Exploring the association between Interoceptive Awareness, Self-Compassion and Emotional Regulation

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This thesis is submitted in partial fulfillment of the Honours degree of Bachelor of Psychological Science (Honours).

Word count: 9297

University of Adelaide

1st October 2019

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Abstract

Although the benefits of adaptive emotional regulation have been extensively researched, the mechanisms behind this are poorly understood. As emotional regulation plays an important role in the onset and maintenance of disturbances associated with a range of psychopathologies, understanding the factors facilitating greater emotional regulation will be beneficial for interventions and mental health promotion in the future. Research is yet to examine the relationship between interoceptive awareness and self-compassion as potential intervention tools for reducing difficulties in emotional regulation. Our aim was to address the gap in the literature by investigating whether self-compassion influences the relationship between interoceptive awareness and emotional regulation. We hypothesised there would be a significant relationship between interoceptive awareness and self-compassion. Two-hundred-and-thirty-two adult participants (178 female, 51 male) completed an online survey measuring interoceptive awareness, self-compassion and emotion regulation difficulties. Results indicated interoceptive awareness was positively associated with self-compassion and negatively associated with emotion regulation difficulties, self-compassion was also negatively associated with difficulties in emotion regulation. Regression analysis found self-compassion mediated the relationship between interoceptive awareness and emotional regulation. Therefore, our findings indicate facilitation of self-compassion may help with reducing the impact of poor interoception on emotional regulation and could have beneficial implications for future therapies.

Declaration

This thesis contains no material which has been accepted for the award of any other degree of 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

Erina Barker

Acknowledgments

Firstly, I would like to sincerely thank my supervisor, Dr Amanda Taylor. I am immensely grateful for your supervision and constant support this year. Your guidance and encouragement throughout this experience was invaluable.

I would like to say a huge thank you to Ivana for your patience, assistance and generous support throughout. Thank you for your valuable advice and your continued ideas and support throughout the year. Thank you to Elysia, Dhar, Bella and Jess for sharing this academic journey with me and the support throughout the process. This experience wouldn't have been nearly as enjoyable without you all. I would also like to extend a big thank you to my friends for their ongoing love, encouragement and support.

Finally, I would like to thank my family, specifically my mum, dad, and sister for your constant support and unconditional love throughout this year. I could not imagine overcoming all the challenges of this year without you backing me.

Overview

Emotional regulation (ER) reflects the conscious and unconscious ability of an individual to effectively communicate between the body, mind and feelings in a coherent manner in order to employ strategies to reduce, uphold or increase the response to emotion (Balzarotti, Biassoni, Villani, Prunas & Velotti, 2016; Gross, 2001; Perasso & Velotti, 2017; Price & Hooven, 2018). Research in this field has shown rapid development over the past decade, and in particular with interest is the role emotion regulation plays in relation to disturbances associated with the development of psychological disorders (Aldao, 2012; Balzarotti et al., 2016; Cibralic, Kohlhoff, Wallace, McMahon & Eapen, 2019; Hirsch, Chavannon & Christiansen, 2019; Perasso & Velotti, 2017). Emotional regulation is a complex process applied to situations concerning emotional stimuli, governing the reaction to positive and negative events to elicit an emotional response that is appropriate for the surrounding environment (Gross, 2003). Differences in the ability to regulate emotions are associated with variances across multiple domains of psychological adjustment (John & Gross, 2004; Perasso & Velotti, 2017). Those with higher levels of adaptive emotion regulation have been found to have better ability to adopt and maintain healthy behaviours (Hu et al., 2014; John & Gross, 2004; Kashdan, Forsyth & Steger, 2006). Furthermore, individuals with good emotion regulation are better able to mitigate the effects of stress on health outcomes, such as a reduced risk for cardiovascular disease and substance abuse (Massah et al., 2016; Roy, Riley & Sinha, 2018). Conversely, maladaptive emotion regulation can underlie a wide range of psychological disorders as the individual is unable to manage the negative emotions associated with the presentation of negative experiences (Anestis, Bagge, Tull & Joiner, 2011; Balzarotti et al., 2016; Price & Hooven, 2018). Difficulties may arise due to the inability to identify, understand or accept particular emotional states and individuals may struggle with accessing strategies to cope with emotion

and control impulsive behaviour, resulting in maladaptive coping strategies such as rumination, thought suppression, avoidance and aggressive behaviours (Gratz & Roemer, 2004; Perasso & Velotti, 2017). It is therefore important to understand the factors that contribute to a person's capacity to recognise and understand emotions, in order to apply appropriate emotional regulation strategies. Interoceptive awareness is the ability to consciously detect and understand the internal signals of the body as cues to emotional experiences and has been linked to emotional regulation (Mehling, Acree, Stewart, Silas & Jones, 2018), with individuals higher in interoceptive awareness often showing a greater ability to regulate their emotions and vice versa (Füstös, Gramann, Herbert & Pollatos, 2013). Mechanisms of this association are not clear and are yet to be explored. Self-compassion, relating to the extent of compassion an individual has towards oneself (Neff, 2003), has also been found to have associations with emotional regulation and aspects of interoceptive awareness, and may represent a skill that can be taught and used to mitigate the impact of poor interoceptive abilities on emotional regulation (Critchley & Garfinkel, 2017; Zamariola, Frost, Van Oost, Cornieille & Luminet, 2019). The present study aims to assist with developing greater understanding of the process of emotional regulation through exploring whether self-compassion may mitigate the impact of difficulties with interoceptive awareness upon emotional regulation.

Emotional Regulation

Adaptive emotional regulation involves an individual's capacity to show awareness and acceptance of their emotions and distress whilst employing appropriate strategies in order to control impulsive behaviours according to the demands of the external situation (Campos et al., 1989; Gratz & Roemer, 2004; Gross, 2007; Szaz et al., 2011). It is thought a change in strength or an intense change in emotion may signal non-adaptive strategies of emotion regulation and lead to poor emotional responding (Snir, Bar-Kalifa, Berenson, Downey, &

Rafaeli, 2017). There is importance in researching ways to increase adaptive regulatory strategies, however, as poor emotional regulation has been linked with lower subjective and psychological wellbeing, the present study focuses on difficulties in emotional regulation within the general population (Balzarotti et al., 2016). Gratz and Roemer's multidimensional model of emotion regulation difficulties (2004), outlines four components of emotional regulation: firstly, an individual's knowledge and understanding of emotions; secondly, their capacity to accept these emotions; thirdly, engagement in goal-oriented behaviour whilst refraining from impulsive behaviour when confronted with negative stimuli; and finally, having access to effective and appropriate regulation strategies for social situations. The multidimensional model of emotional regulation is well-supported and suggests that those who struggle with identifying, understanding or accepting emotional states may struggle to access adaptive coping strategies (Gratz & Roemer, 2004). Having difficulties in emotional regulation is associated with greater emotional distress as well as affective disorders and other mental health problems (Gratz & Roemer, 2004; Khalsa et al., 2018; Szaz et al., 2011).

The different facets of emotional regulation can be consciously controlled, or automatic, and multiple aspects of emotional regulation are involved in the generation of a response to the emotion (Gross et al., 2007; Kever, Pollatos, Vermeulen & Grynberg, 2015). Emotional regulatory strategies can influence the duration, magnitude and latency of emotional states, and the compensatory mechanisms employed can not only affect the behavioural response, but also the experience of a situation and the physiological consequences that result (e.g. the stress response; English et al., 2017; Gross, 2007; Szaz et al., 2011; Thompson, 1990), whilst employment of these different regulation strategies are found to be influenced by age and (John & Gross, 2004; Nolen-Hoeksema & Aldao, 2011). The ability to cope with negative emotions through adaptive emotional regulation has been found to alleviate the likelihood of developing psychopathologies such as anxiety and

depression (Khalsa et al., 2018; Murphy, Catmur & Bird, 2017). However, before we consider how factors may influence the regulation of emotions, it is important to understand the process of emotional regulation.

Process Model of Emotional Regulation.

One theoretical model of emotional regulation widely accepted across the literature is Gross and Thompson's (2007) 'Process Model of Emotional Regulation'. This model proposes a person-situation system where the nature of a response to an emotion-provoking stimulus is attributed to the level of attention applied to the situation, and how the individual appraises that situation (e.g., as positive or negative, important or unimportant; Gross & Thompson, 2007). The process model suggests that each stage in the emotion generation continuum is susceptible to the application of strategies that assist in managing the emotional response (Gross & Thompson, 2007). Within this model, there are five strategies of emotional regulation specific to different points along the continuum of emotion generation: (1) situation selection, which refers to the modification of emotions and taking action by approaching or evading people, certain settings or objects to elicit desirable emotions; (2) situation modification, where there are attempts to alter the situation to adjust the emotional impact; (3) attentional deployment, concerning the amount of attention an individual awards attention within the situation that influences their emotions; (4) cognitive change, where individuals can modify the initial evaluation or appraisal of a situation to change its emotional significance; and (5) response modulation, which aims to influence the physiological, experiential and behavioural outcomes of the emotional response (refer to figure 1; Gross & Thompson, 2007; Schmidt, Tinti, Levine & Testa, 2010). All stages are important as they allow individuals to utilise the regulation strategies in order to alter emotional experiences, expressions and physiology, and respond appropriately to situational and environmental demands (Gross & John, 2003; Gross & Thompson, 2007). However, it is

not always possible to select or modify emotion provoking situations, in particular due to individual differences in the level of intensity experienced with emotion (Barrett, Gross, Christensen & Benvenuto, 2001). Therefore, it is crucial to identify factors that can both assist with attending to relevant emotional cues, and shift the cognitive appraisal of a situation, in order to allow the selection and application of appropriate emotional regulation strategies.

