Mindfulness and Interoception: Potential Mechanisms in the Relationship Between Meditation Practice, Alexithymia and Emotional Affect

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Abstract

Alexithymia describes difficulties in the understanding and expression of emotions due to deficits in emotional regulation. People with alexithymia are more likely to experience emotional affect-related difficulties, contributing to reduced physical, psychological, and social wellbeing. Meditation may be an effective intervention for alexithymia and its associated affect difficulties. However, the mechanisms by which meditation may reduce alexithymia remain unclear. Aims of this study were to investigate both interoception and mindfulness as potential mechanisms in the relationship of meditation practice with alexithymia, and positive and negative affect. A sample ($N = 205$) of undergraduate students and participants recruited from organised meditation groups in Australia were invited to complete an online survey. This survey measured participants' meditation experience, mindfulness, interoception, alexithymia, and positive and negative affect. Simple mediation models showed significant indirect effects, where frequent meditation practice predicted increases in positive affect and decreases in negative affect, through decreases in alexithymia. Further, there were significant indirect effects when both interoception and mindfulness were included as mediators between meditation frequency and alexithymia. For alexithymics high in negative affect, meditation practice focussed on interoception may be effective. Similarly, meditation practice focussed on developing mindfulness, in particular focussed on maintaining awareness of the self, whilst maintaining non-reaction and non-judgment of experience, may be effective for both positive and negative affect in alexithymic individuals. Therefore, frequent meditation practice, with an emphasis on developing interoception and mindfulness, may lead to reductions in alexithymia and to more balanced emotional affect outcomes.

Keywords: Alexithymia, Emotional Affect, Interoception, Meditation, Mindfulness

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: Christian Rene Ceccon

Date: 27 September 2021

Contribution Statement

In writing this thesis, my supervisor, Dr. Michael Proeve, generated the research topic, and we collaborated to construct relevant research questions and to design the appropriate methodology. Jasmin Taylor and I collaborated to complete a shared ethics application and shared the responsibility of recruiting participants. I was responsible for conducting the literature review, constructing the Qualtrics survey, data collection and cleaning, and the statistical analyses (with advice from my supervisor). I also wrote up all aspects of my thesis independently.

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Mindfulness and Interoception: Potential Mechanisms in the Relationship Between Meditation Practice, Alexithymia and Emotional Affect

Alexithymia describes difficulties in the understanding and expression of emotions (Timoney & Holder, 2013). It is thought to arise from deficits in emotional valuation, regulation, and bodily awareness (Preece et al., 2017). Alexithymics are more likely to experience both increased levels of negative affect and decreased levels of positive affect, contributing to reduced physical, psychological, and social wellbeing (Connelly & Denney, 2007). Emerging research indicate that alexithymia may be treatable through meditation-based interventions (Norman et al., 2019). Mindfulness and interoception have been highlighted as potential mechanisms of action as they have been shown to play a role in alexithymia (Brewer et al., 2016; Norman et al., 2019). However, inconsistencies in intervention outcomes exist in the literature and it is still unclear how these mechanisms influence alexithymia and its related affective deficiencies (Aaron et al., 2020). This study aims to assist alexithymia research by investigating both mindfulness and interoception as possible mediating mechanisms in the relationship between meditation practice, the presence of alexithymia, and the experience of positive and negative affect. Through this investigation I may be able to help clarify the mechanisms by which meditation practice may be related to improved affect for alexithymics, furthering development of alexithymia-specific interventions.

Alexithymia

Alexithymia (Greek: *a* = lack, *lexis* = word, *thymos* = emotion, literally: "*a lack of words for emotions*") is a personality construct that is typified by difficulties in emotional processing, leading to a lack of emotional expression and understanding (Preece et al., 2017). Typical features of alexithymia are marked difficulties in identifying emotions and feelings, distinguishing emotions from bodily sensations, expressing emotions to other people, and an

externally-oriented thinking style whereby one tends not to focus on their emotions (Ogrodniczuk et al., 2011; Preece et al., 2017; Taylor, 2000). Alexithymia has been described as both a stable personality trait (Taylor & Bagby, 2004) and as a response state (Fukunishi et al., 1997). Despite its classification as a dimensional construct with a normal distribution in the general community (Preece et al., 2017), rates of prevalence for high alexithymia are usually given. The rate of alexithymia is approximately 7-18% in the general population (McGillivray et al., 2017; Norman et al., 2020). However, rates can be significantly higher (30-60%) in clinical populations (Leweke et al., 2012; McGillivray et al., 2017).

Alexithymia is a transdiagnostic risk factor for a broad range of emotion-based psychopathologies and physical disorders. It has been found to be related to depressive disorders (Honkalampi et al., 2000), anxiety and panic disorders (De Berardis et al., 2008), self-harm (Norman et al., 2020), eating disorders (Westwood et al., 2017), and somatic disorders (Mattila et al., 2008; Saariaho et al., 2016). As a construct that is focussed on emotional deficits, alexithymia is also an important risk factor for disruptions in social functioning. Alexithymic individuals routinely become confused when asked to express their emotions (Krystal, 1979). They have increased difficulties in emotional regulation (Connelly & Denney, 2007) and in understanding the emotions of others, which leads to social deficiencies and empathy problems (Lumley et al., 1996; Moriguchi et al., 2007; Moriguchi et al., 2009). Alexithymics also have increased difficulties in labelling emotional facial expressions and show less informative body language (Grynberg et al., 2012; Timoney & Holder, 2013). Ultimately these deficiencies lead to undeveloped social networks with alexithymics having fewer relationships and increased superficiality in those few that they do have (Grynberg et al., 2018; Timoney & Holder, 2013).

In this paper, alexithymia is operationalised according to the attention-appraisal model proposed by Preece et al. (2017). The attention-appraisal model was designed to

incorporate both Lane and Schwartz' (1987) cognitive-developmental theory of emotional awareness and the extended process model of emotion regulation described by Gross (2015a). According to Gross' model, people generate, process, and regulate emotions via valuation systems. These valuation systems comprise four sequential stages of *situation*, *attention*, *appraisal,* and *response*. For example, when a stimulus is presented, attention is focussed upon it; it is then appraised in terms of the individual's values and goals; and a resulting emotion is produced. Emotion regulation then occurs when one valuation system is itself evaluated by the individual as to whether the emotional response is a desired one (Gross, 2015b). Accordingly, in order to reduce the conflict between the current state of their world and the desired state of their world, action is then taken by the individual. According to the attention-appraisal model, alexithymia contains three dimensions; a difficulty identifying feelings (DIF); a difficulty describing feelings (DDF); and an externally-oriented thinking style (EOT) (Preece et al., 2017). EOT is considered to reflect a difficulty at the attention stage, where an alexithymic individual does not properly focus attention on their emotions. DIF and DDF are considered to reflect difficulties at the appraisal stage, where emotions are not well understood or communicated.

Emotional Regulation and Emotional Affect

Emotional regulation is the process by which one influences *how*, *when*, to *what degree*, and *which* emotions a person experiences and expresses (Gross, 2002). As noted, alexithymia manifests during the emotional valuation process. Therefore, if a person has difficulties during the valuation process, then emotional regulation will suffer. Indeed, alexithymia is related to reduced capacity for emotional regulation (Connelly & Denney, 2007; da Silva et al., 2017). Individuals with high levels of alexithymia also tend to utilise less adaptive emotion regulation strategies, with increased usage of emotion suppression and reduced usage of emotional reappraisal (Laloyaux et al., 2015; Swart et al., 2009), a pattern

of behaviour associated with increased levels of negative affect and decreased levels of positive affect (Brockman et al., 2017; Gross & John, 2003).

Emotions exist on a wide spectrum but can be broadly classified into two contrasting valences, positive and negative (Watson et al., 1988). Positive affect refers to emotions such as enthusiasm, interest, and excitement. Negative affect refers to emotions such as guilt, hostility, and irritability. Both positive and negative affect represent the experiential components of evolutionarily adaptive neurobiological systems (Watson et al., 1999). Here, negative affect is part of the behavioural inhibition system that is used to keep us away from potentially dangerous situations. Positive affect is part of the behavioural facilitation system that drives us towards potentially rewarding situations. Certainly, these are both useful and functionally adaptive strategies, but can become unbalanced and misapplied when a person's emotional regulation ability is maladaptive (Watson et al., 1999). People with high levels of positive affect tend to lead healthier lifestyles and utilise better coping strategies, which can lead to better psychosocial outcomes and greater overall happiness (Carr, 2011; Fredrickson, 1998, 2004). Contrastingly, an overwhelming experience of negative affectivity is associated with a wide range of wellbeing deficits and psychopathologies (Carr, 2011; Jeronimus et al., 2014). Therefore, a critical outcome of a healthy emotional regulation system is the ability to successfully select the appropriate emotional response for a given situation.

Alexithymia reflects difficulties in emotional regulation, with a resulting reduction in the usage of healthy and adaptive regulation strategies (such as reappraisal) which can lead to affectivity problems. Indeed, alexithymics routinely exhibit increased negative affect when compared to non-alexithymics (Lumley et al., 1996; Lundh & Simonsson-Sarnecki, 2001; Parker & Taylor, 1997; Taylor et al., 1997). In addition, positive affect has been found to negatively correlate with alexithymia (Lumley et al., 1996; Lundh & Simonsson-Sarnecki, 2001). A 1-year longitudinal study looking at adolescents found that participants with higher

levels of alexithymia experienced a significant reduction in their levels of positive affect at the end of the study (Ciarrochi et al., 2008). Because alexithymic individuals tend to experience emotional imbalance via high levels of negative affect and low levels of positive affect, their subjective wellbeing may suffer (Diener & Biswas-Diener, 2008). It is therefore important that research focusses on possible interventions and treatment options.

Meditation

Evidence suggests that alexithymia may have relative, rather than absolute, stability and therefore is responsive to treatment (Porcelli et al., 2011). Unfortunately, high levels of alexithymia are related to poorer therapeutic outcomes (Vanheule et al., 2011), as alexithymics lack the ability or willingness to investigate their feelings, preferring to focus on somatic symptoms and external details (Ogrodniczuk et al., 2011). Further, alexithymia may act as a barrier in the development of a therapeutic alliance, as practitioners have reported boredom and frustrations when dealing with alexithymic clients (Ogrodniczuk et al., 2011). Consequently, there is a need to investigate alternative methods of treatment for alexithymics (Norman et al., 2019; Pinna et al., 2020). One such intervention receiving increasing attention in the literature is meditation.

Meditation can be conceptualised as a family of complex emotional and attentional regulatory training regimes developed for the cultivation of wellbeing and emotional balance (Lutz et al., 2007). Within this family, there are 52 distinct and commonly-practised techniques that are organised into seven categories, *mindful observation*, *body-centred meditation*, *visual concentration*, *contemplation*, *affect-centred meditation*, *mantra meditation*, and *meditation with movement* (Matko et al., 2021; Matko & Sedlmeier, 2019). The most popular of these techniques are body scans, observation of breath, observation of thoughts, cultivating compassion/loving-kindness, mantra meditation, and religious meditation (Matko et al., 2021).

Research has suggested that meditation leads to a wide range of psychological, physical, and social benefits (Rose et al., 2020), with great gains to be made for psychological disorders such as depression, anxiety, and general stress (Ahmad et al., 2020; El Morr et al., 2020). Longitudinal research shows support for meditation practice interventions leading to decreases in alexithymia (Bornemann & Singer, 2017; Norman et al., 2019). However, this is not a simple causal association; rather, meditation may be acting on alexithymia through the mechanisms of both mindfulness and interoception.

Mindfulness

Mindfulness is an ancient concept that is typically associated with Eastern spiritual traditions and is defined as "…the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). It has been presented to the West as a secular method of self-development in recent years (Kabat-Zinn, 1990). Indeed, mindfulness has become a source of growing focus in the psychological literature, becoming a key foundation of third-wave behavioural therapies (Hayes, 2004; Öst, 2008). Mindfulness includes a suite of skills, consisting of observing, describing, acting with awareness, nonjudging of inner experience and nonreactivity to inner experience (Baer et al., 2006). Mindfulness develops an acceptance of uncontrollable experiences (Fjorback et al., 2011), enhances metacognitive awareness (Teasdale et al., 2002), and increases present-moment psychological presence (Shapiro et al., 2006). Taken together, these allow people to adopt an observational role in their internal experience, allowing a differentiation between thoughts and reality, where the former does not reflect the latter (Didonna et al., 2019). Consequently, mindfulness-based therapies (such as mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT)) have proven to be reliable and effective methods of addressing

depression, anxiety, chronic pain, addiction, and general stress (Creswell, 2017; Khoury et al., 2013).

Upon scrutiny, alexithymia and mindfulness appear to represent two sides of the same coin. Alexithymia represents a lack of attending to, and expression of, emotional experience, while mindfulness emphasises attention and expression of said emotional experiences. Indeed, these two constructs have been reported to have an inverse relationship (Baer et al., 2006; Teixeira & Pereira, 2015). Specifically, the mindfulness facets describing, acting with awareness, and nonjudging of inner experience appear to represent the strongest inverse relationship to alexithymia (Didonna et al., 2019). While sparse, there is an expanding literature suggesting that mindfulness-based interventions may be effective for treating alexithymia and associated clinical issues (Norman et al., 2019). Norman et al.'s (2019) meta-analysis included four randomised control trials that investigated the impact of mindfulness practices such as MBSR on levels of alexithymia. While there were some inconsistencies in outcomes, the overall effect of the meta-analysis showed that mindfulness-based practices have a significant reduction on the levels of an individual's alexithymia.

Meditation has a significant effect on the cultivation of mindfulness, with regular meditators scoring higher on measures of the Five Facet Mindfulness Questionnaire (de Bruin et al., 2012; Taylor & Millear, 2016). Taylor and Millear (2016) highlighted that increasing frequency of sessions per week, reflecting commitment, was directly associated with significant increases in the mindfulness facet observing experience. This may play a role as a key factor in alexithymia is a lack of attention directed towards emotions (Preece et al., 2017). It is also suggested that the increased awareness of present experience, especially in the awareness of bodily sensations, is one mechanism by which cultivating a practice of mindfulness may serve to reduce the presence of alexithymia (Bornemann & Singer, 2017; Norman et al., 2019; Viding et al., 2015). Further, mindfulness may help shift a person's

emotional regulation strategies towards reappraisal rather than suppression, an opposite pattern of which is already associated with alexithymia and poor emotional affect (Brockman et al., 2017).

Randomised control trials have shown that the cultivation of mindfulness both increases positive affect and decreases negative affect (Lindsay et al., 2018; May et al., 2020; Schroevers & Brandsma, 2009; Schumer et al., 2018; Světlák et al., 2021). While mindfulness may not prevent a person from feeling negative emotions, it provides them with heightened awareness of these negative emotions, thereby acting as a cue to implement positive coping strategies (Teixeira & Pereira, 2015). Taken together, this literature suggests that meditation cultivates mindfulness which may help to address the affectivity difficulties that alexithymic individuals experience.

Interoception

Interoception is "…the process by which the nervous system senses, interprets, and integrates signals originating from within the body, providing a moment-by-moment mapping of the body's internal landscape across conscious and unconscious levels" (Mehling et al., 2018, p. 2). In other words, it is the skill that allows one to be aware of signals such as body temperature, heart rate, hunger, pain, and fatigue, in order to react appropriately in the goal of bodily regulation (Khalsa et al., 2018).

The ability to interocept is associated with brain regions such as the anterior insula and the anterior cingulate cortex, collectively labelled the *Interoceptive Cortex* (Craig, 2002; Ibañez et al., 2010). These are regions that are not only highly involved in the processing of non-affective signals but also are responsible for the processing of emotions (Lindquist et al., 2012). Thus, there appears to be an overlap between non-affective and affective interoception, which may tie into classical theories of embodied emotion where awareness of

one's internal bodily states are a key component of emotional experience (Zaki et al., 2012). It is therefore possible that interoception is the foundation upon which mindfulness may be built (Gibson, 2019).

Given this possibility, it is logical to posit that deficits in emotional experience, such as those seen in alexithymia, are also related to deficits in interoception. Alexithymia may therefore reflect a broad deficit in interoception across both affective and non-affective functioning (Brewer et al., 2016). Indeed, alexithymia has been associated with irregularities in both the structure and function of the interoceptive cortex (Goerlich-Dobre et al., 2014; Goerlich, 2018), resulting in a reduced ability to accurately perceive bodily states (Herbert et al., 2011; Murphy et al., 2018; Trevisan et al., 2019). This lack of bodily awareness is associated with eating disorders, self-harm, and somatic disorders, which have been associated with alexithymia (Brewer et al., 2016).

The ability to adaptively regulate emotional affect requires one to be both aware of and pay attention to internal bodily cues that indicate emotional arousal (Füstös et al., 2013). Interoceptive deficits may lead alexithymics towards chronic and ineffective attempts at both affective and non-affective regulation despite very little evidence of actual physical distress (Connelly & Denney, 2007). It has been suggested that, just like mindfulness, accurate bodily awareness can be cultivated through targeted meditation interventions (Weng et al., 2021). Longitudinal research shows that meditation-based intervention leads to changes in brain structure with significant increases in cortical thickness in the right insula and somatosensory cortex as well as significant reductions in alexithymia levels (Santarnecchi et al., 2014). By learning to pay attention to, differentiate, and accurately label body sensations, separate from their psychological interpretations, one may help to improve physical and emotional regulation and, in turn, alexithymia (Shalev, 2019). Consequently, recent studies exploring mindfulness interventions for alexithymia have also included aspects designed to target

bodily awareness, but they remain inconclusive in their results (Aaron et al., 2020; Bornemann & Singer, 2017; Edwards et al., 2018).

