** Seeking Participants***

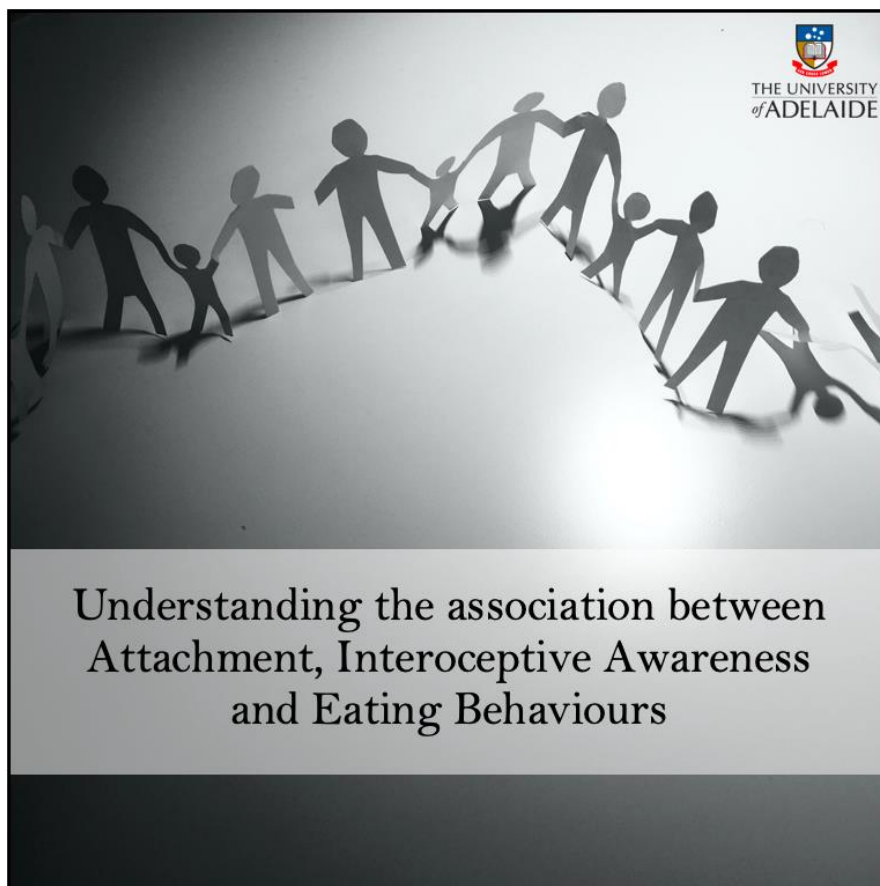
Hello everyone,
I hope you are all keeping safe and well in these uncertain times.

The University of Adelaide invites you to participate in a psychological study investigating the association between attachment, interoceptive awareness and eating behaviours. This online questionnaire-based survey will take approximately 10 minutes of your time, and if you are over the age of 18, reside in Australia and have proficient English skills, your participation would be greatly appreciated. For more information or to participate in the study please follow this link https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_6niQnHq5X7LQcBf
Those who participate in the study have the opportunity to win a \$50 Coles/Myer gift card.

This study has received ethics approval from the Human Research Ethics Subcommittee in the School of Psychology.

The research is being conducted by Psychology Honours student Mikayla Southern, under supervision of Dr Amanda Taylor. If you have any questions about this research study please contact [XXXXXX](#) or XXXXXXXXX

Thank you



Appendix C

Participant Information Sheet

PARTICIPANT INFORMATION SHEET



PROJECT TITLE: Understanding the association between attachment, interoceptive awareness and eating behaviours.

Human Research Ethics Subcommittee in the School of Psychology approval number: 20/48

PRINCIPAL INVESTIGATOR: Dr Amanda Taylor

STUDENT RESEARCHER: Mikayla Southern

STUDENT'S DEGREE: Honours degree of Bachelor of Psychological Science

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

This study is designed to investigate whether a person's ability to identify and recognise the body's cues (known as interoceptive awareness), is associated with both how we experience close relationships (attachment) and eating behaviour.

The survey contains measures relating to adult attachment, interoceptive awareness and eating behaviours. You will also be asked basic demographic information.

Who is undertaking the project?

This project is being conducted by Mikayla Southern. This research will form the basis for the thesis for an Honours degree of Bachelor of Psychological Science at the University of Adelaide, under the supervision of Dr Amanda Taylor.

Why am I being invited to participate?

If you are currently residing in Australia, over the age of 18 and have proficient English skills, your participation in this study would be much appreciated.

What am I being invited to do?

You are being invited to complete a questionnaire-based online survey. The survey, with mobile-friendly capabilities, may be completed on any computer or electronic device. The survey may also be completed at a location of your choosing and time of your convenience.

How much time will my involvement in the project take?

The survey is expected to take 10-15 minutes to complete, with no further participation required. Participants from the first-year undergraduate psychology cohort will receive a half (0.5) course credit for their participation to contribute to their research participation requirements in Psych 1A and 1B. Other participants have the option to enter a draw to win a \$50 Coles/Myer gift card.

Are there any risks associated with participating in this project?

There are no foreseeable risks, side effects, emotional distress or discomforts, or inconveniences likely to arise due to this study, immediately nor subsequently after participation. However, if at any point you begin to feel uncomfortable while completing the survey, you are able to terminate your participation. The contact details for the primary researcher (Dr Amanda Taylor) and various support services are also provided at the completion of the survey.