Interoceptive Awareness

Interoceptive awareness refers to the metacognitive ability of an individual to be aware of and evaluate internal bodily states (for example, heart rate, gastrointestinal symptoms and temperature) that frequently occur alongside emotions (Farb & Logie, 2018; Mehling, Price, Daubenmier, Acree, Bartmess & Stewart, 2012). Interoceptive markers within organs throughout the body communicate information regarding the physiological state of the body, which is transported to cognitive areas of the brain, such as the dorsolateral prefrontal cortex, and is thought to relate to attentional processes and update on physical states relevant to emotion (Kohn et al., 2014; Price & Hooven, 2018). Interoceptive awareness is generally thought to be comprised of two components: interoceptive accuracy, the objective performance on an interoceptive task; and interoceptive sensibility, the level of confidence on task performance by form of self-report (Garfinkel et al., 2015). Murphy, Geary, Millgate, Catmur and Bird (2017), found high levels of interoceptive awareness is significantly negatively correlated with age, proposing one's ability to report on internal bodily signals declines across the lifespan. This has been the only study to measure the relationship between interoceptive awareness and therefore our results will assist in contributing to the body of research regarding this aspect of interoception.

Interoceptive accuracy has previously been measured using a heartbeat discrimination task assessing the ability of an individual to count their own heart beats, however the

reliability of this measure has recently been challenged (Ferentzi, Drew, Tihanyi & Koteles, 2018; Mehling et al., 2012; Zamariola et al., 2019). For example, recent research has suggested measures of objective interoceptive accuracy are not highly correlated with the subjective self-report measures of interoception (Cali, Ambrosini, Picconi, Mehling & Committeri, 2015; Ceunen, Van Diest & Vlaeyen, 2013; Ferentzi, Drew, Tihanyi & Koteles, 2018). Additionally, criticism has surfaced regarding the distinction between interoceptive accuracy and interoceptive sensitivity (Mehling et al., 2012). This has been argued as a reductionist perspective of measuring 'awareness' by taking confidence ratings of ability to detect one's heartbeat without feeling for a pulse, whereby it may not capture the extent of one's inner experience (Chesney et al., 2016). Mehling et al. 2012, define interoceptive awareness as encompassing an individual's ability to consciously report one's inner experience, suggesting that the self-report may be the most appropriate means of measurement. In fact, interoceptive awareness has been clearly associated with wellbeing and emotional regulation outcomes, while heart beat counting-type tasks tend not to show reliable associations (Hanley et al., 2017; Ring et al., 2015). Evidence suggests individuals who experience their bodies as safe whilst trusting their bodily sensations are more likely to report greater psychological well-being, whilst deficits in interoceptive awareness have been associated with a number of psychological disorders (e.g, eating disorders such as binge eating and anorexia), when interoceptive signals are disregarded (Michalak et al., 2012; Price & Hooven, 2018; Hanley et al., 2017; Khalsa et al., 2018; Zamariola et al., 2019; Fassino et al., 2004).

Interoceptive Awareness and Emotion Regulation

Interoceptive awareness encompasses a communication system between bodily sensations and multiple levels of cortical monitoring within the brain to support physical and emotional wellbeing (Craig, 2002; 2003). Here the monitoring system incorporates the ability

to respond adaptively through emotional awareness and emotional regulation (Critchley & Garfinkel, 2017; Price & Hooven, 2018). James' (1984) theory of emotion proposes there is a physiological basis to emotion mediating the emotional experience, whereby emotional stimuli must interact with the individual's internal and external world views before bodily changes can be awakened and without this, emotion would cease to be based off anything other than judgment. Therefore, it is a bidirectional relationship, where the conscious awareness of internal states encompassed by interoceptive awareness, allows an individual to interpret the physiological response of the body to an emotional stimulus and similarly, the interpretation of emotions which elicit a physiological response within the body (James, 1984). Whilst numerous studies have found associations between interoceptive awareness and emotional regulation (Barrett et al., 2001; Critchley & Garfinkel, 2017; Füstös et al., 2013; Willem et al., 2019; Zamariola et al., 2019), few attempts have focused on trying to identify the mechanisms by which they are associated (Füstös et al., 2013; Price & Hooven, 2018). Füstös et al. (2013) proposed interoceptive awareness assists emotional regulation by providing extensive information of bodily signals during the specific emotional state, and those with higher levels of interoceptive awareness showed a greater capacity to apply adaptive emotional regulation strategies in response to induced negative affect. In particular, interoceptive awareness has been found to help in facilitation of cognitive reappraisal by decreasing negative affect & electrophysiological responses further associated with more adaptive regulation of the emotional response, meaning greater interoceptive awareness leads to more efficient discrimination between different emotional states (Füstös et al., 2013; Schwerdtfeger, Heene & Messner, 2019). Research has found reappraisal of an emotional stimuli is effective in reducing negative emotional response and is positively associated with a component of interoceptive awareness, interoceptive sensitivity, acting as a protective factor for psychological well-being in daily life (Aldao, 2012; Barrett et al., 2001; Füstös et

al., 2013; Schwerdtfeger et al., 2019; Webb et al., 2012) A study conducted by Mauss et al. (2007), found individuals engaging in the use of appraisal techniques, reported lower levels of anger and lower negative affect overall. It has been observed that reappraisal reduces the response to a negative situation without giving rise to a maladaptive physiological response (Memedovic et al., 2010).

Identifying factors that may facilitate or mitigate the effects of interoceptive awareness on emotional regulation will assist in a greater understanding of how adaptive emotion regulation may be promoted and maladaptive emotional regulation reduced. Interoceptive awareness may be considered applicable to the 'attentional deployment' phase of the emotion regulation model, where individuals with higher interoceptive awareness may show greater levels of attention to the sensations that arise during a situation (DeSteno Gross & kubzansky, 2013; Garfinkel, Seth, Barrett, Suzuki & Critchley, 2015)**.** The intensity of negative emotions is greatest at the beginning of the emotion regulation continuum (Diedrich et al., 2016), therefore it may be inferred that interoceptive awareness must be associated with the evaluation of an emotional stimuli as it also occurs early in the regulation continuum.

Self-Compassion

Self-compassion has received recent attention in the literature due to its association with numerous positive psychological outcomes, and reduced risk for psychopathology (Inwood & Ferrari, 2018; Kirschner, Kuyken, Wright, Roberts, Brejcha, Karl, 2019; Muris, Meesters, Pierik & de Kock, 2016). Originally proposed by Kristin Neff as an adaptive form of self-regulation, self-compassion is comprised of 3 dimensions: (1) being consciously aware and accepting of one's suffering (termed 'mindfulness'); (2) treating oneself with kindness and understanding during times of difficulty (self-kindness); and (3) relating one's difficult experiences as part of the common human experience (common humanity; Neff,

2003). Self-compassion encourages kindness towards oneself, as well as compassion and a non-judgmental view without avoidance or criticism of oneself, while exposed to negative situations, accepting and understanding the situation as a collective human experience (Neff, 2003; Cunha et al., 2016).

Self-compassion has been associated with constructive health outcomes such as increased positive emotional memories and forgiveness, whilst evidence also suggests self-compassion plays an important role in reducing physiological responses to stress, related to lower levels of depression and anxiety, as well as more empathic concern and mitigation of specific stress outcomes (Arch et al., 2014; Cunha et al., 2016; Finlay-Jones et al., 2015; Neff, 2004; Wilson et al., 2018). Self-compassion is a regulation strategy for counteracting negative self-directed emotions culminating in reduced emotional reactivity, lower levels of negative affect and more acceptance (Vettese et al., 2011; Hanley et al., 2017; Raes et al., 2010; Neff, 2004). Self-compassionate individuals have the capacity to hold their experiences in conscious awareness whilst recognising others share these experiences and are able to deal with failures in a calm and accepting manner (Zhang et al., 2019).

Self-compassion and Emotional Regulation

Conceptually, A study conducted by Terry and Leary (2011) postulates self-compassion is connected to adaptive self-regulation processes such as emotional regulation, which in turn, encourages productive and positive health behaviours (Dunne, Sheffield & Chilcot, 2016; Sirois, Kitner & Hirsch, 2015). During the emotion regulation continuum multiple strategies are employed (Diedrich et al., 2016), self-compassion might be a capable strategy to use early on in the process followed by cognitive reappraisal at a later stage. Cognitive reappraisal is the process of changing the meaning of an emotional stimulus, by adjusting the level of significance it has on our emotions, by changing our thought processes of the situation or our capacity to manage the demands it poses (English et al., 2017; Gross &

Thompson, 2007). For example, in cognitive reappraisal rather than becoming offended and upset if a person makes a rude remark, one might choose instead to interpret the comment as a reflection of stress or tiredness experienced by that person **(**Memedovic et al., 2010). A study conducted by Neff et al. (2005), found self-compassion was positively related to reframing and acknowledgement of emotions, and this relationship between self-compassion and positive coping strategies for emotion regulation are supported throughout the literature (Allen & Leary, 2010; Mizuno, Sugawara & Chishima, 2017).