Research Aims & Hypotheses

Alexithymia reflects difficulties in emotional processing and regulation, which can lead to increased negative affect and decreased positive affect, a pattern associated with poor psychological, physical, and social outcomes. A possible intervention for alexithymia, and associated affectivity problems, may be meditation practice. Further, both mindfulness and interoception have been implicated as mechanisms by which this intervention may have an effect. However, there are still uncertainties surrounding these mechanisms, which thus formed the focus of the present study.

The first aim of this study was to establish the significance, strength, and direction of the relationships between meditation, mindfulness, interoception, alexithymia, and positive and negative affect. Mindfulness was expected to correlate positively with interoception and positive affect, and negatively with alexithymia and negative affect. Interoception was expected to correlate negatively to alexithymia and negative affect. Finally, alexithymia was expected to positively correlate with negative affect and negatively to positive affect.

The second aim was to investigate a simple mediation model where increased meditation predicted decreased alexithymia, which predicted both increased positive affect and decreased negative affect.

The third aim was to investigate a simple mediation model where increased interoception predicted decreased alexithymia, which predicted both increased positive affect and decreased negative affect.

The fourth aim was to investigate a serial mediational model where increased meditation predicted increased interoception which predicted decreased alexithymia which predicted both increased positive affect and decreased negative affect.

The fifth aim was to investigate a simple mediation model where increased mindfulness predicted decreased alexithymia, which predicted both increased positive affect and decreased negative affect.

The sixth aim was to investigate a serial mediational model where increased meditation predicted increased mindfulness which predicted decreased alexithymia which predicted both increased positive affect and decreased negative affect.

Method

Participants

Of the 244 participants who engaged with the study, 205 were included in the statistical analyses. Exclusions were motivated by unacceptably high levels of unanswered items. Participants ranged from 18 to 70 years of age, with a mean age of 30.24 years (*SD* = 15.47). Participants reported their gender as 65.5% female, 32.5% male, and 1.9% non-binary. Most reported their country of birth as Australia (72.3%). Participants reported their country of residence almost exclusively to be Australia (94.2%), the rest were identified as various Asian and Oceanic countries. Most participants reported their first language as English (81.6%). The rest reported Mandarin (7.3%), as well as various Asian, European, and African languages. The highest levels of education reported by participants were high school certificates (52.4%), a university degree (37.9%), and vocational or trade diplomas (9.7%). Participants reported hearing about the study via the University of Adelaide's (UoA) Research Participation System (RPS) (51.7%), Unified (UoA's internal student portal) (30.9%), via an email (9%) or as part of belonging to a meditation group (8.4%). Levels of

alexithymia in the sample were determined by comparison to a normative, Australian, adult, general-community sample (Preece et al., 2018). Scores 1 standard deviation (30.91) above or below the normative sample mean (81.97) were coded as 'high' and 'low' levels of alexithymia, respectively. Therefore, rates of alexithymia in this sample were 'high' = 14%, 'low', = 24.5%, and 'average' = 61.5%.

Measures

Demographic and Meditation Questions

Demographic questions about gender, age, native language, level of education, country of birth, and country of residence were presented to participants.

Questions designed to capture meditation experience were informed by Baer et al. (2008), Proeve (2020) and Taylor and Millear (2016). Questions asked whether participants had meditated before, how long participants had been regularly meditating, frequency of meditation sessions, length of a typical session, number of days spent on meditation retreat, and the type of meditation commonly practised.

Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ is a 39-item self-report scale designed to measure five facets of mindfulness: *Observing, Describing, Acting with Awareness*, *Nonjudging of Inner Experience*, and *Nonreactivity to Inner Experience* (Baer et al., 2006). The items are rated on a 5-point Likert scale from 1 (never or very rarely true), to 5 (very often or always true), several of which are reverse-scored. An example item is "When I'm walking, I deliberately notice the sensations of my body moving". Baer et al. (2008) confirmed construct validity by demonstrating increased facet scores in meditation experienced samples. In general samples, the FFMQ provides a comprehensive coverage of trait mindfulness (Bergomi et al., 2012). Further, the five-factor structure of the FFMQ has been supported and validated for use in

Australian samples via confirmatory factor analysis (Taylor & Millear, 2016). A general factor of mindfulness has been discouraged and was not used in the present study (Van Dam et al., 2012). The FFMQ has also been shown to have good internal consistency across facets (Baer et al., 2008). Internal consistency for the FFMQ was adequate (α = .84 – .93).

Multidimensional Assessment of Interoceptive Awareness – Version 2 (MAIA-2)

The 37-item MAIA-2 is a self-report scale designed to measure an eight-factor operationalisation of interoceptive awareness (Mehling et al., 2018). The eight factors are *Noticing*, *Not-Distracting*, *Not-Worrying*, *Attention Regulation*, *Emotional Awareness*, *Self-Regulation*, *Body Listening*, and *Trusting*. The items are rated on a 6-point Likert scale from 0 (never) to 5 (always), several of which are reverse scored. For each subscale, the relevant items are averaged to receive a final score. An example item is "I try to ignore pain". The MAIA-2 shows improved internal consistency, reliability, and construct validity over the original MAIA (Mehling et al., 2018). This study utilised a general factor of interoception, as recent research has suggested that this may better reflect the construct (Ferentzi et al., 2020). Further, a general interoception factor is strongly related to other measures of bodily awareness and moderately related to measures of mindfulness, suggesting the general factor primarily reflects the perception of body changes and rhythms (Ferentzi et al., 2020). In this study, the general interoception factor was constructed by summing all items of the MAIA-2. Internal consistency for the MAIA-2 was adequate (α = .94).

Perth Alexithymia Questionnaire (PAQ)

The PAQ is a 24-item self-report measure designed to measure an individual's alexithymia (Preece et al., 2018). The PAQ measures alexithymia as a three-dimensional construct, made up of *difficulty identifying one's own feelings* (DIF); *difficulty describing feelings* (DDF); and *an externally orientated thinking style* (EOT). Positively and negatively valanced subscales exist for both DIF and DDF, leading to five total subscales (P-DIF, N-

DIF, P-DDF, N-DDF, and EOT). The subscales can be combined into six composite scores, such as a total alexithymia score. The items are scored on a 7-point Likert scale from 1 (strongly disagree), to 7 (strongly agree). An example item is "When I'm feeling bad, I'm puzzled by those feelings". The PAQ shows good internal validity and reliability, as well as concurrent and discriminant validity (Preece et al., 2018). It also accurately measures alexithymia separate from general psychological distress (Preece et al., 2020). Internal consistency for the PAQ was adequate (α = .97).

Positive and Negative Affect Schedule (PANAS)

The 20-item, self-report PANAS comprises two 10-item subscales that measure positive affect and negative affect (Watson et al., 1988). Positive affect refers to positively-valanced emotions such as enthusiasm, interest, and excitement. Negative affect refers to negatively-valanced emotions such as guilt, hostility, and irritability. The two subscales are both scored on a 5-point Likert scale from 1 (very slightly or not at all) to 5 (extremely). For each item, participants are asked to report how often they have felt a particular emotion in the past 7 days. Higher scores on the scales reflect higher experiences of positive or negative affect. The PANAS shows high internal consistency and reliability, low intercorrelation, and good test-retest reliability (Watson et al., 1988). The PANAS also shows good construct validity and has been validated for use in broad demographic samples (Crawford & Henry, 2004). Internal consistency for the PANAS was adequate (positive: α = .90, negative: α = .91).

Procedure

The project was approved by the Human Research Ethics Sub-committee of the School of Psychology at the University of Adelaide (21/22). Participants were drawn from both a UoA student population and from organised meditation groups around Australia. This was done to ensure a reasonable level of meditation experience due to concerns around a lack

of extensive meditation experience in a general or student sample. The eligibility criteria for the study required participants to be fluent in English, 18 -70 years of age, and have any amount of prior meditation experience. Student participants were invited through the UoA's RPS, an announcement on Unified, and promotional flyers on social media (Facebook, Instagram etc.) (Attachments 1 & 2). Meditating participants were recruited by emailing letters to administrators of online meditation groups and websites requesting them to host the study (Attachment 3). An online survey was administered through Qualtrics, which participants accessed through a link given in recruitment materials. The survey consisted of demographic questions, meditation questions, and four psychometric measures. The measures were presented in a random order to each participant in order to minimise incomplete responses biases. Informed consent was collected from participants at the beginning of the survey (Attachment 4). The survey was expected to take 15-20 minutes to complete, participation was voluntary, and individuals could withdraw at any stage. First-year psychology students who completed the survey through the RPS were eligible to receive a 0.5 course-credit for their participation. All other participants were given the opportunity to enter a draw to win one of two $50 gift certificates to a store of their choosing. Participants were also given the opportunity to request summary results of the study. De-identification of the data was conducted in order to ensure the protection and privacy of participants who provided their emails.

Data Analyses

Power analyses for mediation analysis were conducted through an application utilising the Monte Carlo method (Schoemann et al., 2017). Results indicated that the minimum number of participants required to ensure adequate statistical power for serial mediation analyses was ≥ 190. IBM Statistical Package for the Social Sciences (SPSS; version 26) was used to conduct statistical analyses.

Results

Data Preparation

Data were screened for bias through the assessment of missing values, outliers, linearity, and normality. Missing value analysis revealed that 20% of cases had missing values and 3.7% of values were missing. Little's MCAR test was non-significant ($\chi^2(123, N = 205) = 125.77$, $p = .414$), suggesting there was no pattern to missing values. Missing items in an otherwise complete scale or subscale were replaced with mean values. Outliers were assessed using the Outlier Labelling Rule (Hoaglin & Iglewicz, 1987; Tukey, 1977), where a value for a given measure is considered an outlier when it is outside of a range defined by a lower limit = 25th percentile - (IQR*1.5) and an upper limit = 75th percentile + (IQR*1.5). One outlier was found for interoception (Appendix A, Table A1), this value was replaced with the next highest value within the range for the variable. Normality was assessed using Shapiro-Wilk tests, histograms, Q-Q plots, skewness, and kurtosis values. Several continuous measures showed departures from normality (describing, nonjudge, alexithymia, positive affect, and negative affect). Scatterplots were used to determine linearity between the continuous variables (Appendix A, Figures A1-A30). Most variables were found to be linearly related except for observing and negative affect, describing and negative affect, and positive and negative affect.

Descriptive Statistics and Exploratory Analyses

Table 1 presents participants' responses to meditation experience questions. Most participants had tried meditation at least once. Of the regular meditators, most reported to have been practising for less than a year, with the rest having either meditated for between 1-10 years or greater than 10 years. Most participants reported being minimally committed to meditation practice (see Table 1 legend for description of commitment categories). Despite this, there were still large percentages of fully committed and partially committed

participants. The most common lengths of meditation practice reported were 10-20 minutes and 21-30 minutes. Of those who had spent any amount of time on meditation retreat, the most common number of days spent was between 1 and 10 days. The most common type of meditation reported to be practised was mindfulness meditation followed by yoga.

Table 1

Numbers and Percentages of Participants for Meditation Experience Categories

Variable	*N*	%
Tried meditation		
Yes	184	89.8
No	21	10.2
Years of regular meditation practice		
Does not meditate	79	38.5
<1 year	62	30.2
1–10 years	36	17.6
>10 years	28	13.7
Frequency of sessions		
Little commitment	104	50.7
Partial commitment	50	24.4
Full commitment	51	24.9
Average session length		
Does not meditate	58	28.3
<10 minutes	30	14.6
10-20 minutes	55	26.8
21-30 minutes	39	19.0
>30 minutes	22	10.7
Missing	1	0.5
Days on meditation retreat		
None	141	68.8
1-10 days	35	17.1
>10 days	29	14.1

Variable	*N*	%
Type of meditation practiced		
Does not meditate	50	24.4
Mindfulness	86	42.0
Yoga	29	14.1
Christian meditation	10	4.9
Concentrative	10	4.9
Transcendental/Mantra	7	3.4
Movement	2	1.0
Other	11	5.4

Note. $N = 205$. In category, frequency of sessions, nine original categories were presented to participants but ultimately collapsed in line with the procedure carried out by Taylor and Millear (2016). No sessions ($n = 71$), one session a year ($n = 9$), and one session every six months ($n = 24$) were recoded as 'little commitment'. One session every month ($n = 20$), one session every 2 weeks ($n = 8$), one session every week ($n = 22$) were recoded as 'partial commitment'. One session every other day ($n = 22$), one session a day ($n = 20$), and multiple sessions per day ($n = 9$) were recoded as 'full commitment'. Regular meditation practice was defined as at least two sessions per week (Baer et al., 2008).

Descriptive statistics for the continuous measures are shown in Table 2. All measures had high internal consistency, with the lowest being reported by observing at .84.

To determine whether demographic characteristics needed to be included as covariates, analyses for gender, age, and education were conducted (Appendix B). For gender, independent samples *t*-tests indicated non-significant differences between males and females on all outcome measures, except nonreact. Age showed significant correlations with all outcome measures ranging from weak (observing = .23) to moderate (positive affect = .38) in strength. For education, one-way ANOVAs were conducted which showed

significant differences between university graduates and high school graduates on all measures except observe and nonreact. Thus, age and education were included as covariates in the mediation analyses.

Table 2

Descriptive Statistics for Continuous Measures

Scale/subscale	*α*	*N*	Min	Max	*M*	*SD*	95% Confidence Interval	
							Lower	Upper
FFMQ								
Observing	.84	192	13.00	40.00	28.16	6.08	27.30	29.03
Describing	.92	192	8.00	40.00	26.23	7.66	25.14	27.33
ActAware	.91	192	8.00	40.00	23.63	7.00	22.63	24.62
NonJudge	.93	192	8.00	40.00	24.43	8.05	23.28	25.57
NonReact	.86	192	8.00	35.00	21.05	5.37	20.28	21.81
MAIA-2								
Interoception	.94	192	37.00	173.00	102.86	28.63	98.78	106.94
PAQ								
Alexithymia	.97	200	24.00	168.00	74.80	32.89	70.21	79.39
PANAS								
Positive affect	.90	196	12.00	49.00	30.55	8.37	29.37	31.73
Negative affect	.91	196	10.00	48.00	24.09	8.91	22.84	25.35

Aim one was to establish the significance, strength, and direction of the relationships between meditation categories, mindfulness facets, interoception, alexithymia, and positive and negative affect. To that end, Pearson correlations were conducted between the continuous measures (Table 3). Due to departures in normality, bias-corrected and accelerated (BCa) confidence intervals are presented in Appendix C, Table C1. Mindfulness facets showed moderate to strong negative correlations with alexithymia, the strongest being with

describing, and the weakest with nonreact. Similarly, interoception showed a strong negative correlation with alexithymia. Alexithymia showed a significant inverse correlation with positive affect and a positive correlation with negative affect. Positive and negative affect showed a significant, yet weak, negative correlation between each other.

Table 3

Parametric Correlations Between Continuous Measures

	Obsv	Desc	Aware	NJudge	NReact	Inter	Alex	PA	NA
Obsv	-								
Desc	.44**	-							
Aware	.37**	.47**	-						
NJudge	.20**	.44**	.57**	-					
NReact	.46**	.46**	.47**	.50**	-				
Inter	.64**	.62**	.56**	.50**	.59**	-			
Alex	-.37**	-.74**	-.57**	-.54**	-.36**	-.62**	-		
PA	.41**	.44**	.44**	.30**	.41**	.46**	-.37**	-	
NA	-.17*	-.28**	-.50**	-.50**	-.33**	-.39**	.44**	-.18*	-

Note. Obsv = observing, Desc = describing, Aware = actaware, NJudge = nonjudge, NReact = nonreact, Inter = interoception, Alex = alexithymia, PA = positive affect, NA = negative affect.

* Correlation is significant at .05 level (2-tailed).

** Correlation is significant at the .01 level (2-tailed).

Frequency of meditation sessions was chosen as the representative meditation variable in the mediation analyses. Frequency of sessions has been associated with higher scores of mindfulness measures and maintains good levels of granularity and interpretability (i.e., partitioning participants by levels of commitment to meditation; Taylor & Millear, 2016). One-way Welch's ANOVAs were conducted to explore associations between meditation frequency levels and continuous measures. All models showed significance (Table 4). Therefore, post-hoc Scheffe multiple comparisons tests were conducted to explore the nature of these differences (Appendix C, Table C2), the results of which showed consistent significant differences between minimal commitment and full commitment on the continuous measures.

Table 4

Welch's ANOVA Tests Between Levels of Meditation Frequency and Continuous Measures

Variable	*W*	*df*	*p*	η^2
Observing	21.18	2, 103.76	< .001	.18
Describing	17.99	2, 103.95	< .001	.14
ActAware	17.23	2, 96.44	< .001	.15
NonJudge	19.12	2, 97.20	< .001	.17
NonReact	15.92	2, 103.63	< .001	.16
Interoception	35.13	2, 102.87	< .001	.28
Alexithymia	16.56	2, 108.51	< .001	.13
Positive affect	10.40	2, 96.36	< .001	.10
Negative affect	15.97	2, 102.43	< .001	.12

Mediation Analyses

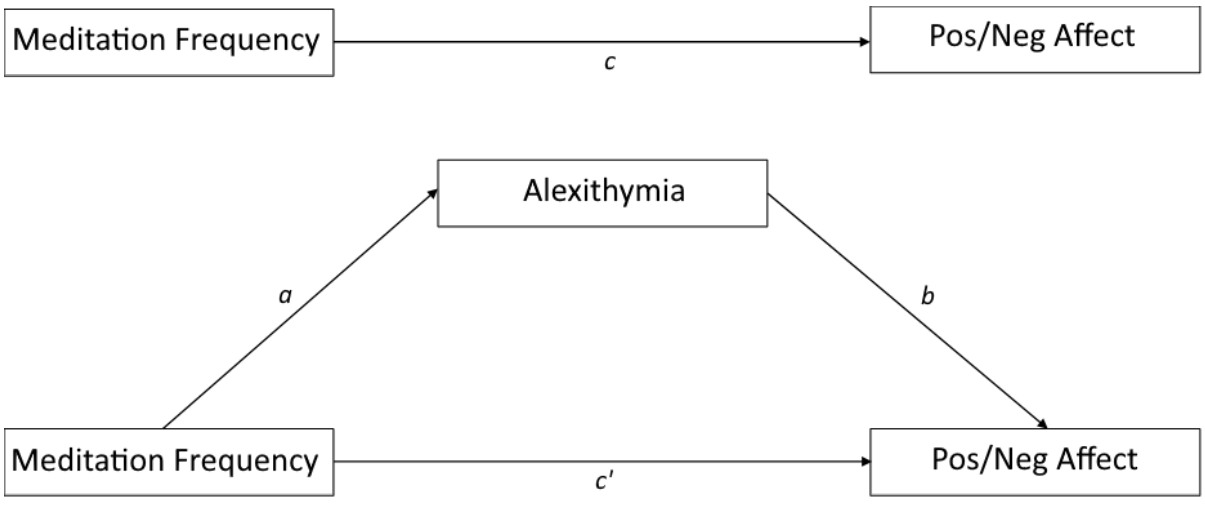
In order to investigate the remaining aims of the study, simple and serial mediation models were run utilising the PROCESS application (Hayes, 2017). An effects coding system was applied to meditation frequency, whereby 'little commitment' was coded as the reference

category (-1) (Davis, 2010). Both age and education were included as covariates. Education was first converted to two dummy variables, where 'high school' was coded as the reference category (0) (Davis, 2010). All models were run using BCa confidence intervals constructed with 5000 bootstrap samples.