What are the potential benefits of the research project?

This study aims to contribute to the emerging literature on the potential impacts and benefits of interoceptive awareness. This research is believed to be the first to investigate the interaction between attachment, interoceptive awareness and eating behaviours in adults. Outcomes of this study will contribute to and inform future research, along with the potential development of future 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 with no consequence until the survey is submitted, at this time the data will be saved anonymously and your responses will be unable to be removed. Prior to submission, should you no longer wish to participate in the survey, simply close the web browser and all your responses will be deleted. Course credit for first year psychology participants can only be awarded to those who have submitted their responses.

What will happen to my information?

This study does not require any identifiable information to be provided, and all information reported in the findings and any subsequent publications will only utilise de-identified data, ensuring confidentiality. The data collected in the study will only be accessible to the research team and stored securely as per University requirements. The de-identified data will only be disclosed according to the consent provided, except as required by law. Information obtained from this survey will be stored at the University of Adelaide.

Who do I contact if I have questions about the project?

If you have any questions about this study, please contact Dr Amanda Taylor via email [xxxx](#) or the student researcher, Mikayla Southern, at [xxxxx](#).

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Subcommittee in the School of Psychology at the University of Adelaide (approval number:). This research project 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 you should consult the Principal Investigator. 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 Chair of the Human Research Ethics Subcommittee in the School of Psychology, Professor Paul Delfabbro on:

Phone: 08 8313 4936

Email: paul.delfabbro@adelaide.edu.au

Post: Level 5, Hughes building, North Terrace campus, ADELAIDE 5000 AUSTRALIA

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?

To participate in the study, please continue to the next page where you will be provided with a consent form. Once you have given your consent, you will be directed through the survey.

Yours sincerely,

xxxxxxxxx

Appendix D

Participant Consent Form

Human Research Ethics Subcommittee in the School of Psychology



CONSENT FORM

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

Title:	Understanding the association between attachment, interoceptive awareness and eating behaviours.
Ethics Approval Number:	20/48

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 I am free to withdraw from the project at any time up until submission of the survey and that 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, report and conference presentations.
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 by any researchers and hereby provide 'unspecified' consent for the use of my data in any future research.
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.

If you would like a copy of the Participant Information Sheet and Consent Form emailed to you,
xxxxxxx

I understand the consent I have provided and agree to participate in the research study as
stated above

Appendix E

Parallel Multiple Mediation Analysis Table – Attachment Anxiety

Mediation Analysis for Attachment Anxiety (RAAS_AX) and Eating Restraint (DEBQ_ER), with Mediators of Trusting (MAIA_T) and Not-Distracting (MAIA_ND), Controlling for Covariates; age, gender, BMI and marital status(mar_sts)

Variable	M ₁ (MAIA_T)			M ₂ (MAIA_ND)			Y (DEBQ_ER)					
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p			
X(RAAS_AX)	a ₁	-.2862	.080	.000	a ₂	-.0172	.060	.775	c'	.0690	.070	.326
M ₁	-	-	-	-	-	-	-	-	b ₁	-.1599	.065	.015
M ₂	-	-	-	-	-	-	-	-	b ₂	.0456	.077	.557
C ₁ (age)		.0089	.008	.257		-.0004	.006	.950		.0030	.006	.642
C ₂ (gender)		-.1874	.161	.247		-.1561	.122	.201		-.2220	.131	.091
C ₃ (BMI)		-.0325	.015	.032		.0082	.011	.473		.0221	.012	.072
C ₄ (mar_sts)		.0119	.109	.913		-.0016	.082	.985		.0176	.088	.842
		R ² = 0.115 F(5, 210) = 5.453, p=0.001				R ² = 0.010 F(5, 210) = 0.411, p=0.841				R ² = 0.106 F(13, 202) = 1.838, p=0.040		

Note. Coefficients are represented as unstandardised regression coefficients

Appendix F

Parallel Multiple Mediation Analysis Table – Attachment Avoidance

Mediation Analysis for Attachment Avoidance (RAAS_AV) and Eating Restraint (DEBQ_ER), with Mediators of Trusting (MAIA_T) and Not-Distracting (MAIA_ND), Controlling for Covariates; age, gender, BMI and marital status(mar_sts)

Variable	M ₁ (MAIA_T)			M ₂ (MAIA_ND)			Y (DEBQ_ER)						
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p				
X(RAAS_AV)	a ₁	-.4098	.114	.000	a ₂	-.2281	.085	.008	c'	-.1226	.097	.208	
M ₁	-	-	-	-	-	-	-	-	b ₁	-.1854	.065	.005	
M ₂	-	-	-	-	-	-	-	-	b ₂	.0298	.078	.704	
C ₁ (age)		.0188	.008	.012		.0005	.006	.934		.0035	.006	.572	
C ₂ (gender)		-.1426	.161	.378		-.1432	.120	.233		-.1875	.134	.164	
C ₃ (BMI)		-.0358	.015	.018		.0102	.011	.357		.0181	.012	.147	
C ₄ (mar_sts)		.0053	.109	.961		-.0177	.081	.824		-.0040	.089	.964	
			R ² = 0.115				R ² = 0.042				R ² = 0.109		
			F(5, 210) = 5.453, p=0.001				F(5, 210) = 1.860, p=0.103				F(13, 202) = 1.891, p=0.034		

Note. Coefficients are represented as unstandardised regression coefficients