Neff (2005), proposed that when mindful awareness is applied as a regulation strategy of self-compassion when facing adversity, it will assist in the regulation of one's emotions. Self-compassion promotes effective emotional regulation by attending to sensitive or negative emotional cues in a non-judgmental manner and interrupting the automatic reactions to the emotional experience, helping to re-evaluate these emotions and recognise this situation as a common human experience rather than an isolated one (Remmers et al., 2016: Raes et al., 2010). Kirschner et al. (2019) found self-compassion temporarily activates the positive affective system associated with effective emotion regulation, resulting in a temporary increase in positive self-view and reduction of negative self-view. For example, related with the capacity to respond to stress in a flexible and self-soothing way, self-compassion was associated with decreased perception of threatening stimuli leading to reduced negative affect, whilst directing attention toward soothing cues increasing positive affect in the wake of stressful situations (Svendsen et al., 2016).

Finlay-Jones and colleagues (2015; 2017; Sirois, 2015), found those who were more self-compassionate and less reactive, may have improved overall wellbeing by attending appropriately to emotional cues and the physiological state of the body in emotion regulation, therefore acting as a buffer for developing emotion regulation difficulties (Castilho, Carvalho, Marque & Pinto-Gouveia, 2017; Diedrich, Grant, Hofmann, Hiller & Berking,

2014). Whilst Svendsen and colleagues (2016), investigated the effects of trait self-compassion on emotional flexibility via association with the physiological marker of vagally mediated heart rate variability (vmHRV), finding trait self-compassion positively predicts a greater ability to physiologically and psychologically adapt to emotional responses. Self-compassion facilitates positive associations with slowing of heart rate and higher self-reported usage of self-compassion associated with a higher vmHRV, a physiological indicator of emotion regulation capacity as the ability to adapt to stressful environmental demands (Kok et al., 2013; Svendsen et al., 2016). These findings suggest there is a physiological component involved in the relationship between self-compassion and emotional regulation, that our ability to perceive our internal signals may assist in our ability to be compassionate towards ourselves and appropriately evaluate our emotions.

Evidence for a relationship between Self-Compassion and Interoceptive awareness

To our knowledge, research is yet to directly investigate the relationship between interoceptive awareness and self-compassion, however, there is some evidence to suggest an association. Hanley et al. (2017), observed a positive association between interoceptive awareness and dispositional mindfulness, one aspect of self-compassion (Neff, 2003). However, this is currently the only study to propose any relationship between how kind we are to ourselves and how well we perceive and interpret our internal signals. Both interoceptive awareness and dispositional mindfulness appear to be independently linked to enhanced psychological well-being (Coffey, Hartman & Fredrickson, 2010; Price & Hooven, 2018; Remmers, Topolinski, & Koole). In particular, one study has found both constructs were linked in the capacity to hold a situation in mindful awareness and remain non-reactive, which also appears to be interconnected with the ability to focus attention on bodily sensations (Hanley et al., 2017). These findings suggest that interoceptive awareness has associations with mindfulness, which is a component of self-compassion.

Interoceptive awareness encompasses a general awareness of internal signals, however it also involves regulation, appraisal, adaptive and maladaptive levels of attention towards such signals (Mehling, 2016; Mehling et al., 2018; 2012). Mindfulness, one of the three aspects of self-compassion, entails being aware and accepting, moment to moment, of thoughts, feelings and bodily sensations in a non-judgemental manner (Segal et al., 2002; Neff, 2003). This process is included in mindful awareness in body-oriented therapy (MABT), to assist with facilitating the adaptive connection between the mind and the body (Cameron, 2001; Price & Hooven, 2018). Interoceptive awareness is connected to the mind-body process, through identifying, accessing and appraising internal body signals (Mehling et al., 2012). In their study observing self-compassionate practices of mindfulness on interoceptive awareness, Price & Hooven (2018), found mindful practice encourages attention toward a targeted area of the inner body and teaches individuals strategies to access greater interoceptive awareness. Thus, given interoceptive awareness has been associated with techniques of mindfulness, an aspect of self-compassion, it appears logical to assume the constructs of interoceptive awareness and self-compassion are therefore related. However, to the knowledge of this author, no previous attempt has been made to investigate the relationship between interoceptive awareness and self-compassion. Associations between interoceptive awareness and the broader component of self-compassion are yet to be explored.

Self-compassion as a mediator in the relationship between interoceptive awareness and emotional regulation

As outlined above, both interoceptive awareness and self-compassion have been shown to have consistent links with emotional regulation (Diedrich et al., 2016; Finlay-Jones et al., 2015; Price & Hooven, 2018), and based on relevant findings, for example, between interoceptive awareness and mindfulness, an association between self-compassion and

interoceptive awareness can also be logically inferred (refer to figure 2.; Hanley et al., 2017; Price & Hooven, 2018). These associations can be mapped on the previously described process model of emotional regulation. Because interoceptive awareness is associated with attending to and noticing body related markers of emotion (Schwerdtfeger et al., 2019), it is considered that this is associated with the 'attention' mode of the model (see Figure 1); Gross & Thompson, 2007; Mehling et al., 2012; Zamariola et al., 2019). Appraisal occurs after a person has attended to relevant emotional content but before emotional response behaviours have been fully generated, therefore it is here that self-compassion may logically act within the continuum, through the application of mindful acceptance of emotions and self-kindness. This may assist in promoting cognitive reappraisal that can modify the perception of the situation by increasing tolerance of an individual's thoughts and emotions, thus potentially reducing any negative arousal by facilitating a breakdown of the link between uncomfortable situations and automatic unregulated responses, promoting a more adaptive response (refer to figure 1.; Price & Hooven, 2018). Therefore, we propose interoceptive awareness and self-compassion play important roles in the continuum of emotional regulation, as well as showing independent associations with each other (as depicted in Figure 2).

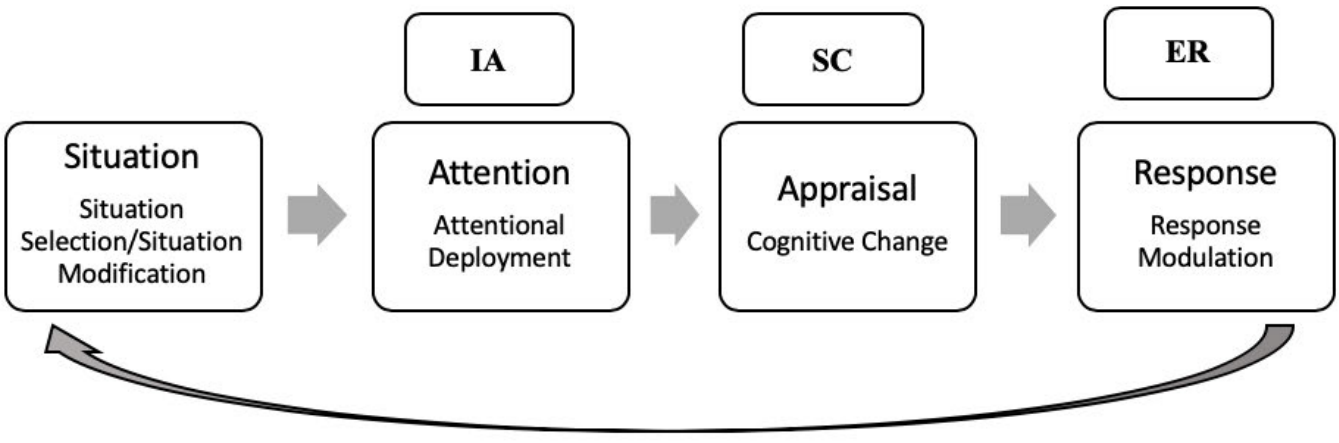

Figure 1. Proposed model of the associations between interoceptive awareness (IA), self-compassion (SC) and emotional regulation (ER) based on the Process Model of Emotion Regulation. Adapted from Gross, J. J. & Thompson, R. A. (2007). Emotion Regulation Conceptual Foundations. In Gross, J. J. (Ed.). In Handbook of Emotion Regulation. (pp. 3-24). New York, NY: The Guilford Press.

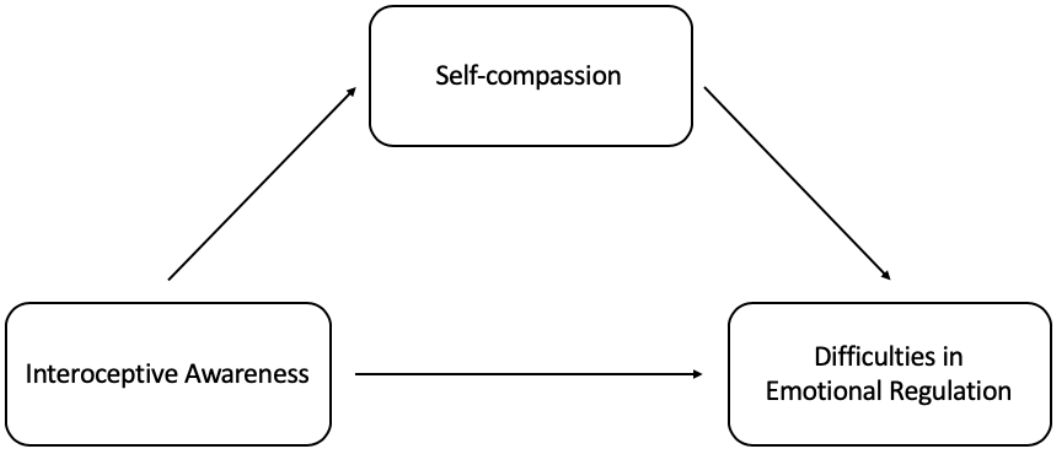

Figure 2. Simple mediation model being tested (on the basis of Baron & Kenny, 1986). Adapted from "Emotion Regulation Conceptual Foundations," by J.J Gross, and R.A. Thompson, 2007, In Gross, J. J. (Ed.). Handbook of Emotion Regulation., p. 3-24. New York, NY: The Guilford Press.