The second aim was to investigate simple mediation models in which increased meditation frequency predicts decreased alexithymia, which in turn predicts both increased positive affect and decreased negative affect (Figure 1). This was necessary in establishing whether alexithymia was relevant to the relationship between meditation practice and positive and negative affect. Therefore, two simple mediation models were analysed. Details of the regression equations for each model are reported in Appendix D, Tables D1 and D2.

Figure 1

Generic Form of a Two-Path Mediation Model Linking Meditation Frequency to Positive and Negative Affect via Alexithymia



There was a nonsignificant indirect effect for partial commitment (Table 5) on negative affect, through alexithymia. However, there was a significant indirect effect of full

commitment on negative affect through alexithymia. Both the total effect, *c*, (*b*(SE) = -.41(1.17), *t* = -3.17, *p* = .002) and direct effect, *c'*, (*b*(SE) = -.27(1.13), *t* = -2.16, *p* = .032), were significant. Similarly, there was a nonsignificant indirect effect for partial commitment on positive affect, through alexithymia. However, there was a significant indirect effect of full commitment on positive affect through alexithymia. Both the total effect, *c*, (*b*(SE) = .06(1.08), *t* = .46, *p* = .642), and direct effect, *c'*, (*b*(SE) = -.05(1.07), *t* = -.40, *p* = .685), were nonsignificant. Education was not a significant covariate. However, age significantly predicted positive affect. These results showed that increasing meditation frequency predicted significant decreases in negative affect and increases in positive affect, and furthermore that these were both significantly mediated by alexithymia.

Table 5

Partially Standardised Estimates for Indirect Effects Between Meditation Frequency and Both Negative and Positive Affect

Outcome	Pathway/variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
Negative affect					
	ab				
	X1	.01	.04	-.06	.09
	X2	-.14*	.05	-.26	-.05
Positive affect					
	ab				
	X1	-.01	.03	-.08	.05
	X2	.11*	.04	.04	.21

Note. X1 = effects coded variable representing partial commitment, X2 = effects coded variable representing full commitment.

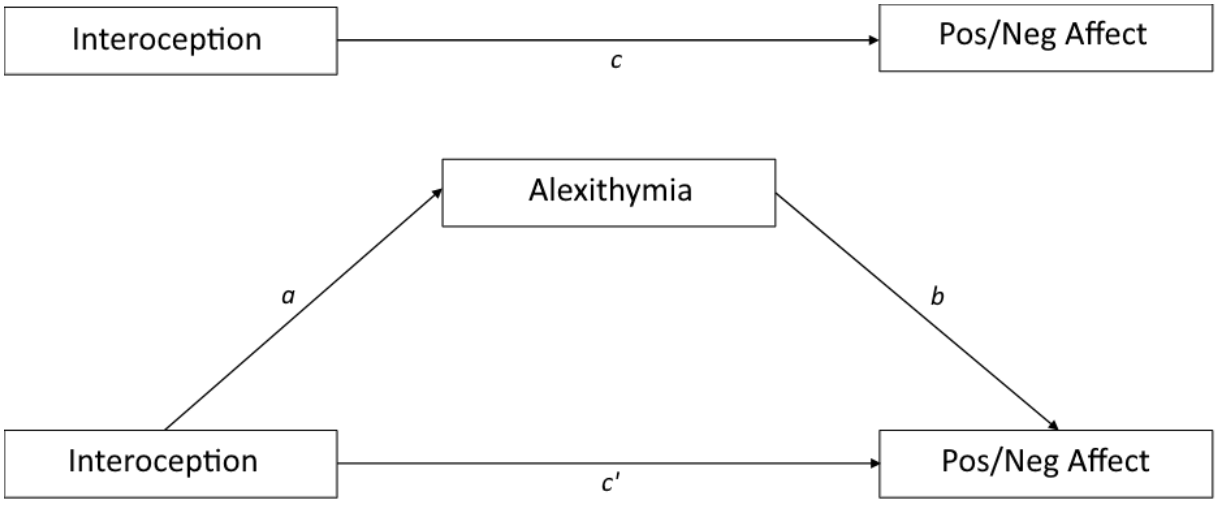
* = effects whose CI's do not include zero, indicating significance

Having established the relevance of alexithymia as a possible mechanism of the relationship between meditation and emotional affect, it became possible to investigate interoception and mindfulness as additional mechanisms in this relationship. The first steps were therefore to initially establish whether both interoception and mindfulness predicted positive and negative affect though alexithymia. These were then followed by serial mediation models investigating whether interception and mindfulness mediated the relationship between meditation frequency, alexithymia, and positive and negative affect.

The third aim was to investigate a simple mediation model where increased interoception predicts decreased alexithymia, which in turn predicts increased positive affect and decreased negative affect (Figure 2). Therefore, two simple mediation models were analysed. Details of the regression equations for each model are reported in Appendix D, Tables D3 and D4.

Figure 2

Generic Form of a Two-Path Mediation Model Linking Interoception to Positive and Negative Affect via Alexithymia

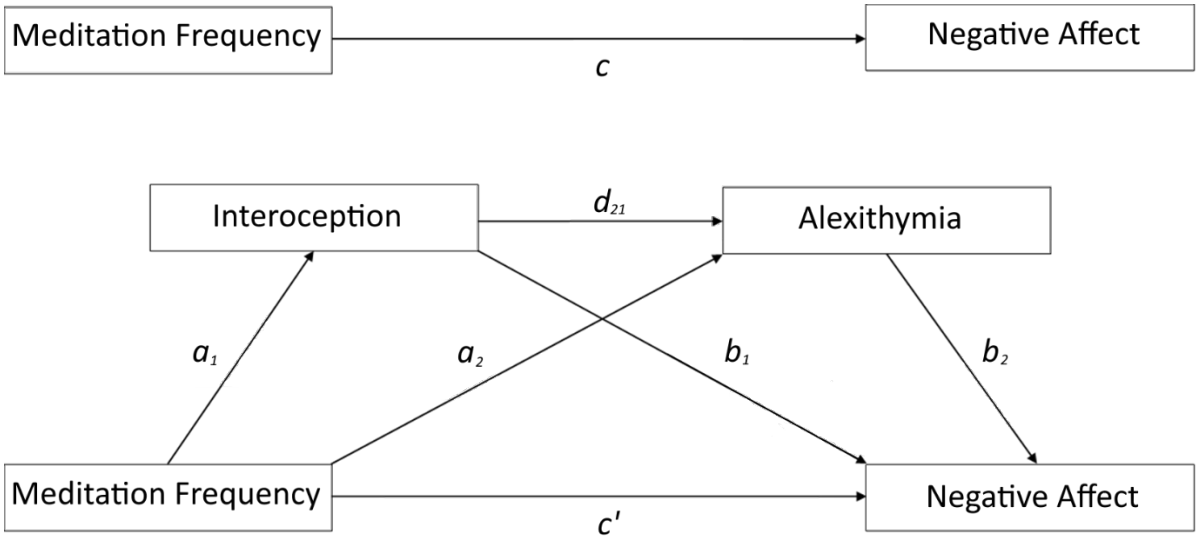


There was a significant indirect effect, *ab*, of interoception on negative affect through alexithymia (*b*(SE) = -.17(.06), BCa 95% CI [-.29, -.05]). The total effect, *c*, (*b*(SE) = -.32(.02), *t* = -4.51, *p* = <.001) was significant, while the direct effect, *c',* (*b*(SE) = -.15(.02), *t* = -1.76, *p* = .079) was not. There was a non-significant indirect effect, *ab*, of interoception on positive affect through alexithymia (*b*(SE) = .07(.05), BCa 95% CI [-.02, .19]). Both the total effect, *c*, (*b*(SE) = .38(.02), *t* = 5.51, *p* = < .001) and direct effect, *c'*, (*b*(SE) = .29(.02), *t* = 3.59, *p* = < .001) were significant. Included covariates generally presented nonsignificant results when introduced as predictors. An exception was age which significantly predicted both negative affect (*b*(SE) = -.17(.05), 95% CI [-.19, -.00], *p* = .042) and positive affect (*b*(SE) = .19(.04), 95% CI [.01, .19], *p* = .021). Taken together, these results showed that increasing interoception predicted a significant decrease in negative affect through alexithymia, though this relationship did not hold for positive affect.

The fourth aim was to investigate a serial mediational model where increased meditation frequency predicts increased interoception, which predicts decreased alexithymia, which predicts increased positive affect and decreased negative affect (Figure 3). Due to the non-significant relationship between interoception and positive affect, only negative affect was investigated as the outcome variable. Details of the regression equations for the model are reported in Appendix D, Table D5.

Figure 3

Generic Form of a Three-Path Mediation Model Linking Meditation Frequency to Negative Affect via Interoception and Alexithymia



There was a nonsignificant indirect effect, $a_1d_{21}b_2$, for partial commitment on negative affect, through general interoception and alexithymia, (Table 6). However, there was a significant indirect effect for full commitment, through general interoception and alexithymia. The total effect, *c*, (*b*(SE) = -.32(.02), *t* = -4.51, *p* = .002) was significant, while the direct effect, *c'*, was not (*b*(SE) = -.22(1.18), *t* = -1.66, *p* = .097). None of the other indirect pathways showed significant effects, nor were any covariates significant. This result showed that increasing meditation frequency predicted significant decreases in negative affect, and furthermore that this was significantly sequentially mediated by general interoception and alexithymia.

Table 6

Partially Standardised Estimates for Indirect Effects Between Meditation Frequency and Negative Affect, Mediated by Interoception and Alexithymia

			BCa 95% Confidence Interval	
Pathway/Variable	Effect	*SE*	Lower	Upper
a_1b_1				

			BCa 95% Confidence Interval	
Pathway/Variable	Effect	*SE*	Lower	Upper
X1	.00	.01	-.02	.04
X2	-.08	.06	-.20	.03
a_2b_2				
X1	.01	.03	-.05	.06
X2	-.01	.04	-.10	.05
$a_1d_{21}b_2$				
X1	.01	.02	-.03	.04
X2	-.10*	.04	-.19	-.03

Note. X1 = effects coded variable representing partial commitment, X2 = effects coded variable representing full commitment.

* = effects whose CI's do not include zero, indicating significance

The fifth aim was to investigate a simple mediation model where individual mindfulness facets (observing, describing, actaware, nonjudge, and nonreact) predict decreased alexithymia, which in turn predicts both increased positive affect and decreased negative affect (Figure 4). Therefore, ten simple mediation models were analysed. Details of the regression equations for each model are reported in Appendix D, Tables D6 – D15.

Figure 4

Generic Form of a Two-Path Mediation Model Linking Mindfulness Facets to Positive and Negative Affect via Alexithymia

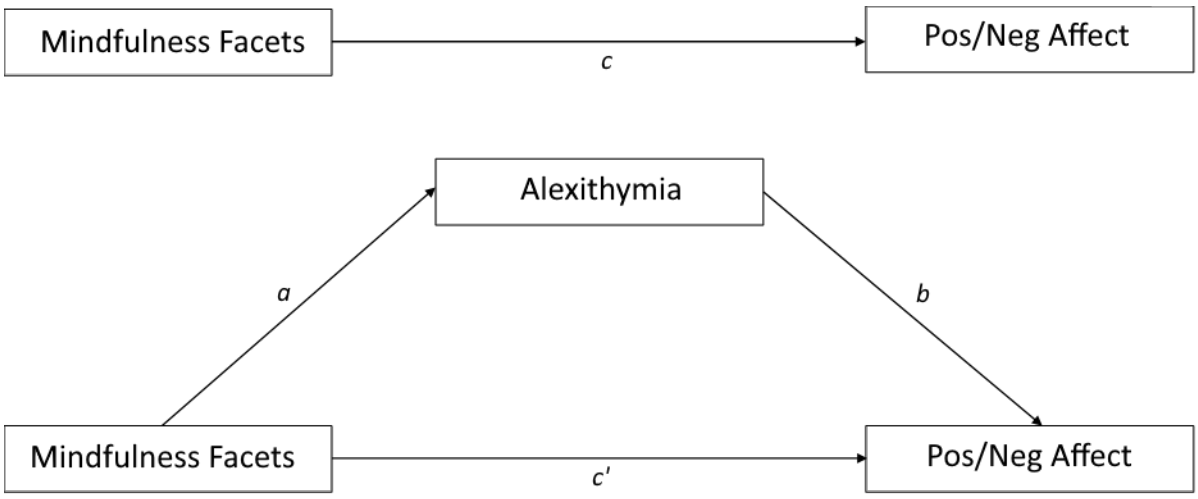


Table 7 reports the indirect effects for all models and outcomes. All models, except describing → alexithymia → positive affect, showed significant indirect effects. Describing showed the strongest effect on negative affect (-.33), while nonjudge showed the strongest effect on positive affect (.17). Education presented nonsignificant results when included as a covariate. However, age significantly predicted both positive and negative affect for all mediation models except nonjudge → alexithymia → negative affect. Taken together, these models almost universally predict a significant increase in positive affect and decrease in negative affect, through alexithymia. However, the interpretation of the strength of these mediations will be determined by their comparison to the direct effects, *c'*, which will be conducted in the discussion.

Table 7

Standardised Estimates for Indirect Effects Between Mindfulness Facets and Positive and Negative Affect, Mediated by Alexithymia

Facet	Pathway/Outcome	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
Observing					
	ab				
	Negative affect	-.13*	.04	-.20	-.06
	Positive affect	.07*	.03	.02	.12
Describing					
	ab				
	Negative affect	-.33*	.07	-.47	-.18
	Positive affect	.06	.07	-.07	.20
ActAware					
	ab				
	Negative affect	-.10*	.05	-.19	-.01
	Positive affect	.08*	.04	.00	.18
NonJudge					
	Ab				
	Negative affect	-.11*	.05	-.20	-.02
	Positive affect	.17*	.05	.06	.25
NonReact					
	Ab				
	Negative affect	-.10*	.03	-.18	-.04
	Positive affect	.07*	.03	.02	.12

Note.

* = effects whose CI's do not include zero, indicating significance

The sixth aim was to investigate a serial mediational model where increased meditation frequency predicts increased mindfulness facets, which predict decreased alexithymia, which predict increased positive affect and decreased negative affect (Figure 5). Because of a non-significant result, the meditation frequency → describing → alexithymia →

positive affect model was not run. Therefore, nine serial mediation models were analysed. Details of the regression equations for each model are reported in Appendix D, Tables D16 – D24.

Figure 5

Generic Form of a Three-Path Mediation Model Linking Meditation Frequency to Negative Affect via Mindfulness Facets and Alexithymia

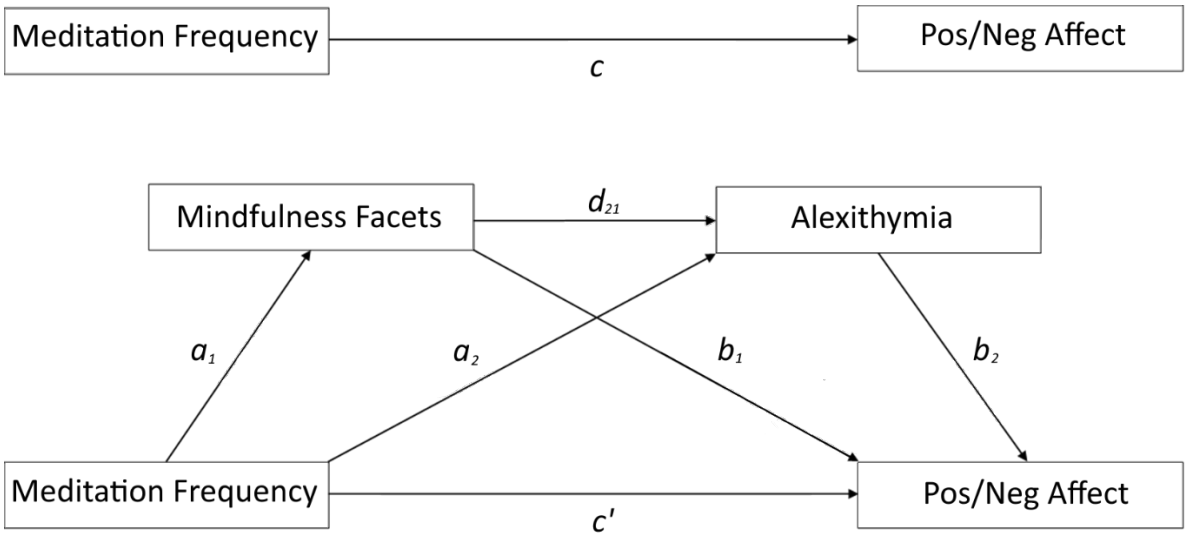


Table 8 reports the indirect effects for models with negative affect as the outcome variable. Full commitment significantly predicted decreased negative affect through the indirect pathway ($a_1d_{21}b_2$) for all five mindfulness facets. These effects varied in size, with the strongest represented by describing (-.10) and the weakest represented by observing (-.03). Partial commitment significantly predicted *increased* negative affect when mediated by both nonjudge (.03) and nonreact (.02). Neither age nor education were found to significantly predict any other variable in these models.

Table 8

Partially Standardised Estimates for Indirect Effects Between Meditation Frequency and Negative Affect, Mediated by Mindfulness Facets and Alexithymia

Facet	Pathway/Variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
Observing					
	a_1b_1				
	X1	.01	.02	-.03	.04
	X2	.01	.02	-.04	.06
	a_2b_2				
	X1	.04	.04	-.04	.11
	X2	-.11*	.05	-.24	-.02
	$a_1d_{21}b_2$				
	X1	-.02*	.01	-.05	-.00
	X2	-.03*	.02	-.08	-.00
Describing					
	a_1b_1				
	X1	.00	.02	-.04	.04
	X2	.04	.04	-.03	.14
	a_2b_2				
	X1	.02	.03	-.05	.09
	X2	-.07	.05	-.17	.01
	$a_1d_{21}b_2$				
	X1	-.01	.03	-.07	.06
	X2	-.10*	.05	-.20	-.02
ActAware					
	a_1b_1				
	X1	.04	.04	-.03	.12
	X2	-.15*	.06	-.28	-.06
	a_2b_2				

Facet	Pathway/Variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
	X1	-.00	.02	-.05	.03
	X2	-.03	.02	-.10	.01
	$a_1d_{21}b_2$				
	X1	.01	.01	-.01	.04
	X2	-.04*	.03	-.10	-.00
NonJudge					
	a_1b_1				
	X1	.11*	.05	.03	.21
	X2	-.15*	.06	-.28	-.05
	a_2b_2				
	X1	-.02	.02	-.08	.02
	X2	-.04	.03	-.11	.01
	$a_1d_{21}b_2$				
	X1	.03*	.02	.00	.07
	X2	-.04*	.03	-.10	-.00
NonReact					
	a_1b_1				
	X1	.03	.02	-.00	.08
	X2	-.06	.04	-.14	.01
	a_2b_2				
	X1	-.01	.03	-.07	.06
	X2	-.09*	.05	-.19	-.01
	$a_1d_{21}b_2$				
	X1	.02*	.01	.00	.05
	X2	-.04*	.02	-.09	-.01

Note. X1 = effects coded variable representing partial commitment, X2 = effects coded variable representing full commitment.

* = effects whose CI's do not include zero, indicating significance

Table 9 reports the indirect effects for models with positive affect as the outcome variable. Full commitment significantly predicted increased positive affect through the indirect pathway, $a_1d_{21}b_2$, for facets observing, nonjudge and nonreact. These effects varied in size, with the strongest represented by nonjudge (.06) and the weakest represented by observing (.02). Similar to the models run with negative affect as the outcome, partial commitment significantly predicted decreased positive affect when mediated by both nonjudge (-.04) and nonreact (.02). Education did not significantly predict any variables. However, age significantly predicted positive affect for all mindfulness facets tested (observing, actaware, nonjudge, nonreact).

Together, these results show that being fully committed to frequent meditation significantly predicts decreased negative affect and increased positive affect through mindfulness facets and alexithymia. However, the strength and significance of the indirect pathways of these effects varied by mindfulness facet. Further, being partially committed to frequent meditation predicted increases in negative affect and decreases in positive affect when mediated by both nonjudge and nonreact.

Table 9

Partially Standardised Estimates for Indirect Effects Between Meditation Frequency and Positive Affect, Mediated by Mindfulness Facets and Alexithymia

Facet	Pathway/Variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
Observing					
	a_1b_1				
	X1	.07*	.03	.01	.14
	X2	.09*	.05	.01	.20

Facet	Pathway/Variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
	a_2b_2				
	X1	-.02	.03	-.08	.02
	X2	.07*	.04	.01	.15
	$a_1d_{21}b_2$				
	X1	.01*	.01	.00	.03
	X2	.02*	.01	.00	.05
ActAware					
	a_1b_1				
	X1	-.04	.03	-.11	.03
	X2	.13*	.06	.03	.25
	a_2b_2				
	X1	.00	.02	-.04	.04
	X2	.03	.03	-.01	.09
	$a_1d_{21}b_2$				
	X1	-.01	.01	-.04	.01
	X2	.04	.02	-.00	.09
NonJudge					
	a_1b_1				
	X1	-.02	.03	-.09	.04
	X2	.03	.05	-.07	.12
	a_2b_2				
	X1	.03	.03	-.03	.10
	X2	.05	.04	-.01	.12
	$a_1d_{21}b_2$				
	X1	-.04*	.02	-.09	-.01
	X2	.06*	.03	.01	.13
NonReact					
	a_1b_1				
	X1	-.07*	.04	-.15	-.01
	X2	.14*	.05	.05	.26

Facet	Pathway/Variable	Effect	*SE*	BCa 95% Confidence Interval	
				Lower	Upper
	a_2b_2				
	X1	.01	.03	-.05	.05
	X2	.06*	.04	.00	.14
	$a_1d_{21}b_2$				
	X1	-.01*	.01	-.03	-.00
	X2	.03*	.02	.01	.06

Note. X1 = effects coded variable representing partial commitment, X2 = effects coded variable representing full commitment.

* = effects whose CI's do not include zero, indicating significance

Discussion

The current study aimed to examine mindfulness and interoception as possible mechanisms in the relationship between meditation practice, alexithymia, and emotional affect. Specifically, the study aimed to test whether increases in frequency of meditation predicted increases in the skills of both interoception and mindfulness which would then predict decreases in alexithymia and, ultimately, both increases in positive affect and decreases in negative affect. The first aim of the current study established the significance, strength, and direction of the relationships between the meditation categories, mindfulness facets, general interoception, alexithymia, and positive and negative affect. The hypotheses were well supported, as all correlations were significant, in the directions expected, and generally were larger in magnitude than estimated. The second aim and associated finding was that increasing meditation frequency predicted increases in positive affect and decreases in negative affect, which were both mediated by reductions in alexithymia. This showed that

mediation may be an important factor in the reduction of alexithymia and improved emotional affect. The third and fourth aims explored interoception as an additional mechanism. The indirect effects of these models were only significant when negative affect was the outcome variable. These results suggested that for alexithymics high in negative affect, meditation practice focussed on interoception may be effective. The fifth and sixth aims explored mindfulness as an additional mechanism. The most important indirect effects were shown when the mindfulness facets of awareness, non-reaction, and non-judgment of experience were included in the pathway predicting both positive and negative affect. These results suggested that meditation practice focussed on developing mindfulness may be effective for both positive and negative affect in alexithymic individuals. Overall, these results highlight that frequent meditation practice, with an emphasis on developing interoception and mindfulness, may lead to reductions in alexithymia and to more balanced emotional affect outcomes. These findings and their implications, strengths, and weaknesses, as well as directions for future research, are described in further detail below.

Summary of Findings

Meditation, Alexithymia, and Emotional Affect

The second aim was to explore whether meditation frequency predicted both positive and negative affect through alexithymia. The first mediation model explored whether increasing meditation frequency led to decreases in alexithymia and decreases in negative affect. In line with the hypothesis, there was a significant indirect effect when full commitment to meditation was included as the predictor variable. The second mediation model explored whether increasing meditation frequency led to decreases in alexithymia and increases in positive affect. Similar to negative affect, and in line with the hypothesis, it was demonstrated that there was a significant indirect effect when full commitment to meditation was included as the predictor variable.

This reduction in alexithymia, predicted by meditation, was expected and in line with prior research (Bornemann & Singer, 2017; Norman et al., 2019). Alexithymia is typified by an inability or an unwillingness to focus attention on and understand bodily and emotional cues, leading to confusion, increased usage of maladaptive emotional regulation strategies, increased experience of negative affect, and reduced positive affect (Lundh & Simonsson-Sarnecki, 2001; Preece et al., 2017). Conversely, meditation practice increases one's ability to pay attention to emotional and physiological cues in a way that promotes acceptance and nonjudgement (Didonna et al., 2019). Also in line with previous research was the finding that meditation practice promotes positive emotions and minimises negative emotions (Lindsay et al., 2018; Schumer et al., 2018). Together, these results suggest that meditating at least every other day predicts decreased negative affect and increased positive affect via the reduction of alexithymia. This finding could be explained through the development of attention regulation and monitoring, which are critical components of the ability to regulate emotions, a skill that is lacking in alexithymic individuals. This is an important finding which may help to inform the development of interventions targeted at the affectivity difficulties experienced by alexithymics.

Mechanism: Interoception

The third aim was to explore whether interoception predicted both negative affect and positive affect through alexithymia. The first mediation model explored whether increasing interoception led to decreases in alexithymia and decreases in negative affect. In line with the hypothesis, a significant indirect effect was found through this pathway. The second mediation model explored whether increasing interoception led to decreases in alexithymia and increases in positive affect. Contrary to the hypothesis, the indirect effect for positive affect was non-significant. The direct effect was also significant. Thus, while increasing interoception predicts an increase in positive affect, it does not appear to do so through

alexithymia. As a result of the nonsignificant positive affect model, the only model in the fourth aim explored whether increasing meditation frequency led to increased interoception, decreased alexithymia, and decreased negative Affect. The results were in line with the hypothesis and showed a significant indirect pathway and a non-significant direct pathway.

Because of the relative lack of research investigating the association between interoception and alexithymia, it is difficult to know whether this pattern of results aligns with the broader literature. Tentative explanations can be made regarding these results, however. Brewer et al. (2016) has highlighted that increased levels of alexithymia are related to a greater degree of similarity in the perception between affective and non-affective interoceptive states. Suggesting that alexithymic individuals have difficulties being able to separate their emotions from their bodily cues, reflecting poor interoception. These interoception difficulties mean that alexithymics struggle to accurately perceive the intensity of their bodily states and may misinterpret them as more severe than they are. Connelly and Denney (2007) highlighted this finding and showed that alexithymia was related to a tendency to inaccurately perceive psychological indices of distress as *far more* acute than objective measures of their bodily states would suggest. da Silva et al. (2017) further noted that alexithymia's broad negative influence on emotional awareness might impair the emotional processing sequence and the selection of healthy regulation strategies. Together, these inabilities to both interocept accurately and select the correct regulation strategy may lead alexithymics to both experience and perpetuate heightened negative affect.

Conversely, having high levels of interoception is associated with increased emotional awareness and differentiation as well as a tendency to engage in reappraisal as a strategy to down-regulate negative affect (Füstös et al., 2013; Gross & John, 2003). This is suggesting that individuals high in interoception are not actively suppressing their emotional arousal but are utilising it in an attempt to reframe their cognitions in a healthier way. The

results show that although there was a direct effect of increasing interoception on positive affect, this effect did not occur indirectly through alexithymia. Due to the limited amount of research on this topic, it remains unclear why this indirect effect does not hold for positive affect, especially as the reappraisal strategies associated with higher levels of interoception are associated with increased positive affect (Gross, 2015a). It is possible that for an alexithymic individual, an increased ability to sense one's bodily cues may not be helpful for increasing positive affect due to their inability to grasp their emotions, precluding them from engaging in alternative emotional regulation such as reappraisal. This finding therefore requires replication and further investigation.

Ultimately, for alexithymic individuals, interoception may not substantially support the development and maintenance of positive emotions, beyond the reduction of heightened negative affect as a result of the reduced propensity to inflate distress. However, developing interoception through targeted meditation practices, may develop the individual's ability to process and interpret their bodily cues more accurately, which may in turn facilitate adaptive emotional regulation allowing them to engage with adaptive strategies before overwhelming negative emotionality is experienced. This skillset could be especially effective for alexithymic individuals and may help to avoid the worst aspects of negative emotional experiences.

Mechanism: Mindfulness

The fifth aim was to explore whether increases in the various mindfulness facets (observing, describing, acting with awareness, non-judging, and non-reacting) predicted both decreased negative and increased positive affect through decreased alexithymia. All models, except describing → alexithymia → positive affect, showed significant indirect effects. In predicting negative affect, the most important mindfulness facets were observing, describing, and to a lesser extent non-reacting. In terms of the attention-appraisal model, alexithymia has

been defined as difficulties in both identifying and describing feelings (Preece et al., 2018). Therefore, it is expected that the facets of observing (the ability to observe and attend to one's thoughts, feelings, and experiences) and describing (the ability to accurately describe one's own thoughts, feelings, and experiences) are most strongly related to decreases in alexithymia. In predicting positive affect, the most important mindfulness facet was non-judging. This finding suggests that being able to refrain from judging one's own experiences and thoughts is a critical factor in the reduction of alexithymia. Certainly, the cultivation of an attitude of acceptance towards present-moment experiences is a central mechanism in mindfulness interventions aimed at boosting positive emotions (Lindsay et al., 2018). Taken together, these results show that individual mindfulness facets play varying roles in the reduction of alexithymia and both reduced negative affect and increased positive affect.

The sixth aim was to explore whether increasing meditation frequency predicted decreased negative affect and increased positive affect through the various mindfulness facets and alexithymia. Similar to the previous aim, most models had significant indirect effects. Acting with awareness, non-judge, and non-react were the strongest mediators of the indirect pathway between meditation frequency, alexithymia, and negative affect. Observing, non-judge, and non-react were the strongest mediators in the indirect pathway between meditation frequency, alexithymia, and positive affect.

This pattern of findings generally aligns with what has been previously reported (Baer et al., 2006; de Bruin et al., 2012; Didonna et al., 2019). Non-judge, non-react, and acting with awareness (the ability to behave with an awareness of one's activities whilst avoiding automaticity) reflect the most crucial part of mindfulness; the ability to be able to assume an observational and accepting role in one's internal emotional experience, allowing for a differentiation between thoughts and reality. Alexithymia has been shown to positively associate with non-acceptance, experiential avoidance, and suppression of unpleasant

emotions, which generally lead to increases in the severity and frequency of unwanted thoughts and feelings (Ghorbani et al., 2017; Panayiotou et al., 2020). Observing was shown to significantly mediate the connection between meditation frequency and positive affect. This is a slightly surprising outcome as observing has been found to be of limited association to alexithymia (Baer et al., 2006). However, this may be due to the high number of meditators in our sample, as observing is known to react differently according to one's meditation experience (Baer et al., 2008). Similarly, it may be a result of the usage of the PAQ to measure alexithymia. These findings suggest that increasing frequency of meditation leads to increases in various mindfulness facets which in turn predicts decreases in alexithymia. Indeed, those with increased levels of mindfulness are better able to attend to both internal experiences and external stimuli, while retaining an intentional, nonreactive, and nonjudgmental focus (Baer et al., 2006). Together, this allows an individual to demonstrate acceptance and non-judgment, even in the face of difficult situations and emotions (MacDonald, 2016). Further, this pattern of behaviour reflects effective emotion regulation, a key deficiency of alexithymia (Hill & Updegraff, 2012; Preece et al., 2018). Therefore, this skill set, built upon effective emotional regulation, may contribute to the reduction of heightened levels of negative affect (seen in anxiety and depression), and an increase in levels of psychological wellbeing (Baer et al., 2008; Cash & Whittingham, 2010). Meditation therefore promotes functionally adaptive emotional and bodily regulation by allowing one to make decisions and choices whereby they are fully aware of their thoughts and needs in an accepting way. Thus, meditation may lead to the usage of more adaptive regulation strategies and the increased experience of positive emotions and reduction in experience of negative emotions for those with alexithymia. Therefore, meditation practice may be an effective intervention tool for alexithymics and their associated affectivity difficulties.

Interestingly, partial commitment to meditation significantly predicted increased negative affect and decreased positive affect through indirect pathways when both nonjudge and nonreact were included as mediators. In both of these models, partial commitment predicted significant decreases in both nonjudge and nonreact, which in turn predicted increased alexithymia and worse affect outcomes. This is in opposition to the majority of findings in this study, where increasing meditation frequency generally led to increased mindfulness facet levels, leading to decreased alexithymia and better affect outcomes. These results are not completely unexpected as similar findings of meditation-associated adverse events have been reported in prior literature (Farias et al., 2020; Proeve, 2020; Woods & Proeve, 2014). The current findings could be explained by the inconsistent pattern of the development of mindfulness facets when meditating (Taylor & Millear, 2016). Skills such as observing may increase rapidly at the beginning of meditation practice, but the ability to refrain from judgement and reactivity to thoughts may be more cognitive demanding and take longer to develop. This opens up the possibility that unless one is committed to meditating frequently, they may increase their awareness but maintain a high level of judgment of their experience, a phenomenon known as 'ruminative self-awareness' (Takano & Tanno, 2009). However, because of the limitations in cross-sectional studies, it is equally possible that this pattern may be arising when individuals, who may be high in negative affect and low in positive affect, are inconsistently using meditation as a response to high stress situations. In other words, this finding may be the result of a selection bias. This finding therefore requires replication and further investigation.

Implications

The present study is one of the few exploring the mechanisms of interoception and mindfulness in the relationship between meditation practice and alexithymia as well as

extending this to emotional affect. Consequently, the results presented herein have contributed to an emerging and relatively unexplored area of alexithymia research.

Alexithymia is an important construct because of its wide-ranging associations with reduced psychological, biological, and social functioning . The results presented in this study are promising as traditional psychotherapies have proven to be of limited effectiveness for individuals suffering from high levels of alexithymia (Ogrodniczuk et al., 2011). Meditation shows much promise in being able to help develop an alexithymic individual's interoceptive awareness and mindfulness skills. In turn, these could have a beneficial effect on their emotional affect which could lead to increased biological, psychological, and social wellbeing.