The present study

Our research aims to improve the current understanding of emotional regulation and interoceptive awareness by investigating whether self-compassion influences the relationship between these two variables. Ultimately, if we can understand this in greater detail, it will help to provide clarity as to factors contributing to adaptive emotional regulation and assist in identifying ways therapeutic programs may intervene in promoting adaptive emotional regulation and overall wellbeing. Self-compassion has been found to be a teachable skill that can be developed, therefore it may mitigate the impacts of problems within interoceptive awareness on emotional regulation. Furthermore, whilst the relationship between interoceptive awareness and self-compassion has not been directly investigated, there has

been an observed association between increased interoception and one aspect of self-compassion (mindfulness; Price & Hooven, 2018). As depicted in figure 2, this study intends to bridge the gap in the literature by examining how interoceptive awareness and self-compassion are associated, as well as investigating the association interoceptive awareness and self-compassion have on emotional regulation.

Summary of Hypotheses

1. There will be a significant negative association of interoceptive awareness on emotional regulation, whereby high levels of interoceptive awareness will be associated with lower levels of difficulty with emotional regulation.
2. There will be a significant negative association between self-compassion and emotional regulation. Specifically, those who report higher on self-compassion will have fewer difficulties with emotional regulation.
3. There will be a significant positive association between interoceptive awareness and self-compassion. Specifically, those who report higher scores on interoceptive awareness will report higher levels of self-compassion.
4. The effect of interoceptive awareness on difficulties in emotional regulation will be mediated by self-compassion.

Method

Participants

Two-hundred-and-thirty-two participants (178 female; 51 male), aged between 18 and 66 were recruited for this study. Of these participants, 117 were enrolled in the undergraduate Psychology course at the University of Adelaide, recruited via the School of Psychology Research Participation Pool. The second sub-sample comprised of 115 were from the general

public, recruited via a social media post (Appendix A) and physical flyer (Appendix B). To partake in the study, the participants had to be over the age of 18 and fluent in English. Seventy-nine percent of participants identified as Caucasian, 13% Asian, 2% African, 1.5% Aboriginal/Torres Strait Islander and 5% other. Ethics approval was granted for the purpose of this study by the University of Adelaide Human Research Ethics Committee.

Measures

This study was part of a wider composite investigation into the multidimensional construct of interoceptive awareness and psychological related outcomes. However, for convenience, only demographic questions and the measures relevant to the present study were included in this study.

Demographic questionnaire.

Participants were asked to complete a demographic questionnaire stating their gender, age, level of education, marital status, and estimated height and weight (Appendix C).

Emotional regulation measure.

The Difficulties in Emotion Regulation Scale (DERS) is a 36-item scale (Gratz & Roemer, 2004). The DERS is a frequently used questionnaire measuring six dimensions of emotional regulation difficulties (Appendix D). Items include questions such as “I have difficulty making sense out of my feelings”, with responses ranging from 1 (“almost never [0-10%]”) to 5 (“almost always [91-100%]”). Higher scores equate to increased difficulties with regulating emotions. The DERS exhibits good construct and predictive validity, test-retest reliability and overall internal consistency (α = .93; Gratz & Roemer, 2004), as well as adequate subscale reliability (Hallion, Steinman, Tolin & Diefenbach, 2018). The current study found similar results for internal consistency (α = .95).

Interoceptive awareness measure.

The Multidimensional Assessment of Interoceptive Awareness, second version (MAIA-2) is a self-report state-trait questionnaire measuring multiple dimensions of interoception and includes items such as "I notice how my body changes when I am angry" (Appendix E; Mehling et al, 2012). This study utilises an overall MAIA score to measure interoceptive awareness as a hierarchical model (i.e. one overall score with eight subscales) has shown to reflect adequate fit indices (Mehling et al, 2012; Muir, Madill & Brown, 2016), as well as acceptable internal consistency (α = .84). The present study found similar internal consistency for the 37-item scale (α = .87). Nine items were reverse scored when calculating an overall score and a higher overall score indicates greater interoceptive awareness.

Self-compassion measure.

The Self-Compassion Scale (SCS; Neff, 2003) is a 26-item self-report questionnaire used to assess trait self-compassion. Self-compassion is measured via an overall score or by being divided into six subscales, however only the overall scale was used for the present study (Appendix F). Participants were asked to score themselves according to how they perceived themselves and included items such as "I try to be loving toward myself when I'm feeling emotional pain", where responses range from 1 (*almost never*) to 5 (*almost always*). Items indicating uncompassionate responses to suffering were reverse-coded, and high overall scores represent greater self-compassion. Total scores were obtained by calculating a grand mean based summed from the six subscale means. The SCS demonstrates good internal consistency for the total subscale (α=.92; Neff, 2003), as well as adequate construct validity, test-retest reliability and moderate discriminant validity with other self-attitude measures (Allen, Goldwasser & Leary, 2012; Neff, Whittaker & Karl, 2016; Werner et al., 2012). In the present study, the scale presented similar results for internal consistency (α = .94).

Procedure

Following ethics approval, recruitment of participants occurred via an advertisement placed on social media sites (e.g., Facebook), a physical flyer posted on campus at the University of Adelaide, and via the University's Research Participation System. Students were compensated for their time with course credit and members of the public were offered a chance to win one of two $50 Coles vouchers. Participants were provided with a link to the survey, which was hosted by the online survey tool SurveyMonkey™. Participants gave consent (Appendix G) prior to completing the study questionnaires, and estimated completion time was 26 minutes. Participants were provided with details of relevant mental health organisations (e.g., beyond blue, Lifeline) and encouraged to contact these organisations should they have found any of the content unsettling (Appendix H).

Sample Considerations

A priori statistical power analysis was conducted to estimate required sample size in G*Power 3.1 (Faul, Erdfelder, Buchner & Lang, 2009). An alpha level of .05 was used to determine if *p* values were significant. Using linear multiple regression, the input parameters were set at a power level of .80 and an alpha level of .05. Effect size was selected at .01 based on a small effect. Results indicated a sample size of 143 would be required to achieve sufficient power in the current study. Correlations between variables will be observed using the Pearson's correlation coefficient using SPSS (version 25.0).

Results

Data Analysis

All data analysis utilised IBM SPSS Statistics version 25 (IBM Corp., 2017). Prior to main data analysis, all data were examined to confirm underlying assumptions of normality and homogeneity were met. Thirteen outliers were identified based on violation of two of the regression diagnostic tests, and one respondent violated the three tests. The cut-off score for

Mahalanobis' distance was set at 12.59 using a critical chi-square value table and reports the distance of a case from the centre of all cases for multivariate outliers (Mahalanobis, 1936), Cooks distance was set at .020 (Cook, 1977), where any scores above indicate outliers that may negatively affect the regression model. and a leverage value of .047 was used to observe any extremely large data values (Rousseeuw & van Zomeron, 1990). When examined individually, three participants responses had extreme scores on at least one of the measures and thus were removed, and the remaining respondents were within the logical range of responses and were therefore retained in the analyses. Homoscedasticity and linearity were examined, and assumptions were met through inspection of a scatterplot of standardised residuals, which indicated good consistency of spread through the data points, and a histogram of standardised residuals showed the data was comprised of adequately normally distributed errors. Similar results were yielded from the standardised P-P plot where residuals ran close along the line indicating linearity, and therefore the required assumptions for analysis were considered to be met. Hayes' (2013) PROCESS macro Version 3.3, was used to test whether self-compassion mediated the relationship between interoceptive awareness and difficulties with emotional regulation. PROCESS is a method testing linear multiple regression, producing an appropriate test of the indirect effects in mediation, allowing for more conclusive inferences to be drawn. This method estimates the standard errors of the direct and indirect effects, as well as the confidence intervals, using a resampling bootstrap procedure. Indirect effects were run for each of 10,000 bootstrapped samples. Age, gender, ethnicity and level of education were included as covariates to control for their influence on potential relationships between the three variables. A significant effect was found if the 95% confidence interval (CI) does not cross the value of zero.

Sample Characteristics

A total of 232 participants contributed to the overall sample for data analysis. An independent samples t-test found no systematic differences between those who did (*n*= 209*)* and did not complete all three measures incomplete responses (*n*= 20*),* and therefore incomplete responses were removed from further analysis. Analysis was conducted using pairwise One participant did not report their age and therefore was removed using listwise deletion to ensure the sample size was the same within all groups. Two-hundred-and-eight participants were included in final analysis and were between 18 and 66 years (*M*= 26, *SD*= 11.84). Fifty-four percent participants had completed high school or less, 28.8% had completed a degree or diploma, 8.5% had completed a technical qualification and 5.5% had completed a postgraduate degree. Seventy-eight percent were Caucasian, 11.4% Asian, 1.3% Aboriginal and/or Torres Strait Islander, 1.7% African and 4.7% other. Demographic differences were examined to ascertain any differences between the three main variables (interoceptive awareness, self-compassion, emotional regulation). Means and Standard Deviations are reported in Table 1. Furthermore, a series of correlations were conducted to assess the relationship between age of participants and the main variables.