Future interventions aimed at alexithymic individuals should therefore incorporate meditation practices that have an emphasis on developing one's mindfulness and interoceptive awareness. Further, emphasis should be placed on frequent meditation engagements of at least three sessions a week.

Strengths

In the current study, there was an emphasis placed on sampling experienced meditators from organised groups. While there were less participants drawn from this population than hoped for, half of the participants reported to be at least partially committed to meditation practice, with around a quarter fully committed. Further, the study was adequately powered, meeting the a priori estimates.

Further, this study focussed on measuring *both* negative and positive affect. Much of the literature surrounding alexithymia focusses on negative affect. While an understanding of negative emotionality is critical, many common psychopathologies have been associated with patterns of increased negative affect *and* reduced positive affect (Watson, Clark, et al., 1995;

Watson, Weber, et al., 1995). An understanding in this area could help to encourage development and maintenance of positive emotions, thereby helping to reduce common psychopathologies associated with alexithymia.

Limitations

First, along with the typical response biases that may be seen in self-report measures (Althubaiti, 2016), there may be additional biases when an individual with alexithymia is asked to comment accurately on their emotional awareness deficits. Observer scales of alexithymia such as the Observer Alexithymia Scale (Haviland et al., 2000) exist that could potentially subvert some of these concerns in future research. Additionally, it has been suggested that some alexithymics may become aware of their deficiencies via interpersonal feedback which may alleviate some of these self-report concerns (Suslow & Donges, 2017).

Second, there are limitations in cross-sectional studies, as even though mediation analyses are causal explanations (Hayes, 2017), there are significant limitations in being unable to definitely determine a temporal relationship due to the simultaneous collection of data (Carlson & Morrison, 2009; Sedgwick, 2014). Further, there may also be biases that emerge from conducting mediation analyses with cross-sectional data. It is suggested that this combination leads to erroneous estimates and conclusions regarding the mediation process that may be significantly different than estimates from longitudinal mediation analyses (O'Laughlin et al., 2018). Therefore, it is necessary to replicate the results of the present study through longitudinal research.

Third, the current study utilised a 2-week time frame in the PANAS. This may have impacted the results as an individual's state affect may have been influenced by factors unrelated to their level of alexithymia. Therefore, a trait measure of affect may have been more informative in this study. However, Watson et al. (1988) noted that the different

possible timescales of the PANAS exhibit similar levels of stability, reflecting the strongly dispositional component of emotional affect. In other words, even momentary state moods are, to an extent, fairly accurate reflections of one's general affective baseline (Watson & Clark, 1984).

Fourth, although the PAQ shows great promise and was informative in the current study, it is relatively new and untested. The majority of alexithymia-focussed studies still utilise the more established TAS-20 (Bagby et al., 1994), and it is unknown how these two scales compare, particularly in terms of predicting emotional affect.

Directions for Future Research

One of the avenues for future research would be to conduct a longitudinal design whereby the causal mechanisms presented herein may be replicated. This could more effectively determine just how much meditation may assist alexithymic individuals with their affectivity struggles. This investigation could also be conducted with clinical populations with high levels of alexithymia, as this sample was in line with general community samples at 14%.

Exploring specific meditation practices could also be beneficial. While this study collected data on the types of meditation practice performed by participants, it was never substantially utilised. By investigating particular types of meditation drawn from the myriad meditation practices known (Matko et al., 2021), researchers may be able to better understand which types of meditation may better serve to develop mindfulness and interoception skills for alexithymic individuals.

Conclusion

The aims and hypotheses of this study have been almost fully supported. The current study provided support for meditation practice as a potential intervention tool for individuals

with high levels of alexithymia and their associated affectivity struggles. Further, both interoception and mindfulness were implicated as possible mechanisms of action in this relationship, although to varying degrees and for varying outcomes. Although longitudinal cohort studies are needed, meditation shows promise as an effective intervention tool for alexithymic individuals, which may allow them to become more observant, more expressive, and more accepting of their affective and non-affective states, which may assist them with ongoing and chronic affectivity struggles.

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Appendix A

Data preparation

Table A1

Outlier Labelling Rule Calculations

Measure	IQR	IQR*1.5	25th percentile	75th percentile	25th percentile - (IQR*1.5)	75th percentile + (IQR*1.5)	Min	Max
Observing	7.75	11.625	24.25	32	12.625	43.625	13	40
Describing	11.5	17.25	21	32.5	3.75	49.75	8	40
ActAware	9	13.5	19	28	5.5	41.5	8	40
NonJudge	11	16.5	19	30	2.5	46.5	8	40
NonReact	8	12	17	25	5	37	8	35
GenInteroception	43.5	65.25	83.25	126.75	18	192	11*	173
GenAlexithymia	56.5	84.75	45.25	100.75	-39.5	185.5	24	168
Positive Affect	12.75	19.125	24	36.75	4.875	55.875	12	49
Negative Affect	13	19.5	17	30.25	-2.5	49.75	10	48

* denotes a value lying beyond the calculated range, indicating an outlier.

Table A2

Normality Tests for Continuous Measures

			Shapiro-Wilk		
Measure	Skewness	Kurtosis	Statistic	df	*p*
Observing	-.17	-.30	.99	192	.055
Describing	-.27	-.71	.98	189	.002*
ActAware	.11	-.39	.99	192	.181
NonJudge	.05	-.71	.98	191	.012*
NonReact	.25	-.21	.99	190	.119
GenInteroception	.06	-.47	.99	183	.399
GenAlexithymia	.38	-.48	.97	195	.000*
Positive Affect	-.11	-.66	.99	195	.054
Negative Affect	.46	-.71	.96	193	.000*

* denotes significance at a .05 level, indicating a departure from normality

Figure A1

Scatterplot of Observing and General Interoception

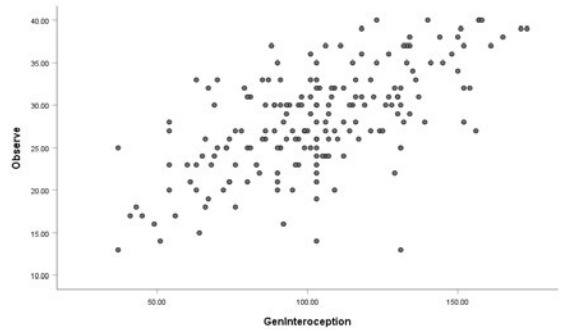


Figure A2

Scatterplot Of Observing and General Alexithymia

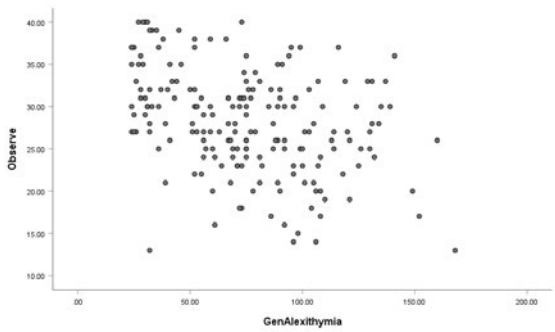


Figure A3

Scatterplot Of Observing and Positive Affect

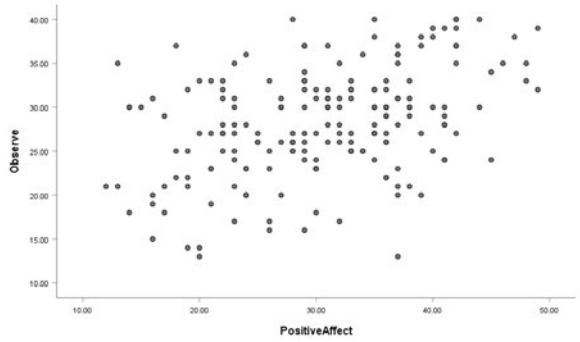


Figure A4

Scatterplot Of Observing and Negative Affect

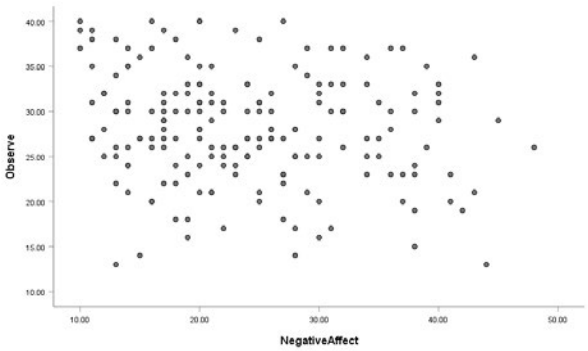


Figure A5

Scatterplot Of Describing and General Interoception

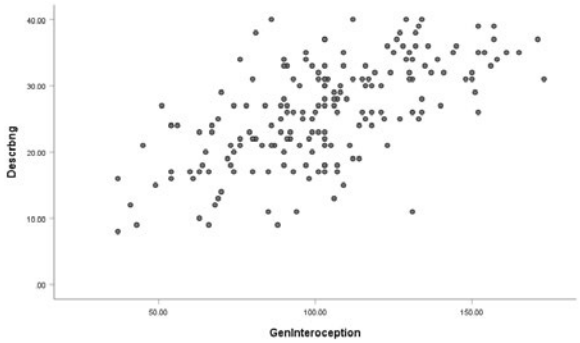


Figure A6

Scatterplot of Describing and General Alexithymia

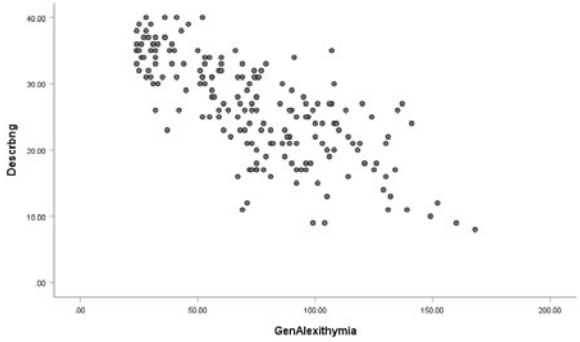


Figure A7

Scatterplot of Describing and Positive Affect

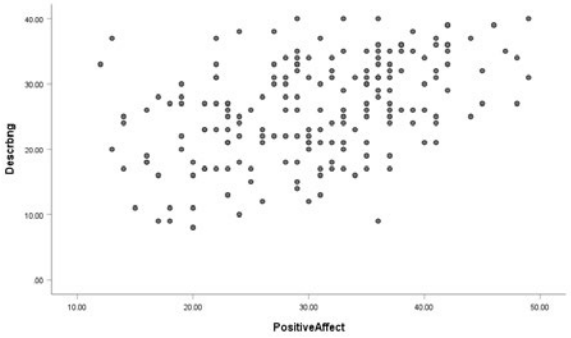


Figure A8

Scatterplot of Describing and Negative Affect

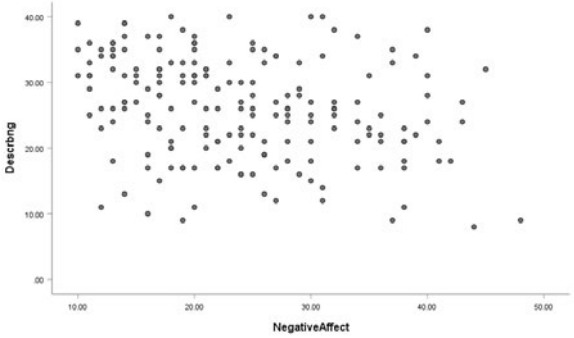


Figure A9

Scatterplot of ActAware and General Interoception

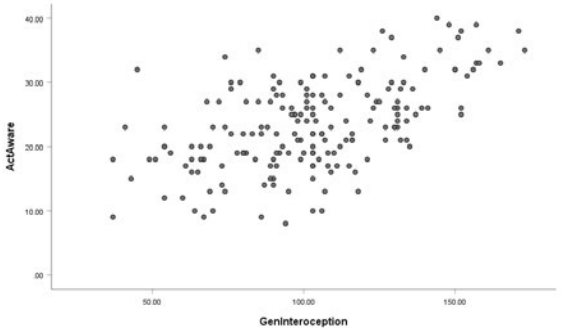


Figure A10

Scatterplot of ActAware and General Alexithymia

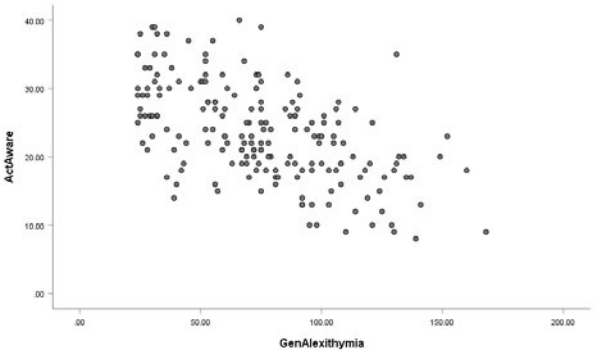


Figure A11

Scatterplot of ActAware and Positive Affect

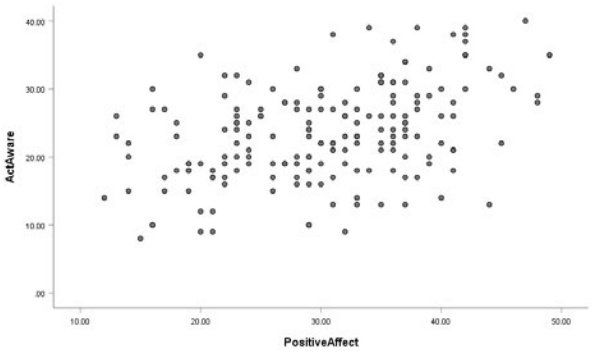


Figure A12

Scatterplot of ActAware and Negative Affect

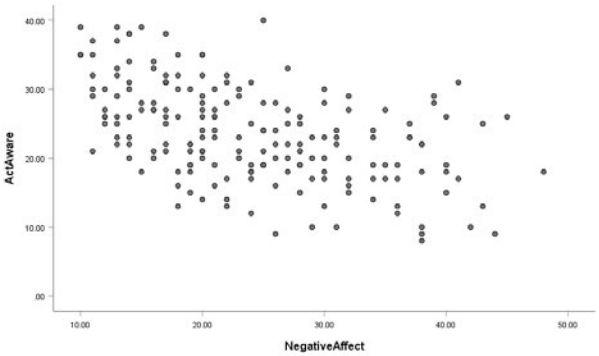


Figure A13

Scatterplot of Nonjudge and General Interoception

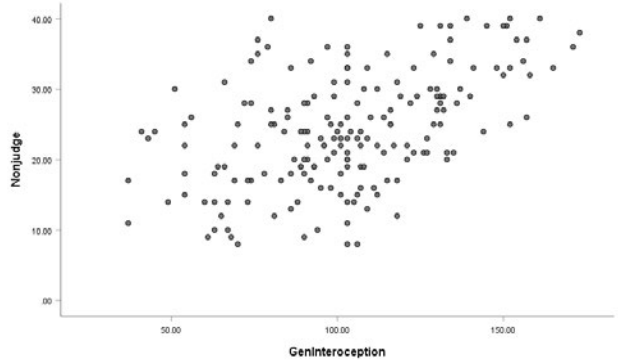


Figure A14

Scatterplot of Nonjudge and General Alexithymia

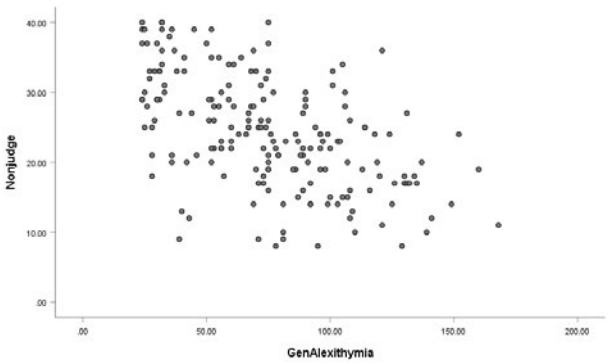


Figure A15

Scatterplot of Nonjudge and Positive Affect

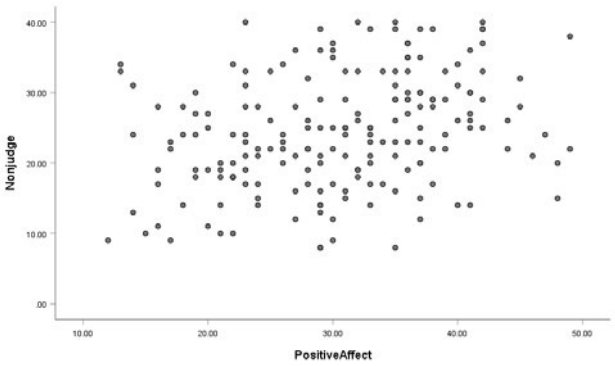


Figure A16

Scatterplot of Nonjudge and Negative Affect

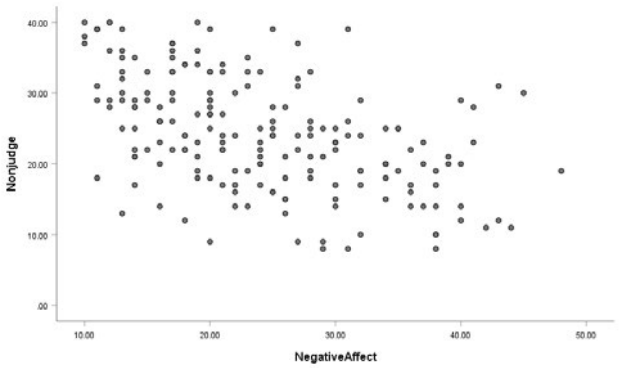


Figure A17

Scatterplot of Nonreact and General Interoception

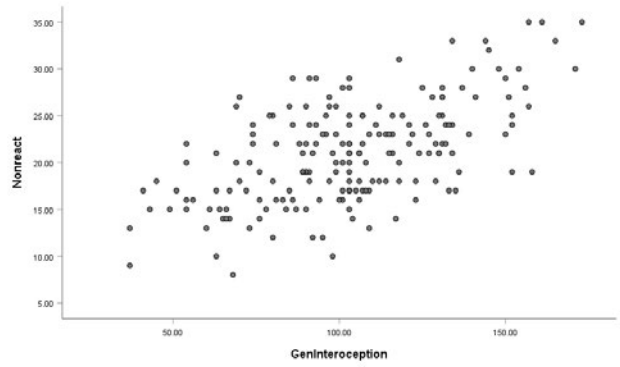


Figure A18

Scatterplot of Nonreact and General Alexithymia

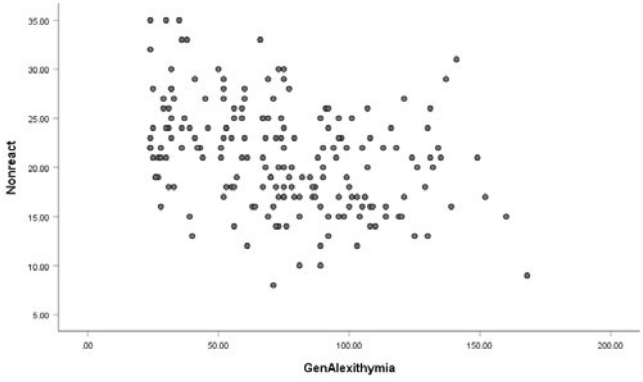


Figure A19

Scatterplot of Nonreact and Positive Affect

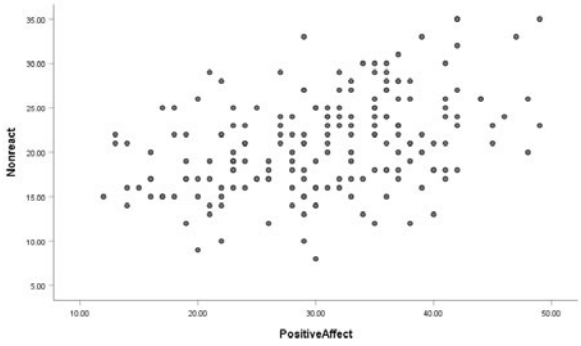


Figure A20

Scatterplot of Nonreact and Negative Affect

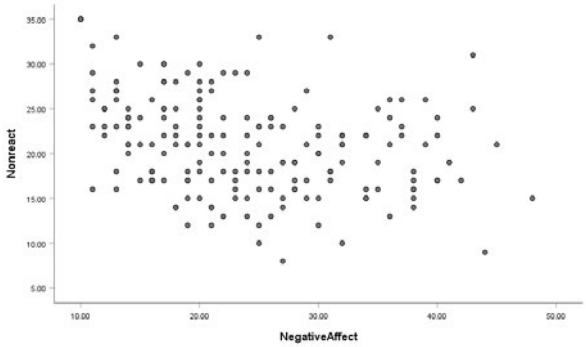


Figure A21

Scatterplot of Nonreact and General Interoception

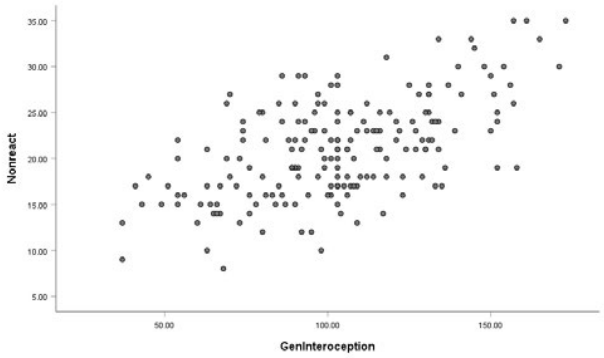


Figure A22

Scatterplot of Nonreact and General Alexithymia

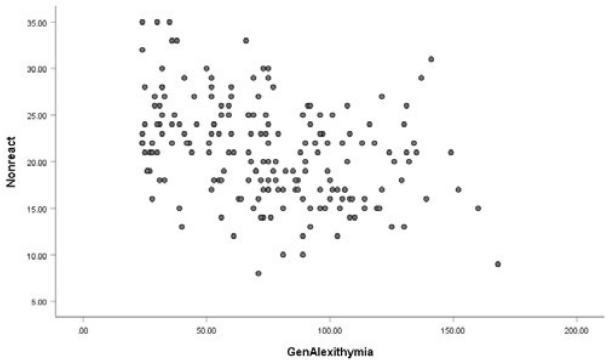


Figure A23

Scatterplot of Nonreact and Positive Affect

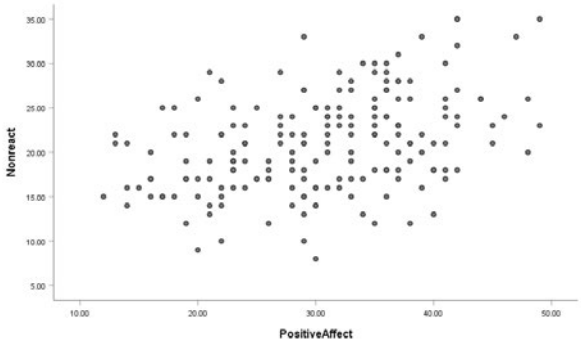


Figure A24

Scatterplot of Nonreact and Negative Affect

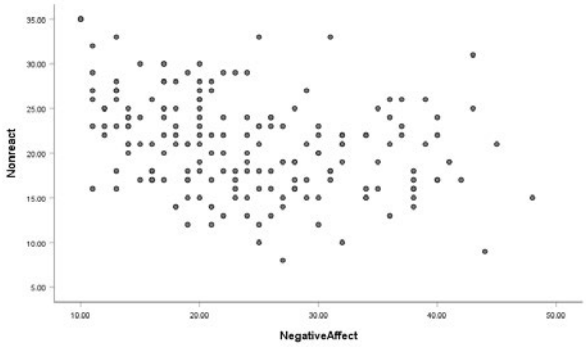


Figure A25

Scatterplot of General Interoception and General Alexithymia

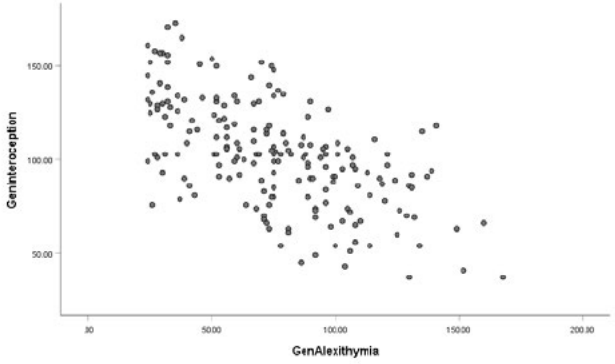


Figure A26

Scatterplot of General Interoception and Positive Affect

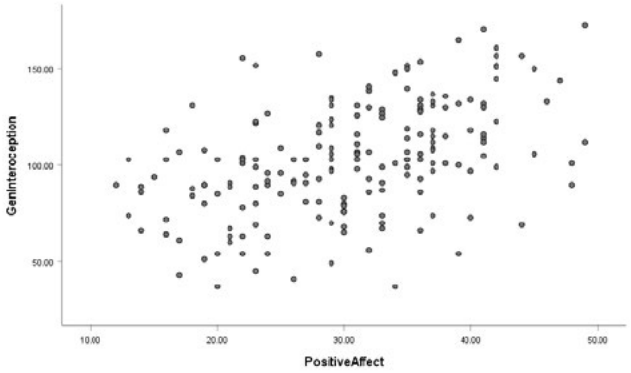


Figure A27

Scatterplot of General Interoception and Negative Affect

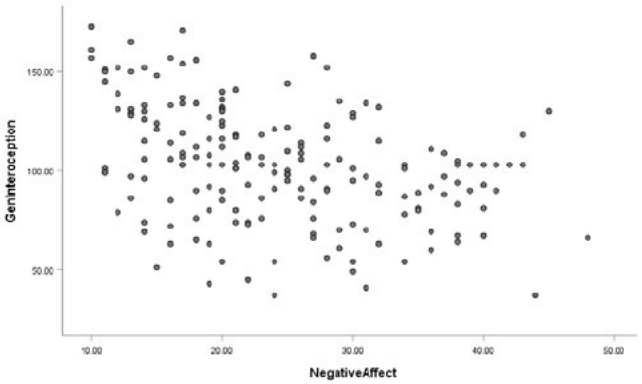


Figure A28

Scatterplot of General Alexithymia and Positive Affect

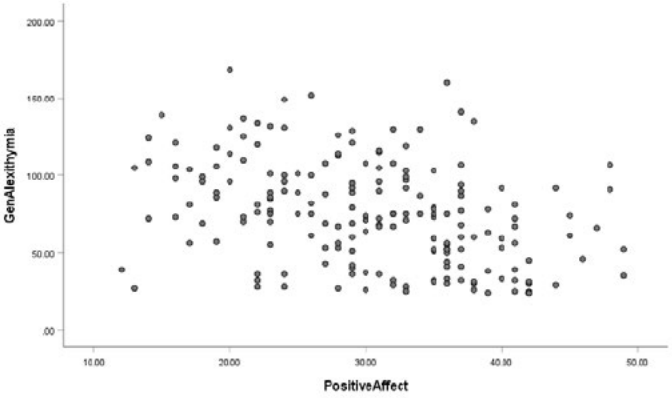


Figure A29

Scatterplot of General Alexithymia and Negative Affect

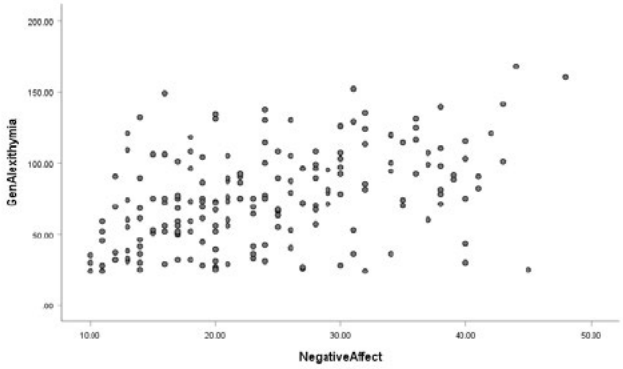
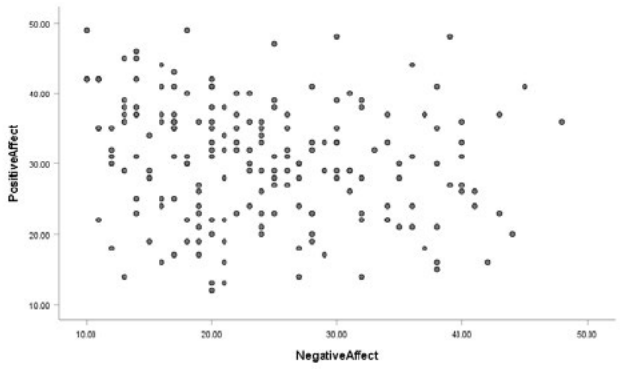


Figure A30

Scatterplot of Positive Affect and Negative Affect



Appendix B

Tests for possible covariates

T-tests for gender differences

Scores of Observing were lower for men (M = 27.77, SE = .72) than women (M = 28.43, SE = .56). This difference, -.67, 95% CI [-2.55, 1.21], was not significant, $t(187) = -.70$, $p = .484$, and represented an effect of $d = .11$.

Scores of Describing were higher for men (M = 27.85, SE = .93) than women (M = 25.59, SE = .68). This difference, 2.25, 95% CI [-.07, 4.58], approached significance, $t(187) = 1.91$, $p = .058$, and represented an effect of $d = .30$.

Scores of ActAware were higher for men (M = 24.35, SE = .84) than women (M = 23.33, SE = .64). This difference, 1.02, 95% CI [-1.15, 3.18], was not significant, $t(187) = .93$, $p = .356$, and represented an effect of $d = .14$.

Scores of NonJudge were higher for men (M = 26.05, SE = .98) than women (M = 23.74, SE = .72). This difference, 2.31, 95% CI [-.16, 4.79], approached significance, $t(187) = 1.85$, $p = .067$, and represented an effect of $d = .29$.

Scores of NonReact were higher for men (M = 23.23, SE = .58) than women (M = 20.02, SE = .49). This difference, 3.21, 95% CI [-.1.60, 4.82], was significant, $t(187) = 3.95$, $p = .000$, and represented an effect of $d = .64$.

Scores of General Interoception were higher for men (M = 107.52, SE = 3.50) than women (M = 101.05, SE = 2.58). This difference, 6.48, 95% CI [-2.30, 15.26], was not significant, $t(187) = 1.46$ $p = .147$, however, it represented an effect of $d = .22$.

Scores of General Alexithymia were lower for men (M = 70.56, SE = 4.00) than women (M = 76.09, SE = 2.86). This difference, -5.54, 95% CI [-15.33, 4.26], was not significant, $t(194) = -1.11$, $p = .266$, and it represented an effect of $d = .17$.

Scores of Positive Affect were higher for men (M = 31.72, SE = .99) than women (M = 30.13, SE = .76). This difference, 1.59, 95% CI [-.99, 4.17], was not significant, $t(190) = 1.21$, $p = .227$, and it represented an effect of $d = .19$.

Scores of Negative Affect were lower for men (M = 23.67, SE = 1.11) than women (M = 24.08, SE = .78). This difference, -.42, 95% CI [-3.1, 2.3], was not significant, $t(190) = -.30$, $p = .763$, and it represented an effect of $d = .04$.

Correlations for age

Age was significantly correlated with Observing, $r = .23$, Describing, $r = .28$, ActAware, $r = .29$, NonJudge, $r = .37$, NonReact, $r = .31$, General Interoception, $r = .36$, General Alexithymia, $r = -.25$, Positive Affect, $r = .38$, and Negative Affect, $r = -.30$ (all ps <.001).

ANOVAs for education levels

There was a non-significant effect of Education levels on levels of Observation, $F(2,48.27) = 1.04$, $p = .360$, $\eta^2 = .01$.

There was a significant effect of Education levels on levels of Describing, $F(2, 46.00) = 8.41$, $p = .001$, $\eta^2 = .08$. Post hoc comparisons using the Scheffe test indicated that the difference (-4.63, 95% CI [-7.46, -1.80]) between mean scores for university graduates ($M = 28.90$, $SD = 7.57$) and high school graduates ($M = 24.26$, $SD = 7.15$) was significant, $p = .000$. However, levels for those holding a trade or vocational diploma ($M = 27.78$, $SD = 7.93$) did not significantly differ from those who had graduated from high school, $p = .177$, or held a university degree, $p = .849$.

There was a significant effect of Education levels on levels of ActAware, $F(2, 46.45) = 6.67$, $p = .003$, $\eta^2 = .07$. Post hoc comparisons using the Scheffe test indicated that the difference (-4.00, 95% CI [-6.60, -1.40]) between mean scores for university graduates ($M = 26.06$, $SD = 7.39$) and high school graduates ($M = 22.06$, $SD = 6.36$) was significant, $p = .001$. However, levels for those holding a trade or vocational diploma ($M = 23.66$, $SD = 6.79$) did not significantly differ from those who had graduated from high school, $p = .649$, or held a university degree, $p = .415$.

There was a significant effect of Education levels on levels of NonJudge, $F(2, 46.34) = 6.82$, $p = .003$, $\eta^2 = .07$. Post hoc comparisons using the Scheffe test indicated that the difference (-4.54, 95% CI [-7.53, -1.55]) between mean scores for university graduates ($M = 27.16$, $SD = 8.04$) and high school graduates ($M = 22.62$, $SD = 7.59$) was significant, $p = .001$. However, levels for those holding a trade or vocational diploma ($M = 24.72$, $SD = 8.19$) did not significantly differ from those who had graduated from high school, $p = .574$, or held a university degree, $p = .501$.

There was a non-significant effect of Education levels on levels of NonReact, $F(2, 47.51) = 1.94$, $p = .155$, $\eta^2 = .02$

There was a significant effect of Education levels on levels of General Interoception, $F(2, 32.59) = 4.42$, $p = .018$, $\eta^2 = .05$. Post hoc comparisons using the Scheffe test indicated that the difference (-13.01, 95% CI [-23.75, -2.25]) between mean scores for university graduates ($M = 110.42$, $SD = 30.11$) and high school graduates ($M = 97.42$, $SD = 26.49$) was significant, $p = .013$. However, levels for those holding a trade or vocational diploma ($M = 106.88$, $SD = 29.73$) did not significantly differ from those who had graduated from high school, $p = .437$, or held a university degree, $p = .898$.

There was a significant effect of Education levels on levels of General Alexithymia, $F(2, 31.40) = 5.04$, $p = .013$, $\eta^2 = .06$. Post hoc comparisons using the Scheffe test indicated that the difference (16.78, 95% CI [4.78, 28.79]) between mean scores for university graduates ($M = 65.38$, $SD = 34.23$) and high school graduates ($M = 82.16$, $SD = 29.34$) was significant, $p = .003$. However, levels for those holding a trade or vocational diploma ($M = 69.75$, $SD = 37.68$) did not significantly differ from those who had graduated from high school, $p = .285$, or held a university degree, $p = .865$.

There was a significant effect of Education levels on levels of Positive Affect, $F(2, 46.78) = 8.10$, $p = .001$, $\eta^2 = .07$. Post hoc comparisons using the Scheffe test indicated that the difference (-4.80, 95% CI [-7.86, -1.75]) between mean scores for university graduates ($M = 33.33$, $SD = 7.18$) and high school graduates ($M = 28.25$, $SD = 8.56$) was significant, $p = .001$. However, levels for those holding a trade or vocational diploma ($M = 31.33$, $SD =$

8.71) did not significantly differ from those who had graduated from high school, $p = .399$, or held a university degree, $p = .645$.