Results from a series of one-way ANOVAs only found statistically significant differences between participant education level on degrees of emotional regulation and self-compassion. The homogeneity of variance was assumed for these two variables, and accordingly, post-hoc tests with Bonferroni adjustments were used. Analyses revealed participants with a postgraduate degree had significantly higher levels of self-compassion compared to those with a degree/diploma (p <.001), high school or less education (p = .007) and technical qualifications (p = .036). Furthermore, those with a high school or less level of education had significantly greater scores of emotional regulation difficulties compared to those with a degree/diploma (p <.001) and those holding a postgraduate degree (p <.001). As such, education was included as a covariate in subsequent analyses. There were no significant

differences found in ethnicity or gender within the variables and thus were not included as covariates.

Correlational analyses revealed small significant relationships between age with self-compassion and emotional regulation, whereby older participants had significantly higher levels of self-compassion, $r = .24$, $p < .001$, and significantly lower levels of emotional dysregulation, $r = -.35$, $p < .001$. As a result, age was included as a covariate in subsequent analyses.

Table 1.

Means (and Standard Deviations) of Participants' Characteristics by Interoceptive Awareness, Self-Compassion, and Emotional Regulation.

Demographic Characteristic and Subcategory	*n*	Variable		
		Interoceptive Awareness	Self-Compassion	Emotional Regulation
Gender				
Male	48	110.27 (17.08)	3.00 (0.63)	90.26 (27.29)
Female	159	105.82 (19.04)	2.94 (0.76)	88 (20.22)
Prefer not to specify	2	98.50 (0.71)	3.33 (0.04)	76 (1.41)
		$F(2,206) = 1.26$, $p = .285$	$F(2,31.4) = .89$, $p = .417$*	$F(2,105.9) = 1.14$, $p = .325$*
Education Level				
High School or less	123	105.42 (18.14)	2.87 (0.70)	96.37 (25.30)
Technical Qualification	18	112.33 (22.93)	3.04 (0.75)	83.72 (24.02)
Degree/ Diploma	60	106.55 (17.64)	2.99 (0.74)	81.02 (23.38)
Postgraduate Degree	8	116.63 (20.12)	3.88 (0.59)	63.25 (12.59)
		$F(3, 205) = 1.52$, $p = .211$	$F(3, 205) = 3.15$, $p = .002$	$F(3, 205) = 9.15$, $p<.001$
Ethnicity				
Caucasian	164	106.58 (19.78)	2.95 (0.78)	89.09 (25.96)
Asian	27	106.41 (11.76)	3.01 (0.48)	89.81 (24.50)
African	4	102.50 (4.65)	2.89 (0.16)	107.25 (12.84)
Aboriginal/Torres Strait Islander	3	116.33 (20.55)	3.20 (0.65)	78.00 (16.09)
Other	11	109.45 (17.66)	2.91 (0.71)	93.55 (30.30)
		$F(4, 9.15) = 0.47$, $p = .760$*	$F(4, 14.09) = 0.25$, $p = .903$*	$F(4, 204) = 0.70$, $p = .592$

Notes. *The Brown-Forsythe omnibus ANOVA result was reported when the homogeneity of variance assumption was violated.

Bivariate relationship between variables

Pearson's correlation coefficients were conducted to assess relationships between study variables. Potential continuous confounding variables included age, gender, level of education and ethnicity and bivariate correlations between the predictor, mediator, outcome and control variables are presented in Table 2. The results indicate relationships between key variables were all significant. Interoceptive awareness was significantly negatively correlated with difficulty with emotional regulation and the relationship was of moderate effect. Self-compassion was significantly negatively correlated with difficulties with emotional regulation, the large magnitude of the effect suggests there is a strong relationship between these two variables and those who scored high on self-compassion scored lower on difficulties with emotional regulation. Lastly, interoceptive awareness was significantly positively correlated with self-compassion, and this relationship was of a moderate effect. Participants who reported high levels of interoceptive awareness reported having high levels of self-compassion and vice-versa. Table 2 also reports the bivariate relationships between age, the predictor and outcome variables. Self-compassion was shown to have a particularly strong correlation with difficulties in emotional regulation, as well as a significant correlation with interoceptive awareness.

Interestingly, interoceptive awareness had significant correlations with emotional regulation difficulties but no significant correlations with age (r = -.02, p= .774). Age showed significant negative correlations with difficulties in emotional regulation (r = -.35, p<.001), indicating that increased age is related with fewer emotional regulation difficulties. There were also significant positive correlations between age and self-compassion (r = .24, p<.001). It was noted participants who were higher in age reported higher levels of self-compassion, and similarly those with higher level of education also reported higher self-compassion.

Table 2.

	1	2	3	4	5
1. Interoceptive awareness	1				
2. Difficulties in Emotional Regulation	-.41**	1			
3. Self-Compassion	.43**	-.76**	1		
4. Age	-.02	-.35**	.24**	1	

Note. ** p<.01. Correlation Matrix of interoceptive awareness, difficulties in emotional regulation, self-compassion and age (n=208).

Testing of the Mediation Model

Figure 4 reports the unstandardised regression coefficients as well as the 95% confidence intervals for the direct pathways between variables. Results from the analysis indicate interoceptive awareness was a significant predictor of self-compassion (*b*= .017, SE= .002, p<.001; *a* pathway in figure 3), and age was found to be significant in this pathway (*b* =.015, SE= .004, p<.001). Self-compassion was also found to be a significant predictor of difficulties in emotional regulation (*b*= -22.437, SE= 1.731, p<.001; *b* pathway in figure 3) and age was significant in these pathways (*b*= -.280, SE= .105, p< .01), as was level of education (*b*= -4.218, SE= 1.234, p<.001). The indirect effect of interoceptive awareness on emotional regulation difficulties through self-compassion was significant, *b* = -.385, SE= .063, 95% CI [-0.51, -.26]. However, results also indicate a direct effect between interoceptive awareness and emotional regulation. The direct pathway found interoceptive awareness was significantly found to be negatively associated with emotional regulation difficulties while controlling for covariates, *(b* = -.169, SE= .067, p<.05; path c' in the model

in figure 3), showing interoceptive awareness has a reduced association with difficulties in emotional regulation independently of self-compassion's association with emotional regulation difficulties.

Furthermore, a Sobel test was utilised to test the reduced mediation effect and indicated the pathway from the independent variable (interoceptive awareness) to the mediator (self-compassion), to the outcome (difficulties in emotional regulation) was statistically significant (z=-6.20, p<.01), with the total effect model explaining 33% of the variance in difficulties in emotional regulation, R^2= .323, F(3, 204) = 32.47, p<.001. As shown in Figure 2, the associations between self-compassion and interoceptive awareness and difficulties in emotional regulation were significant. To ensure the effects of confounding variables could be confidently excluded, we ran the mediational model again and found only a small increase in the mediational effect, which may be due to interoceptive awareness having no significant correlation with any covariate variables individually.

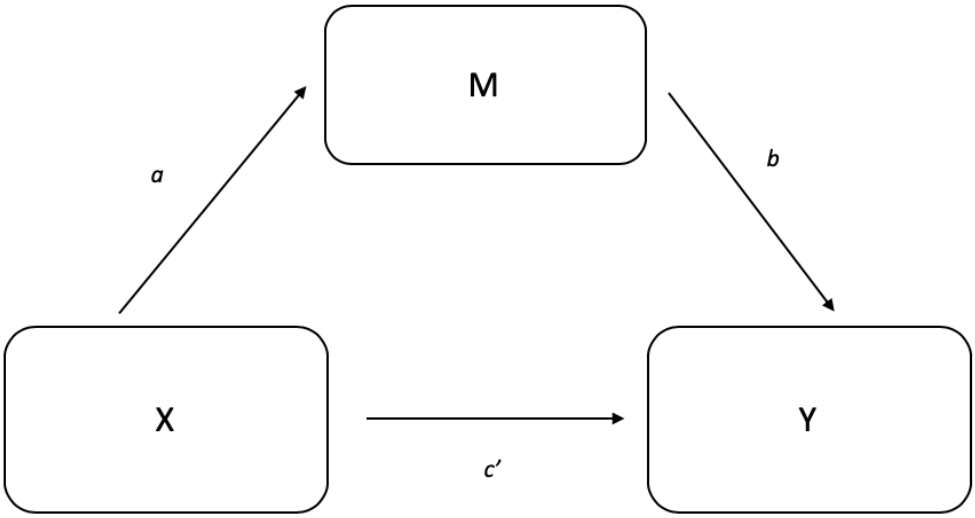

Figure 3. Generic mediation model pathways being tested (on the basis of Baron & Kenny, 1986). X represents the independent variable (IA), M represents the mediating variable (SC), and Y is the dependent variable (Difficulties in ER). Adapted from "Emotion Regulation Conceptual Foundations," by J.J Gross, and R.A. Thompson, 2007, In Gross, J. J. (Ed.). Handbook of Emotion Regulation., p. 3-24. New York, NY: The Guilford Press.