There was a significant effect of Education levels on levels of Negative Affect, $F(2, 47.00) = 4.35$, $p = .018$, $\eta^2 = .04$. Post hoc comparisons using the Scheffe test indicated that the difference (3.85, 95% CI [.55, 7.16]) between mean scores for university graduates ($M = 21.69$, $SD = 8.44$) and high school graduates ($M = 25.55$, $SD = 8.91$) was significant, $p = .017$. However, levels for those holding a trade or vocational diploma ($M = 25.11$, $SD = 9.17$) did not significantly differ from those who had graduated from high school, $p = .981$, or held a university degree, $p = .337$.

Appendix C

Details of exploratory analyses

Table C1

BCa bootstrapped confidence intervals for parametric correlations between continuous measures

	Obsv	Desc	Aware	NJudge	NReact	GenI	GenA	P-A	N-A
Obsv	-	-	-	-	-	-	-	-	-
Desc	[.32, .56]	-	-	-	-	-	-	-	-
Aware	[.22, .52]	[.34, .57]	-	-	-	-	-	-	-
NJudge	[.05, .36]	[.29, .54]	[.47, .66]	-	-	-	-	-	-
NReact	[.31, .57]	[.35, .59]	[.33, .60]	[.40, .63]	-	-	-	-	-
GenI	[.53, .74]	[.53, .70]	[.45, .66]	[.39, .60]	[.48, .68]	-	-	-	-
GenA	[-.50, -.25]	[-.80, -.66]	[-.65, -.46]	[-.63, -.43]	[-.49, -.23]	[-.69, -.53]	-	-	-
P-A	[.29, .54]	[.32, .55]	[.30, .55]	[.16, .42]	[.31, .53]	[.34, .57]	[-.49, -.26]	-	-
N-A	[-.32, -.03]	[-.41, -.14]	[-.60, -.39]	[-.61, -.40]	[-.51, -.28]	[-.51, -.28]	[.28, .56]	[-.32, -.04]	-

Note. Obsv = Observing, Desc = Describing, Aware = ActAware, NJudge = NonJudge, NReact = NonReact, GenI = General Interoception, GenA = General Alexithymia, P-A = Positive Affect, N-A = Negative Affect.

Table C2

Post-hoc multiple comparison tests between Meditation Frequency levels and continuous measures

Category		Mean difference	*p*	95% Confidence Interval	
				Lower	Upper
Observing					
1	2	-4.76	.000*	-7.17	-2.36
	3	-5.56	.000*	-7.98	-3.13
2	1	4.76	.000*	2.36	7.17
	3	-.79	.782	-3.59	2.00
3	1	5.56	.000*	3.13	7.98
	2	.79	.782	-2.00	3.59
Describing					
1	2	-3.30	.034*	-6.42	-.19
	3	-6.84	.000*	-9.98	-3.70
2	1	3.30	.034*	.19	6.42
	3	-3.53	.058	-7.15	.09
3	1	6.84	.000*	3.70	9.98
	2	3.53	.058	-.09	7.15
ActAware					
1	2	-1.69	.336	-4.51	1.12
	3	-6.71	.000*	-9.56	-3.87
2	1	1.69	.336	-1.12	4.51
	3	-5.02	.001*	-8.30	-1.74
3	1	6.71	.000*	3.87	9.56
	2	5.02	.001*	1.74	8.30
NonJudge					
1	2	.94	.766	-2.25	4.15
	3	-7.43	.000*	-10.65	-4.20
2	1	-.94	.766	-4.15	2.25
	3	-8.38	.000*	-12.10	-4.65
3	1	7.43	.000*	4.20	10.65
	2	8.38	.000*	4.65	12.10
NonReact					
1	2	-0.20	.973	-2.36	1.95
	3	-4.99	.000*	-7.16	-2.81
2	1	0.20	.973	-1.95	2.36
	3	-4.78	.000*	-7.29	-2.27

Category		Mean difference	*p*	95% Confidence Interval	
				Lower	Upper
3	1	4.99	.000*	2.81	7.16
	2	4.78	.000*	2.27	7.29
GenInteroception					
1	2	-16.37	.001*	-26.95	-5.79
	3	-37.01	.000*	-47.74	-26.28
2	1	16.37	.001*	5.79	26.95
	3	-20.63	.000*	-32.94	-8.33
3	1	37.01	.000*	26.28	47.74
	2	20.63	.000*	8.33	32.94
GenAlexithymia					
1	2	11.75	.090	-1.38	24.88
	3	29.27	.000*	16.05	42.50
2	1	-11.75	.090	-24.88	1.38
	3	17.52	.020*	2.25	32.79
3	1	-29.27	.000*	-42.50	-16.05
	2	-17.52	.020*	-32.79	-2.25
Positive Affect					
1	2	-3.65	.036*	-7.11	-0.18
	3	-6.11	.000*	-9.57	-2.64
2	1	3.65	.036*	0.18	7.11
	3	-2.45	.324	-6.48	1.56
3	1	6.11	.000*	2.64	9.57
	2	2.45	.324	-1.56	6.48
Negative Affect					
1	2	0.66	.904	-2.96	4.29
	3	7.45	.000*	3.82	11.08
2	1	-0.66	.904	-4.29	2.96
	3	6.79	.001*	2.56	11.01
3	1	-7.45	.000*	-11.08	-3.82
	2	-6.79	.001*	-11.01	-2.56

Note. 1 = little commitment, 2 = partial commitment, 3 = full commitment. All comparisons were conducted using Scheffé's method.

* denotes significance at a .05 level.

Appendix D

Detailed regression equations for mediation analyses

Table D1

Regression equations for simple mediation of Meditation Frequency and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R^2 = 15%, F(5, 185) = 6.41, p = .000			
X1	(*c*)	.19	.98	1.72	.087
X2	(*c*)	-.41	1.17	-3.17	.002*
Age		-.13	.06	-1.34	.180
edu1		.07	2.32	-.94	.349
edu2		-.17	2.23	-1.43	.155
		Equation 2: predicting Alexithymia			
		R^2 = 15%, *F(*5, 185) = 6.50, *p* = .000			
X1	(*a*)	.04	3.63	.36	.715
X2	(*a*)	-.27	4.33	-3.09	.002*
Age		-.02	.21	-.23	.818
edu1		-.01	8.59	-.11	.911
edu2		-.13	5.84	-1.53	.126
		Equation 3: predicting Negative affect			
		R^2 = 25%, F(6, 184) = 10.27, p = .000			
X1	(*c'*)	.17	.92	1.69	.096
X2	(*c'*)	-.27	1.13	-2.16	.032*
GenA	(*b*)	.34	.02	5.03	.000*
Age		-.12	.05	-1.34	.180
edu1		.07	2.18	1.04	.299
edu2		-.01	1.49	-.10	.919

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D2

Regression equations for simple mediation of Meditation Frequency and Positive Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(5, 185) = 7.07, p = .000			
X1	(*c*)	.15	.91	1.36	.172
X2	(*c*)	.06	1.08	.46	.642
Age		.28	.05	2.96	.003*
edu1		-.03	2.15	-.37	.708
edu2		.06	1.46	.65	.51
		Equation 2: predicting Alexithymia			
		R^2 = 15%, *F(*5, 185) = 6.50, *p* = .000			
X1	(*a*)	.04	3.63	.36	.714
X2	(*a*)	-.40	4.33	-3.09	.002*
Age		-.02	.21	-.23	.818
edu1		-.01	.59	-.11	.911
edu2		-.13	5.84	-1.53	.126
		Equation 3: predicting Positive affect			
		R2 = 23%, F(6, 184) = 8.95, p = .000			
X1	(*c'*)	.16	.87	1.52	.128
X2	(*c'*)	-.05	1.07	-.40	.685
GenA	(*b*)	-.22	.01	-3.94	.000*
Age		.28	.05	3.01	.003*
edu1		-.03	2.07	-.41	.674
edu2		.02	1.42	.23	.814

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D3

Regression equations for simple mediation of General Interoception and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 19%, F(4, 184) = 10.52, p = .000			
GenI	(*c*)	-.32	.02	-4.51	.000*
Age		-.16	.05	-1.90	.059
edu1		.04	2.30	.61	.544
edu2		-.05	1.53	-.59	.555
		Equation 3: predicting Negative affect			
		R2 = 24%, F(5, 183) = 11.37, p = .000			
GenI	(*a*)	-.60	.07	-9.61	.000*

Age		.03	.16	.35	.730
edu1		-.05	7.40	-.73	.460
edu2		-.13	4.94	-1.77	.077
		Equation 3: predicting Negative affect			
		R2 = 24%, F(5, 183) = 11.37, p = .000			
GenI	(*c'*)	-.15	.02	-1.76	.079
GenA	(*b*)	.28	.02	3.49	.001*
Age		-.17	.05	-2.04	.042*
edu1		.06	2.24	.81	.415
edu2		-.01	1.50	-.15	.881

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D4

Regression equations for simple mediation of General Interoception and Positive Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting *Positive* Affect			
		R^2 = 26%, *F(4*, 184) = 16.22, *p* = .000			
GenI	(*c*)	.38	.02	5.51	.000*
Age		.19	.05	2.26	.025*
edu1		-.00	2.07	-.05	.958
edu2		.08	1.38	.99	.322
		Equation 2: predicting Alexithymia			
		R^2 = 39%, *F(4, 184*) = 29.37, *p* = .000			
GenI	(*a*)	-.60	.07	-9.61	.000*
Age		.02	.16	.34	.730
edu1		-.05	7.40	-.73	.460
edu2		-.12	4.94	-1.77	.077
		Equation 3: predicting *Positive* affect			
		R^2 = 27%, *F(5, 183*) = 13..60, *p* = .000			
GenI	(*c'*)	.29	.02	3.59	.000*
GenA	(*b*)	-.12	.02	-1.59	.111
Age		.19	.04	2.31	.021*
edu1		-.01	2.03	-.14	.889
edu2		.06	1.38	.78	.436

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D5

Regression equations for serial mediation of Meditation Frequency and Negative Affect through General Interoception and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 10.52, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting General Interoception			
		R^2 = 30%, $F(5, 183) = 15.95$, $p = .000$			
X1	(a_1)	-.04	2.86	-.35	.719
X2	(a_1)	.62	3.41	5.23	.000*
Age		.11	.16	1.22	.222
edu1		-.04	6.95	-.65	.514
edu2		-.01	4.63	-.19	.842
		Equation 3: predicting Alexithymia			
		R^2 = 39%, $F(6, 182) = 19.40$, $p = .000$			
X1	(a_2)	.02	3.08	.20	.841
X2	(a_2)	-.04	3.94	-.37	.708
GenI	(d_{21})	-.59	.08	-8.47	.000*
Age		.04	.18	.47	.635
edu1		-.05	7.51	-.74	.458
edu2		-.12	5.00	-1.76	.079
		Equation 4: predicting Negative Affect			
		R^2 = 25%, F(7, 181) = 8.71, p = .000			
X1	(*c'*)	.18	.92	1.74	.089
X2	(*c'*)	-.22	1.18	-1.66	.097
GenI	(b_1)	-.12	.02	-1.36	.174
GenA	(b_2)	.28	.02	3.46	.001*
Age		-.10	.05	-1.12	.262
edu1		.04	2.25	.61	.538
edu2		-.02	1.51	-.32	.751

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D6

Regression equations for simple mediation of Observing and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 11%, F(4, 184) = 5.53, p = .000			
Observing	(*c*)	-.11	.11	-1.50	.133
Age		-.26	.05	-2.96	.003*
edu1		.05	2.41	.71	.481
edu2		-.05	1.61	-.60	.546
		Equation 2: predicting Alexithymia			
		R^2 = 19%, *F(4*, 184) = 10.62, *p* = .000			
Observing	(*a*)	-.33	.37	-4.8	.000*
Age		-.12	.18	-1.42	.157
edu1		-.03	8.54	-.45	.649
edu2		-.14	5.70	-1.66	.097
		Equation 3: predicting Negative affect			
		R^2 = 22%, *F(5*, 183) = 10.58, *p* = .000			
Observing	(*c'*)	.02	.10	.26	.798
GenA	(*b*)	.38	.02	5.25	.000*
Age		-.22	.05	-.2.61	.009*
edu1		.07	2.26	.93	.353
edu2		.00	1.51	-.00	.999

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D7

Regression equations for simple mediation of Observing and Positive Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 26%, F(4, 184) = 16.04, p = .000			
Observing	(*c*)	.36	.09	5.45	.000*
Age		.13	.04	3.01	.003*
edu1		-.22	2.07	-.11	.913
edu2		1.56	1.56	1.13	.259
		Equation 2: predicting Alexithymia			
		R^2 = 19%, *F(4*, 184) = 10.62, *p* = .000			
Observing	(*a*)	-.33	.37	-4.87	.000*

Age		-.12	.18	1.41	.157
edu1		-.03	8.54	-.45	.649
edu2		-.14	5.70	-1.66	.097
		Equation 3: predicting Positive affect			
		R^2 = 29%, *F(5*, 183) = 14.96, *p* = .000			
Observing	(*c'*)	.29	.09	4.26	.000*
GenA	(*b*)	-.19	.02	-2.87	.005*
Age		.21	.04	2.76	.006*
edu1		-.01	2.04	-.20	.836
edu2		.06	1.36	.79	.452

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D8

Regression equations for simple mediation of Describing and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(4, 184) = 7.19, p = .000			
Describing	(*c*)	-.20	.08	-2.87	.005*
Age		-.24	.05	-2.90	.004*
edu1		.07	2.37	.90	.363
edu2		-.01	1.60	-.15	.879
		Equation 2: predicting Alexithymia			
		R^2 = 54%, *F(4*, 184) = 54.92, *p* = .000			
Describing	(*a*)	-3.10	.22	-13.64	.000*
Age		-.15	.13	-1.09	.274
edu1		1.52	6.40	.23	.812
edu2		-.29	4.31	-.06	.945
		Equation 3: predicting Negative affect			
		R2 = 23%, F(5, 183) = 10.95, p = .000			
Describing	(*c'*)	.11	.11	1.22	.221
GenA	(*b*)	.45	.03	4.75	.000*
Age		-.21	.04	-2.66	.008*
edu1		1.95	2.25	.86	.386
edu2		-.20	1.51	-.13	.891

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D9

Regression equations for simple mediation of Describing and Positive Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 26%, F(4, 184) = 15.76, p = .000			
Describing	(*c*)	.35	.07	5.36	.000*
Age		.26	.04	3.31	.001*
edu1		-.04	2.08	-.52	.599
edu2		.02	1.40	.20	.837
		Equation 2: predicting Alexithymia			
		R^2 = 54%, *F(4*, 184) = 54.92, *p* = .000			
Describing	(*a*)	-.71	.22	-13.64	.000*
Age		-.06	.13	-1.09	.274
edu1		.01	6.40	.23	.812
edu2		-.00	4.31	-.06	.945
		Equation 3: predicting Positive affect			
		R^2 = 26%, *F(5*, 183) = 12.78, *p* = .000			
Describing	(*c'*)	.30	.11	3.11	.002*
GenA	(*b*)	-.08	.02	-.94	.346
Age		.26	.04	3.22	.001*
edu1		-.03	2.08	-.50	.611
edu2		.02	1.40	.20	.841

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D10

Regression equations for simple mediation of ActAware and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 27%, F(4, 184) = 17.56, p = .000			
ActAware	(*c*)	-.44	.08	-6.76	.000*
Age		-.18	.04	-2.35	.019*
edu1		.05	2.17	.72	.468

edu2		.01	1.46	.12	.900
		Equation 2: predicting Alexithymia			
		R^2 = 33%, *F(4*, 184) = 22.86, *p* = .000			
ActAware	(*a*)	-.52	.30	-8.28	.000*
Age		-.08	.16	-1.08	.281
edu1		-.03	7.74	-.47	.635
edu2		-.06	5.20	-.77	.439
		Equation 3: predicting Negative affect			
		R^2 = 23%, *F(5*, 183) = 10.95, *p* = .000			
ActAware	(*c'*)	-.34	.09	-4.51	.000*
GenA	(*b*)	.20	.02	2.58	.011*
Age		-.16	.04	-2.17	.031*
edu1		.05	2.14	.82	.408
edu2		.02	1.44	.27	.784

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D11

Regression equations for simple mediation of ActAware and Positive Affect through General Alexithymia

Predictor	Path	*β*†	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 25%, F(4, 184) = 15.20, p = .000			
ActAware	(*c*)	.35	.08	5.18	.000*
Age		.25	.04	3.12	.002*
edu1		-.01	2.08	-.18	.852
edu2		.03	1.40	.40	.685
		Equation 2: predicting Alexithymia			
		R^2 = 33%, *F(4*, 184) = 22.86, *p* = .000			
ActAware	(*a*)	-.52	.30	-8.28	.000*
Age		-.17	.16	-1.08	.281
edu1		-3.67	7.74	-.47	.635
edu2		-4.02	5.20	-.77	.439
		Equation 3: predicting Positive affect			
		R^2 = 27%, *F(5*, 183) = 13.23, *p* = .000			
ActAware	(*c'*)	.26	.09	3.38	.001*
GenA	(*b*)	-.16	.01	-2.06	.040*
Age		.23	.04	2.97	.003*
edu1		-.01	2.07	-.26	.795
edu2		.02	1.39	.29	.771