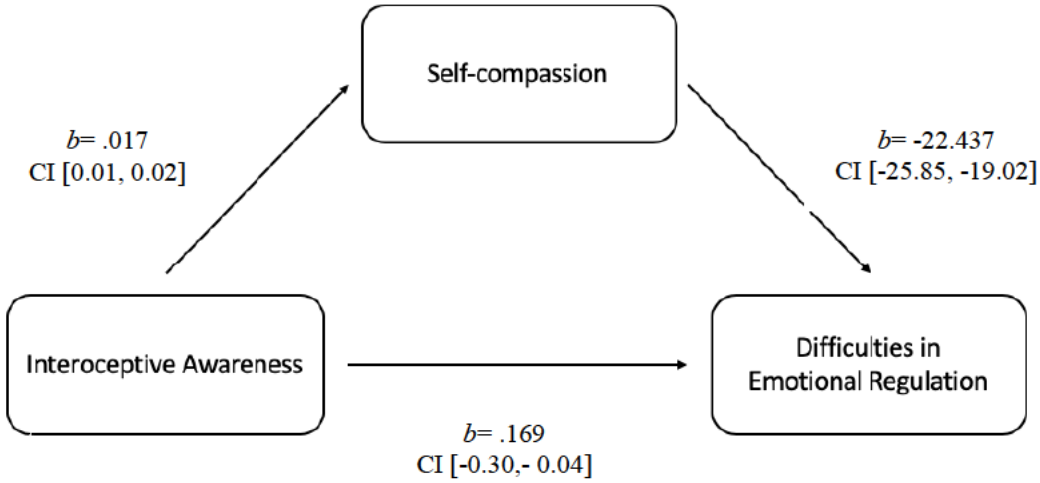

Figure 4. Mediation model (on the basis of Baron & Kenny, 1984), with unstandardised regression coefficients and 95% confidence intervals for the association between interoceptive awareness on difficulties with emotional regulation as mediated by self-compassion.

DISCUSSION

Emotional Regulation has recently developed as a growing field of research (Lopez & Denny, 2019; DeSteno et al., 2013; Koole, 2009; Massah et al., 2016). However, to the best of our knowledge, no research has been undertaken regarding the role of interoceptive awareness and compassion towards oneself in encouraging adaptive emotional regulation. The findings from the current study build on previous research by establishing evidence for a relationship between interoceptive awareness and self-compassion on emotional regulation

following the framework of the process model of emotional regulation, as these associations had not previously been researched. The present study explored how individuals' conscious ability to pay attention to and understand their internal bodily signals, along with their kindness towards themselves may associate with the emotional regulation process, particularly the attention phase and the appraisal phase through cognitive change. This study measured the associations between interoceptive awareness, self-compassion and difficulties in emotional regulation. As predicted, interoceptive awareness and self-compassion were significantly associated with reduced difficulties in emotional regulation, and interoceptive awareness and self-compassion were also significantly associated. The association between emotional regulation and interoceptive awareness was significantly mediated upon inclusion of self-compassion, however, although a reduction in effect was observed, a significant direct pathway between interoceptive awareness and emotional regulation remained present without self-compassion. Age was significantly correlated with association with self-compassion and emotional regulation but not interoceptive awareness. Overall, these results indicate initial support for the importance of targeting interoceptive awareness and self-compassion in interventions designed to reduce emotional regulation difficulties. Accordingly, the following discussion encompasses a reflection of the results by exploring theoretical and methodological explanations, along with considering practical implications and discussing future research directions.

Firstly, examination of the relationship between interoceptive awareness and emotional regulation found a significantly negative association. In support of the hypotheses, higher levels of interoceptive awareness was significantly related to lower levels of difficulties with emotional regulation. This is consistent with previous research on emotional regulation, whereby those more responsive to interoceptive signals and information, possess a

greater awareness of an emotional cue earlier resulting in more time to manage the response in an appropriate manner (Barrett et al., 2001; Price & Hooven, 2018; Anestis et al., 2011). As such these findings suggest the ability to perceive our internal signals is a powerful factor influencing our ability to regulate emotion, and interoceptive awareness may encourage the employment of different strategies for emotional regulation in providing feedback of the experienced emotional state across a variety of bodily variables (Füstös et al., 2013). In accordance with Gratz & Roemer's (2004) multidimensional model of emotional regulation, those who struggle with identifying, understanding or accepting emotional states may struggle to access adaptive coping strategies, and thus struggle to regulate their emotional response. Therefore, interoceptive awareness is important to consider in emotional regulation interventions as it is critical in developing a subjective sense of self and our emotions (Craig, 2003; Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004). Although higher levels of interoceptive awareness is correlated with greater arousal and experience of intense emotions it has been found to associate with greater emotional regulatory capacity (Herbert, Pollatos & Schandry, 2007). The present study's results highlight interoceptive awareness assists in decreasing the likelihood of difficulties in emotional regulation from developing. This can be further explained through the embodiment perspective (Schachter, 1959), whereby psychological processes are influenced by emotions and sensory systems within the body. Evaluating internal sensations efficiently along with the emotional stimuli permits a greater length of time to appraise the situation, therefore, allowing time to select an appropriate regulation strategy and respond to suit the situation (Price & Hooven, 2007).

Further, self-compassion is beneficial in the regulation of emotion as it activates a self-soothing system when evaluating emotions (Leary et al., 2007). This occurs as emotional regulation requires appraisal of the contextual emotional stimuli, by which, self-kindness assists in the reduction of difficulties in regulation emotion (Inwood & Ferrari, 2018). In light

of the current literature, the second hypothesis was also supported as lower levels of self-compassion was associated with higher levels of emotional regulation difficulties (Bakker, Cox, Hubley & Owens, 2019; Diedrich et al., 2016). A potential explanation for this relationship could be that self-compassion may assist emotional regulation by not only encouraging the individual to be mindfully aware of the situation but also acknowledging alternative reasons for negative situations (Gross, 1998). Consistent with the aforementioned example of cognitive reappraisal, when receiving a rude comment, reappraisal of the immediate negative emotional reaction by acknowledging tiredness or stress as a common occurrence, adjusts evaluation of the event to acknowledge external reasons behind the comment (reappraisal towards common humanity) rather than a personal attack (Memedovic et al., 2010). A proposed mechanism of action is that self-compassion has been shown to decrease defensiveness following presentation of socially threatening situations and negative life events, therefore it is indicative that self-compassion assists in protecting oneself from instinctive defensive responses to evaluation of a negative emotional stimuli (Arch et al., 2014; Leary, Tate, Adams, Allen & Hancock, 2007). The results from the current study support the notion that self-compassion is significantly involved in the development of the emotional regulation continuum, through which re-evaluating and accepting mistakes in the appraisal phase of the emotional regulation continuum may help the individual avoid becoming overwhelmed by the emotional situation and promote manageable regulation strategies (Price & Hooven, 2018). Furthermore, by keeping a mindful attitude, it allows the upregulation of an accepting mindset, where individuals consider and accept stressful situations and avoid implementing maladaptive emotional regulation strategies (Castilho et al., 2017).

To the best of our knowledge this study was the first to investigate the relationship between the construct of interoceptive awareness and self-compassion. Studies have

previously recognised the importance of interoceptive awareness in the development of mindfulness, and the ability to sustain attention toward current experiences with a positive attitude involving openness, curiosity, and self-compassion (Bishop et al, 2004; Kabat-Zinn, 1990; Price & Hooven, 2018). As such, the current study predicted a positive relationship between interoceptive awareness and self-compassion. Our findings were in support of this hypothesis, as participants with greater interoceptive awareness scores also had higher levels of self-compassion. This is unsurprising, as previous theoretical models have demonstrated those with greater perceptual ability can distinguish between making a good or bad metacognitive decision, and consequently may be more likely to accept responsibility for their mistakes and failures in a kind manner, as well as taking initiative when personal changes are needed (Allen et al., 2012; Garfinkel et al., 2015). Moreover, a study conducted by Fissler et al. (2016) found mindfulness interventions increase regulation of attention to internal sensations caused by distress within those with clinical depression, as well as reports of having greater trust in their body and a decreased tendency to worry about sensations of discomfort. These results were additionally generalised to a healthy population (Bornemann, Herbert, Mehling & Singer, 2014), with findings from the current study further solidifying this relationship. Taken together, it can be inferred that the relationship between interoceptive awareness and self-compassion may be bidirectional, whereby interoceptive feedback assists in focusing attention back to internal bodily signals for processing and evaluation of emotional responses to external situations (Kerr, Sacchet, Lazar, Moore & Jones, 2013). However, further research is warranted to specifically examine the direction between interoceptive awareness and self-compassion.

The literature suggests interoception facilitates emotional regulation in mindful practices, and cognitive reappraisal acts as an effective emotion regulation strategy for the

management of negative emotions by diminishing the emotional experience, and subsequently enhancing health and wellbeing (Corcoran et al. 2009; Diedrich et al., 2016; Holzel et al., 2011; Memedovic et al., 2010). As such, it is plausible to suggest that those with higher levels of self-compassion may be predisposed to have higher levels of interoceptive awareness, and a better ability to regulate their emotions. In the final objective of this study, it was predicted the link between interoceptive awareness and difficulties in emotional regulation would be mediated by self-compassion. No previous studies have considered the mediating effects of self-compassion on ability to perceive and evaluate internal signals and therefore, the proceeding insights from the results are the first of this nature. As expected, the effect of interoceptive awareness on difficulties in emotional regulation was found to be mediated by self-compassion, as the strength of the association between interoceptive awareness and difficulties in emotional regulation was reduced. Self-compassion encourages acceptance of negative feelings without growing overwhelmed, consequently perceiving internal bodily sensations calmly and managing emotional output (Scoglio et al., 2018). However, the direct effect found interoceptive awareness was also significantly associated with fewer difficulties in emotional regulation independently of self-compassion. Braun, Park & Gorin (2016) postulate self-compassion training has the potential to promote increased interoceptive awareness explicitly or implicitly by inducing self-soothing and non-reactivity during unpleasant emotional cues that are vulnerable to misinterpretation or suppression. This suggests while self-compassion may facilitate the benefits of interoceptive awareness on problems regulating emotion, it is important to have the capacity to understand our internal sensation in order to regulate emotions. In general, individuals who trust their body, and approach life with greater self-compassion appear to experience greater control over their emotional outcomes (Fissler et al., 2016). The present study is the first to provide any support for this theory.

Research has shown that self-compassion programmes have some success in combatting emotional dysregulation (Hutchison, Huws & Dorjee, 2017; Bluth & Eisenlohr-Moul, 2017; Bluth, Gaylord, Campo, Mullarkey & Hobbs, 2016). However, it has been suggested that appraisal of physiological sensations is an influential factor in altering the emotional trajectory in this phase helping to reduce the emotional response, as evaluation is thought to occur before the emotive stimuli has entirely developed (Gross & John, 2003; Ochsner & Gross, 2004). The findings from the current study theoretically support the notion that self-compassion occurs within the appraisal phase of the emotion regulation continuum and extend the aforementioned findings by indicating appraisal of the emotional stimuli with greater self-compassion is linked to decreased maladaptive emotional responding. Age was shown to have a statistically significant association with self-compassion and emotional regulation but not interoceptive awareness. Indicating there is a role for individual differences such as age, in ability to regulate emotion, and in particular those with a greater capacity to appraise between distinct emotional states, as opposed to treating all experiences as a direct positive or negative experiences toward themselves (Barrett et al., 2001). The results from the one-way ANOVA found individuals who had completed a higher level of education i.e. postgraduate degree, had better self-compassion. Age was also found to negatively correlate with emotional regulation difficulties, indicating the older an individual the more likely they are to have adaptive emotional regulation. Research by Livingstone, Castro & Isaacowitz (2018), suggest this may be due to differences in emotional regulation strategies, as young adults tend to use strategies such as avoidance and rumination, which may decline with age as individuals experience different emotions and acquire skills to more effectively deal with emotions from past experiences. Those who often use regulatory mechanisms may build an automatic response to a large range of interoceptive and self-compassionate representations (including both mindful strategies and cognitive reappraisal) strengthened by the regular use

of such strategies (English et al, 2018). Therefore, older individuals may be able to easily represent their emotional experience in a finely differentiated way without effort or intent (Gross, 2007).

As explained previously, poor emotional regulation has been identified as a transdiagnostic risk factor for the development of negative mental health outcomes and psychopathologies such as disordered eating, social anxiety and depression, and evidence suggests this is particularly pertinent in adolescence (Gouveia, Canavarro & Moreira, 2019; Hofmann, Sawyer, Fang, & Asnaani, 2012; Kaufman et al., 2015; Masters, Zimmer-Gembeck & Farrell, 2019). Therefore, by promoting factors such as self-compassion and interoceptive awareness that appear to be associated with better adaptive regulation strategies, it may not only encourage better capabilities for responding to emotional distress later in life, but also lower the risks of developing some psychopathologies and health conditions (Price & Hooven, 2017). However, further research is required to construct a more comprehensive understanding of self-compassion on interoceptive awareness as factors in emotional regulation.

Implications of these findings suggest that interoceptive awareness and self-compassion may be of benefit in emotional regulation interventions to a non-clinical population. As proposed by Hanley et al. (2017), the ability to evaluate both internal and external experiences is related with our attention to internal sensations, and the ability to be mindful of these sensations without reacting is suggested to be related with the ability to attend to these sensations to regulate the emotional distress by trusting one's body and considering it a safe place. An experimental study conducted by Diedrich et al. (2014), found when comparing the effects of self-compassion with cognitive reappraisal, self-compassion showed a greater effect in regulating emotion when higher levels of depression were present in those with Major Depressive Disorder. Whilst current research explicitly examines self-

compassion and emotional regulation in clinical samples (Diedrich et al., 2014; Gouveia et al., 2019; Scoglio et al., 2015), our findings show self-compassion is connected with reduced difficulties in emotional regulation in healthy populations.

Our research provides empirical findings in two factors that assist in reduction of overall difficulties in emotional regulation individuals face in daily life. Importantly, self-compassion is a teachable skill (Smeets, Neff, Alberts & Peters, 2014), and therefore could be valuable in potential interventions targeting self-compassion in a therapeutic capacity and in a broader public health setting to encourage greater adaptive emotional regulation.

Establishing these psychological and physiological correlates of emotional regulation is beneficial as it provides important information to create prevention and intervention programs for those with poor emotional regulation, the current study's findings indicate self-compassion associates with the evaluation of emotional and physiological stimuli effectively reducing troubles in regulating emotion. Research indicates that self-compassion programmes have some success in combatting emotional dysregulation (Hutchison, Huws & Dorjee, 2017; Bluth & Eisenlohr-Moul, 2017; Bluth, Gaylord, Campo, Mullarkey & Hobbs, L, 2016), and as such, there is value in investigating the effectiveness of an intervention that could enhance greater outcomes with the inclusion of mindful practices to teach self-compassion skills. Katterman, Kleinman, Hood, Nackers and Corsica (2014) propose that encouraging mindful awareness of internal states such as emotional cues and bodily sensations enhances greater self-acceptance, cognitive capacities and the capability of responding adaptively to negative emotions. Additionally, our results indicate those greatest in self-compassion were those who had completed a postgraduate degree, whilst high school or less completers had the lowest average self-compassion score.

To the best of our knowledge, there has been no current research on interventions within a school context, and therefore, it may be beneficial to design programs teaching

mindfulness similar to MABT or mindfulness-based interventions (MBI's; Price et al., 2019; Renshaw, Fischer & Klingbeil, 2017). MABT develops interoceptive skills and self-awareness to promote adaptive emotional regulation in daily life and chronic illness, and has been shown to have longitudinal effects, however this intervention has only been researched in clinical populations (Price & Hooven, 2018; Price, Thompson, Crowell & Pike, 2019). Implementation of such programs within schools is plausible according to the results of the present study and would encourage greater self-compassion at the schooling level and, therefore promoting greater psychological functioning and tools for emotional regulation in adolescents.

A considerable limitation that should be noted in lack of conclusive evidence drawn due to the cross-sectional study design. is being unable to confidently ascertain the mechanisms underlying the effectiveness of the interoceptive awareness and self-compassion on emotional regulation. The analyses presented in this study were correlational and therefore no causal relationship between interoceptive awareness, self-compassion and emotion regulation can be inferred. While higher levels of self-compassion have been suggested to protect against difficulties in regulating emotion (Castilho et al., 2017), it may also be that fewer difficulties in emotional regulation may promote higher compassion towards oneself (Chishima, Mizuno, Sugawara & Miyagawa, 2018). Furthermore, research is warranted into the direct relationship between interoceptive awareness and self-compassion in a controlled study which would allow for stronger conclusions, as understanding their association could have theoretical and clinical benefits for future therapies.

The absence of screening for diagnosed psychological conditions which may affect emotional regulation further limits inferences that can be made regarding general population assumptions. Whilst our research aimed to focus on emotional regulation in terms of creating general aptitude for better emotional regulation in daily life, it would be worthwhile

examining in detail whether self-compassion and interoceptive awareness provide similar results in disorders where individuals struggle to regulate emotion, such as autism spectrum disorders and Attention Deficit/Hyperactivity Disorder (Cibralic, Kohlhoff, Wallace, McMahon & Eapen, 2019; Hirsch, Chavannon & Christiansen, 2019). Furthermore, future studies investigating emotional regulation in a more comprehensive approach might look to employ questionnaires such as Gross & John's Emotional Regulation Questionnaire (2003), a 10-item scale of which measures the effect of cognitive reappraisal on emotional regulation and self-compassion, as well as expressive suppression. While our research highlights the relationship between self-compassion, emotional regulation and interoceptive awareness, this cannot be said with complete confidence as to what strategies self-compassion and interoceptive awareness interact with. To increase confidence in future findings, research should incorporate more specific measures of emotion regulation investigating adaptive regulation as well as different strategies, and the direct role self-compassion has in encouraging adaptive techniques such as cognitive reappraisal.

In summary, the present study aimed to address a significant gap in the literature and demonstrated the positive effect of self-compassion on emotional responding and understanding internal physiological signals. Primarily, the present study concludes that self-compassion and interoceptive awareness contribute to overall well-being particularly in relation to emotional regulation. These findings give insight into two factors that potentially assist in individuals accessing effective coping mechanisms to manage everyday challenges. This may provide valuable pathways in public health promotion of effective and adaptive emotional regulation, as well as providing important research for the development of interventions and therapies to assist in the treatment of disorders associated with difficulties in emotional regulation. Importantly, we recommend targeting self-compassion may be a promising inclusion to current therapies improving emotional regulation. As discussed,

consideration in developing programs to implement in settings such as schools to encourage individuals to be more self-compassionate will be beneficial. For the general population, employing greater self-compassionate strategies such as mindfulness may lead to further access to, and development of, internal resources and strategies to cope with negative situations in everyday life and improved emotion regulation. Further exploration into the utility of targeting poor emotional regulation via promotion of interoceptive awareness and self-compassion is necessary, as this may provide information regarding important pathways for the reduction of regulatory difficulties leading to psychopathologies.

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Appendix A: Social Media post

Advertisement to survey link (social media and/or email)

Would you like to be a part of a research project in psychology looking at how we understand our bodies and emotions?

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

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

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

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

Appendix B: Physical flyer used for participant recruitment

(3)

THE UNIVERSITY of ADELAIDE

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

If so, then the University of Adelaide invites you to participate in a study that will form the basis for three Honours projects being conducted by Erina Barker, Jessica Szulc and Isabella Ferraro respectively under the supervision of Dr. Amanda Taylor. These projects are interested in investigating how we understand our body based experience of emotion (interoceptive awareness), and how this may link to other factors like our relationships, how we appreciate our bodies, and how we understand and cope with feelings.

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

www.surveymonkey.com.au/XXXXXXXXXXX

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

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

amanda.taylor@adelaide.edu.au
www.surveymonkey.com.au/XXXXXXXXXX

amanda.taylor@adelaide.edu.au
www.surveymonkey.com.au/XXXXXXXXXX

amanda.taylor@adelaide.edu.au
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amanda.taylor@adelaide.edu.au
www.surveymonkey.com.au/XXXXXXXXXX

Appendix C: Demographic Questionnaire

Survey Measures

What is your gender?

- ○ Female
- ○ Male
- ○ Other
- ○ Prefer not to specify

What is your age? (In whole years)

[ ]

What is the highest level of education you have completed?

- ○ Completed Primary School
- ○ Completed High School
- ○ Technical qualification (e.g., Certificate III)
- ○ Degree or diploma (e.g., Bachelors degree, Graduate diploma)
- ○ Postgraduate degree (e.g., Masters, Doctorate)

What is your marital status?

- ○ Single
- ○ Married
- ○ Defacto
- ○ Divorced
- ○ Other

What is your current height (cm)?

[ ]

What is your current weight (kgs)?

What is your ethnicity?

- ○ Caucasian or White
- ○ Aboriginal and/or Torres Strait Islander
- ○ Asian
- ○ African
- ○ Other (please specify) .....

Appendix D: Difficulties in Emotional Regulation Scale (DERS)

DERS-18

Response categories:

1	2	3	4	5
Almost Never (0-10%)	Sometimes (11-35%)	About Half the Time (36-65%)	Most of the Time (66-90%)	Almost Always (91-100%)

1. _____ I pay attention to how I feel.
2. _____ I have no idea how I am feeling.
3. _____ I have difficulty making sense out of my feelings.
4. _____ I am attentive to my feelings.
5. _____ I am confused about how I feel.
6. _____ When I'm upset, I acknowledge my emotions.
7. _____ When I'm upset, I become embarrassed for feeling that way.
8. _____ When I'm upset, I have difficulty getting work done.
9. _____ When I'm upset, I become out of control.
10. _____ When I'm upset, I believe that I will remain that way for a long time.
11. _____ When I'm upset, I believe that I'll end up feeling very depressed.
12. _____ When I'm upset, I have difficulty focusing on other things.
13. _____ When I'm upset, I feel ashamed with myself for feeling that way.
14. _____ When I'm upset, I feel guilty for feeling that way.
15. _____ When I'm upset, I have difficulty concentrating.
16. _____ When I'm upset, I have difficulty controlling my behaviors.
17. _____ When I'm upset, I believe that wallowing in it is all I can do.
18. _____ When I'm upset, I lose control over my behaviors.

Original DERS (36 item) Citation: Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41-54.

DERS-18 (18 item) Reference: Victor, S. E., & Klonsky, E. D. (2016). Validation of a brief version of the Difficulties in Emotion Regulation Scale (DERS-18) in five samples. *Journal of Psychopathology and Behavioral Assessment, in press.*

APPENDIX E: Multidimensional Assessment of Interoceptive Awareness (MAIA-2)

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

	Never					Always
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

APPENDIX F: Self-Compassion Scale

HOW I TYPICALLY ACT TOWARDS MYSELF IN DIFFICULT TIMES

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never				Almost always
1	2	3	4	5

_____ 1. I'm disapproving and judgmental about my own flaws and inadequacies.

_____ 2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.

_____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.

_____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.

_____ 5. I try to be loving towards myself when I'm feeling emotional pain.

_____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.

_____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.

_____ 8. When times are really difficult, I tend to be tough on myself.

_____ 9. When something upsets me I try to keep my emotions in balance.

_____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.

_____ 11. I'm intolerant and impatient towards those aspects of my personality I don't like.

_____ 12. When I'm going through a very hard time, I give myself the caring and tenderness I need.

_____ 13. When I'm feeling down, I tend to feel like most other people are probably happier than I am.

_____ 14. When something painful happens I try to take a balanced view of the situation.

_____ 15. I try to see my failings as part of the human condition.

_____ 16. When I see aspects of myself that I don't like, I get down on myself.

_____ 17. When I fail at something important to me I try to keep things in perspective.

_____ 18. When I'm really struggling, I tend to feel like other people must be having an easier time of it.

_____ 19. I'm kind to myself when I'm experiencing suffering.

_____ 20. When something upsets me I get carried away with my feelings.

_____ 21. I can be a bit cold-hearted towards myself when I'm experiencing suffering.

_____ 22. When I'm feeling down I try to approach my feelings with curiosity and openness.

_____ 23. I'm tolerant of my own flaws and inadequacies.

_____ 24. When something painful happens I tend to blow the incident out of proportion.

_____ 25. When I fail at something that's important to me, I tend to feel alone in my failure.

_____ 26. I try to be understanding and patient towards those aspects of my personality I don't like.

APPENDIX G: Participant consent form

(2)

THE UNIVERSITY of ADELAIDE

Human Research Ethics Committee (HREC)

CONSENT FORM

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

Title:	Exploring associations between multidimensional interoceptive awareness and attachment, body image, and emotional regulation.
Ethics Approval Number:	**Researcher to insert this number (allocated once the project has been approved.**

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

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

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

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

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

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

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

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

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

Version 1 Date: 05/04/2019

APPENDIX H: Relevant Mental Health Resources

Exploring associations between multidimensional interoceptive awareness and attachment, body image, and emotional regulation.

Contact Details and Health Services

If you have any questions about the research, or would like a brief description of results sent to you after the study is completed, please contact [redacted]

If you have experienced any distress while completing the survey, the following services are available to offer support:

BeyondBlue (Mental Health and Wellbeing)
Reach Out Australia (Mental Health and Wellbeing)
Lifeline Australia (Crisis Support and Suicide Prevention)
The Butterfly Foundation (Body Image and Eating Disorders)

If you are concerned about your health, Health Direct can link you to appropriate health services:
PH: 1800 022 222
https://www.healthdirect.gov.au

Thank you for participating in our survey, your responses are greatly appreciated. Please click done to submit the survey.

APPENDIX I: Participant Information Sheet

(1)

THE UNIVERSITY of ADELAIDE

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: Exploring associations between multidimensional interoceptive awareness and attachment, body image, and emotional regulation.
HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: [redacted]
PRINCIPAL INVESTIGATOR: Dr. Amanda Taylor
STUDENT RESEARCHERS: Erina Barker, Isabella Ferraro and Jessica Szulc
STUDENT'S DEGREE: Honours Degree Bachelor of Psychological Science

Dear Participant,

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

What is the project about?

Interoceptive awareness, or the ability to understand and utilize body cues as markers of emotion, has been identified as a potential precursor to many positive and negative psychological outcomes. However, its association with some aspects of psychological functioning (e.g., self-compassion and functioning in interpersonal relationships) has not yet been explored. The present study aims to explore the association between interoceptive awareness and relevant psychological outcomes, and investigate factors that may contribute to and explain these relationships.

This survey comprises of several measures related to interoceptive awareness and relevant psychological factors to provide data for three individual thesis projects.

Who is undertaking the project?
This project is being conducted by Erina Barker, Jessica Szulc, and Isabella Ferraro. This research will form the basis of the thesis component for an Honours Degree of Bachelor of Psychological Science at the University of Adelaide under the supervision of Dr. Amanda Taylor.

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

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

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

Are there any risks associated with participating in this project?
There are no foreseeable risks, side effects, emotional distress, or inconveniences expected to arise from the study either immediately or following participation. However, if you at any point you begin to feel upset or uncomfortable while completing the survey, you should cease working on it. The contact details of the primary researcher (Dr. Amanda Taylor) and student researchers, along with various mental health support services will be included at the end of the survey.

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

Will I directly benefit from my involvement in this research project?
While there are no direct anticipated benefits from participation in this research project, after completing the survey participants will have the opportunity to enter a draw to win one of two $50 Coles-Myer vouchers. Please note that students who participate in the study for course credit are not able to enter this draw, although they may opt to enter the draw instead of receiving course credit.

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

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

Who do I contact if I have questions about the project?
If you have any questions about the research, please contact Dr. Amanda Taylor via email: [redacted]

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

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

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

Yours sincerely,

Erina Barker, Student
Jess Szulc, Student
Isabella Ferraro, Student

Dr. Amanda Taylor, Supervisor