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D12

Regression equations for simple mediation of NonJudge and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 27%, F(4, 184) = 17.28, p = .000			
NonJudge	(*c*)	-.46	.07	-6.69	.000*
Age		-.12	.04	-1.48	.139
edu1		.02	2.18	.32	.748
edu2		-.02	1.45	-.31	.758
		Equation 2: predicting Alexithymia			
		R^2 = 30%, *F(4*, 184) = 19.64, *p* = .000			
NonJudge	(*a*)	-.50	.27	-7.53	.000*
Age		-.01	.17	-.21	.827
edu1		-.06	7.95	-.90	.365
edu2		-.09	5.30	-1.30	.194
		Equation 3: predicting Negative affect			
		R^2 = 27%, *F(5*, 183) = 13.23, *p* = .000			
NonJudge	(*c'*)	-.35	.08	-4.58	.000*
GenA	(*b*)	.21	.01	2.84	.005*
Age		-.11	.04	-1.46	.144
edu1		.03	2.14	.51	.605
edu2		-.00	1.43	-.04	.967

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D13

Regression equations for simple mediation of NonJudge and Positive Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(4, 184) = 9.02, p = .000			
NonJudge	(*c*)	.17	.07	2.35	.019*
Age		.27	.05	3.06	.002*
edu1		-.01	2.20	-.07	.941
edu2		.06	1.47	.82	.412
		Equation 2: predicting Alexithymia			
		R^2 = 30%, *F(4*, 184) = 19.64, *p* = .000			
NonJudge	(*a*)	-.50	.27	-7.54	.000*
Age		-.01	.17	-.21	.827
edu1		-.06	7.95	-.90	.365
edu2		-.09	5.30	-1.30	.194
		Equation 3: predicting Positive affect			
		R^2 = 22%, *F(5*, 183) = 10.33, *p* = .000			
NonJudge	(*c'*)	.03	.08	.36	.714
GenA	(*b*)	-.28	.02	-3.63	.000*
Age		.26	.05	3.10	.002*
edu1		-.02	2.14	-.31	.750
edu2		.04	1.43	.49	.619

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D14

Regression equations for simple mediation of NonReact and Negative Affect through General Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 15%, F(4, 184) = 8.39, p = .000			
NonReact	(*c*)	-.25	.11	-3.55	.001*
Age		-.19	.05	-2.26	.024*
edu1		.03	2.36	.42	.637
edu2		-.05	1.56	-.68	.495
		Equation 2: predicting Alexithymia			
		R^2 = 17%, *F(4*, 184) = 9.35, *p* = .000			
NonReact	(*a*)	-.31	.43	-4.36	.000*
Age		-.09	.18	-1.06	.286
edu1		-.05	8.67	-.73	.465
edu2		-.13	5.76	-1.65	.100

		Equation 3: predicting Negative affect			
		R^2 = 24%, *F(5*, 183) = 11.75, *p* = .000			
NonReact	(*c'*)	-.15	.11	-2.14	.033*
GenA	(*b*)	.32	.01	4.63	.000*
Age		-.16	.05	-2.01	.045*
edu1		.05	2.24	.69	.488
edu2		-.01	1.49	-.15	.877

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D15

Regression equations for simple mediation of NonReact and Positive Affect through General Alexithymia

Predictor	Path	*β*†	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 24%, F(4, 184) = 14.70, p = .000			
NonReact	(*c*)	.34	.10	5.01	.000*
Age		.21	.04	2.54	.011*
edu1		.01	2.10	.22	.824
edu2		.08	1.40	1.12	.262
		Equation 2: predicting Alexithymia			
		R^2 = 17%, *F(4*, 184) = 9.35, *p* = .000			
NonReact	(*a*)	-.31	.43	-4.36	.000*
Age		-.09	.18	-1.06	.286
edu1		-.05	8.67	-.73	.456
edu2		-.13	5.76	-1.65	.100
		Equation 3: predicting Positive affect			
		R^2 = 28%, *F(5*, 183) = 14.25, *p* = .000			
NonReact	(*c'*)	.27	.11	3.92	.000*
GenA	(*b*)	-.21	.02	-3.11	.002*
Age		.19	.04	2.35	.019*
edu1		.00	2.06	.06	.953
edu2		.06	1.37	.76	.444

Note. edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D16

Regression equations for serial mediation of Meditation Frequency and Negative Affect through Observing and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 6.11, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting Observing			
		R^2 = 19%, *F*(5, 183) = 8.30, *p* = .000			
X1	(a_1)	.23	.65	2.20	.028*
X2	(a_1)	.30	.78	2.39	.017*
Age		.08	.04	.90	.367
edu1		-.05	1.59	-.79	.428
edu2		-.06	1.06	-.80	.423
		Equation 3: predicting Alexithymia			
		R^2 = 22%, *F(*6, 182) = 8.37, *p* = .000			
X1	(a_2)	.10	3.54	1.00	.316
X2	(a_2)	-.32	4.23	-2.52	.012*
Observing	(d_{21})	-.28	.39	-3.93	.000*
Age		.00	.20	.01	.994
edu1		-.04	8.52	-.52	.600
edu2		-.14	5.67	-1.67	.095
		Equation 4: predicting Negative affect			
		R^2 = 24%, F(7, 181) = 8.38, p = .000			
X1	(*c'*)	.17	.94	1.67	.096
X2	(*c'*)	-.27	1.14	-2.17	.031*
Observing	(b_1)	.03	.10	.34	.728
GenA	(b_2)	.35	.01	4.82	.000*
Age		-.11	.05	-1.27	.204
edu1		.05	2.26	.73	.465
edu2		-.01	1.51	-.17	.862

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D17

Regression equations for serial mediation of Meditation Frequency and Positive Affect through Observing and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(5, 183) = 7.02, p = .000			
X1	(*c*)	.15	.91	1.36	.175
X2	(*c*)	.06	1.09	.45	.651
Age		.28	.05	2.94	.003*
edu1		-.03	2.23	-.45	.649
edu2		.06	1.48	.70	.480
		Equation 2: predicting Observing			
		R^2 = 19%, F(5, 183) = 8.30, p = .000			
X1	(a_1)	.23	.65	2.20	.028*
X2	(a_1)	.30	.78	2.39	.017*
Age		.08	.04	.90	.367
edu1		-.05	1.59	-.79	.428
edu2		-.06	1.06	-.80	.423
		Equation 3: predicting Alexithymia			
		R^2 = 22%, F(6, 182) = 8.37, p = .000			
X1	(a_2)	.10	3.54	1.00	.316
X2	(a_2)	-.32	4.23	-2.52	.012*
Observing	(d_{21})	-.28	.39	-3.93	.000*
Age		.00	.20	.01	.994
edu1		-.04	8.52	-.52	.600
edu2		-.14	5.67	-1.67	.095
		Equation 4: predicting Positive Affect			
		R^2 = 29%, F(7, 181) = 10.77, p = .000			
X1	(*c'*)	.09	.86	.86	.390
X2	(*c'*)	-.12	1.04	-.92	.354
Observing	(b_1)	.28	.09	4.01	.000*
GenA	(b_2)	-.21	.02	-2.95	.004*
Age		.25	.05	2.84	.005*
edu1		-.02	2.06	-.31	.756
edu2		.05	1.38	.69	.490

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D18

Regression equations for serial mediation of Meditation Frequency and Negative Affect through Describing and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 6.11, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting Describing			
		R^2 = 16%, F(5, 183) = 6.88, p = .000			
X1	(a_1)	.02	.83	.15	.877
X2	(a_1)	.35	.99	2.66	.008*
Age		.03	.05	.31	.754
edu1		.04	2.02	.58	.559
edu2		.16	1.35	1.87	.062
		Equation 3: predicting Alexithymia			
		R^2 = 55%, F(6, 182) = 37.44, p = .000			
X1	(a_2)	.05	2.64	.64	.521
X2	(a_2)	-.17	3.21	-1.74	.084
Describing	(d_{21})	-.69	.23	-12.79	.000*
Age		-.00	.15	-.04	.965
edu1		.01	6.43	.16	.870
edu2		-.01	4.32	-.13	.890
		Equation 4: predicting Negative affect			
		R^2 = 25%, F(7, 181) = 8.68, p = .000			
X1	(*c'*)	.18	.92	1.71	.088
X2	(*c'*)	-.28	1.13	-2.22	.027*
Describing	(b_1)	.13	.11	1.30	.193
GenA	(b_2)	.43	.03	4.48	.000*
Age		-.11	.05	-1.27	.203
edu1		.05	2.25	.66	.509
edu2		-.02	1.51	-.32	.744

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D19

Regression equations for serial mediation of Meditation Frequency and Negative Affect through ActAware and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 6.11, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting ActAware			
		R^2 = 17%, F(5, 183) = 7.37, p = .000			
X1	(a_1)	-.13	.75	-1.22	.222
X2	(a_1)	.47	.90	3.63	.000*
Age		.03	.04	.34	.729
edu1		-.01	1.83	-.13	.899
edu2		.13	1.22	1.55	.121
		Equation 3: predicting Alexithymia			
		R^2 = 35%, F(6, 182) = 16.27, p = .000			
X1	(a_2)	-.02	3.20	-.26	.792
X2	(a_2)	-.18	3.93	-1.50	.135
ActAware	(d_{21})	-.48	.31	-7.46	.000*
Age		-.01	.18	-.08	.928
edu1		-.03	7.75	-.39	.694
edu2		-.05	5.20	-.72	.469
		Equation 4: predicting Negative affect			
		R^2 = 25%, F(7, 181) = 8.68, p = .000			
X1	(*c'*)	.15	.89	1.46	.144
X2	(*c'*)	-.18	1.10	-1.48	.138
ActAware	(b_1)	-.33	.09	-4.22	.000*
GenA	(b_2)	.18	.02	2.47	.014*
Age		-.11	.05	-1.23	.219
edu1		.05	2.15	.64	.516
edu2		.01	1.44	.09	.923

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D20

Regression equations for serial mediation of Meditation Frequency and Positive Affect through ActAware and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(5, 183) = 7.02, p = .000			
X1	(*c*)	.15	.91	1.36	.175
X2	(*c*)	.06	1.09	.45	.651
Age		.28	.05	2.94	.003*
edu1		-.03	2.23	-.45	.649
edu2		.06	1.48	.70	.480
		Equation 2: predicting ActAware			
		R^2 = 17%, F(5, 183) = 7.38, p = .000			
X1	(a_1)	-.13	.75	-1.22	.222
X2	(a_1)	.47	.90	3.63	.000*
Age		.03	.04	.34	.729
edu1		-.01	1.83	-.13	.899
edu2		.13	1.22	1.55	.121
		Equation 3: predicting Alexithymia			
		R^2 = 35%, F(6, 182) = 16.27, p = .000			
X1	(a_2)	-.02	3.20	-.26	.792
X2	(a_2)	-.18	3.93	-1.50	.135
ActAware	(d_{21})	-.48	.31	-7.46	.000*
Age		-.01	.18	-.08	.928
edu1		-.03	7.75	-.39	.694
edu2		-.05	5.20	-.72	.469
		Equation 4: predicting Positive Affect			
		R^2 = 28%, F(7, 181) = 10.04, p = .000			
X1	(*c'*)	.19	.86	1.87	.063
X2	(*c'*)	-.13	1.06	-1.06	.288
ActAware	(b_1)	.28	.09	3.48	.000*
GenA	(b_2)	-.15	.02	-1.98	.048*
Age		.27	.05	3.01	.003*
edu1		-.04	2.08	-.49	.619
edu2		.01	1.39	.07	.947

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D21

Regression equations for serial mediation of Meditation Frequency and Negative Affect through NonJudge and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 6.11, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting NonJudge			
		R^2 = 21%, *F*(5, 183) = 9.90, *p* = .000			
X1	(a_1)	-.32	.84	-2.99	.003*
X2	(a_1)	.47	1.00	3.69	.000*
Age		.19	.05	2.04	.042*
edu1		-.05	2.05	-.71	.475
edu2		.07	1.36	.91	.363
		Equation 3: predicting Alexithymia			
		R^2 = 34%, *F(*6, 182) = 15.46, *p* = .000			
X1	(a_2)	-.11	3.29	-1.15	.250
X2	(a_2)	-.18	3.97	-1.51	.131
NonJudge	(d_{21})	-.48	.28	-7.18	.000*
Age		.07	.19	.79	.425
edu1		-.05	7.83	-.69	.485
edu2		-.08	5.22	-1.08	.278
		Equation 4: predicting Negative affect			
		R^2 = 31%, F(7, 181) = 11.72, p = .000			
X1	(*c'*)	.08	.91	.83	.410
X2	(*c'*)	-.18	1.10	-1.45	.146
NonJudge	(b_1)	-.33	.08	-4.21	.000*
GenA	(b_2)	.19	.02	2.56	.011
Age		-.05	.05	-.62	.534
edu1		.03	2.16	.44	.658
edu2		-.01	1.44	-.12	.900

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D22

Regression equations for serial mediation of Meditation Frequency and Positive Affect through NonJudge and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(5, 183) = 7.02, p = .000			
X1	(*c*)	.15	.91	1.36	.175
X2	(*c*)	.06	1.09	.45	.651
Age		.28	.05	2.94	.003*
edu1		-.03	2.23	-.45	.649
edu2		.06	1.48	.70	.480
		Equation 2: predicting NonJudge			
		R^2 = 21%, F(5, 183) = 9.90, p = .000			
X1	(a_1)	-.32	.84	-2.99	.003*
X2	(a_1)	.47	1.00	3.69	.000*
Age		.19	.05	2.04	.042*
edu1		-.05	2.05	-.71	.475
edu2		.07	1.36	.91	.363
		Equation 3: predicting Alexithymia			
		R^2 = 34%, F(6, 182) = 15.46, p = .000			
X1	(a_2)	-.11	3.29	-1.15	.250
X2	(a_2)	-.18	3.97	-1.51	.131
NonJudge	(d_{21})	-.48	.28	-7.18	.000*
Age		.07	.19	.79	.425
edu1		-.05	7.83	-.69	.485
edu2		-.08	5.22	-1.08	.278
		Equation 4: predicting Positive Affect			
		R^2 = 28%, F(7, 181) = 10.04, p = .000			
X1	(*c'*)	.18	.91	1.64	.101
X2	(*c'*)	-.07	1.09	-.57	.564
NonJudge	(b_1)	.06	.08	.71	.477
GenA	(b_2)	-.26	.02	-3.26	.001*
Age		.27	.05	2.83	.005*
edu1		-.03	2.15	-.50	.613
edu2		.02	1.43	.29	.765

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D23

Regression equations for serial mediation of Meditation Frequency and Negative Affect through NonReact and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Negative Affect			
		R2 = 14%, F(5, 183) = 6.11, p = .000			
X1	(*c*)	.19	.98	1.78	.075
X2	(*c*)	-.41	1.17	-3.15	.002*
Age		-.12	.05	-1.26	.206
edu1		.04	2.39	.57	.567
edu2		-.05	1.59	-.67	.501
		Equation 2: predicting NonReact			
		R^2 = 17%, F(5, 183) = 7.51, p = .000			
X1	(a_1)	-.24	.58	-2.21	.028*
X2	(a_1)	.48	.69	3.72	.000*
Age		.17	.03	1.69	.091
edu1		-.08	1.41	-1.12	.262
edu2		-.02	.94	-.26	.792
		Equation 3: predicting Alexithymia			
		R^2 = 21%, F(6, 182) = 8.01, p = .000			
X1	(a_2)	-.02	3.56	-.22	.820
X2	(a_2)	-.28	4.34	-2.13	.034*
NonReact	(d_{21})	-.26	.44	-3.68	.000
Age		.02	.20	.21	.837
edu1		-.04	-.59	-.59	.550
edu2		-.12	-1.51	-1.51	.132
		Equation 4: predicting Negative affect			
		R^2 = 26%, F(7, 181) = 8.92, p = .000			
X1	(*c'*)	.15	.93	1.47	.146
X2	(*c'*)	-.22	1.15	-1.75	.082
NonReact	(b_1)	-.12	.12	-1.71	.087
GenA	(b_2)	.31	.02	4.33	.000*
Age		-.09	.05	-1.04	-.164
edu1		.04	2.25	.55	-3.19
edu2		-.02	1.50	-.28	-3.40

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Table D24

Regression equations for serial mediation of Meditation Frequency and Positive Affect through NonReact and Alexithymia

Predictor	Path	$\beta^{\dagger}$	SE	*t*	*P*
		Equation 1: Total effect, predicting Positive Affect			
		R2 = 16%, F(5, 183) = 7.02, p = .000			
X1	(*c*)	.15	.91	1.36	.175
X2	(*c*)	.06	1.09	.45	.651
Age		.28	.05	2.94	.003*
edu1		-.03	2.23	-.45	.649
edu2		.06	1.48	.70	.480
		Equation 2: predicting NonReact			
		R^2 = 17%, F(5, 183) = 7.51, p = .000			
X1	(a_1)	-.24	.58	-2.21	.028*
X2	(a_1)	.48	.69	3.72	.000*
Age		.17	.03	1.69	.091
edu1		-.08	1.41	-1.12	.262
edu2		-.02	.94	-.26	.792
		Equation 3: predicting Alexithymia			
		R^2 = 21%, F(6, 182) = 8.01, p = .000			
X1	(a_2)	-.02	3.56	-.22	.820
X2	(a_2)	-.28	4.34	-2.13	.034*
NonReact	(d_{21})	-.26	.44	-3.68	.000
Age		.02	.20	.21	.837
edu1		-.04	-.59	-.59	.550
edu2		-.12	-1.51	-1.51	.132
		Equation 4: predicting Positive Affect			
		R^2 = 30%, F(7, 181) = 11.08, p = .000			
X1	(*c'*)	.22	.85	2.25	.026*
X2	(*c'*)	-.17	1.05	-1.35	.176
NonReact	(b_1)	.29	.11	4.21	.000*
GenA	(b_2)	-.21	.02	-3.00	.003*
Age		.23	.05	2.57	.011*
edu1		-.01	2.06	-.19	.844
edu2		.04	1.37	.53	.596

Note. X1 = effects coded variable representing Partial Commitment, X2 = effects coded variable representing Full Commitment, edu1 = dummy coded variable representing Vocational or Trade Diploma, edu2 = dummy coded variable representing a University Degree, SE = Standard Error.

* denotes significance at a .05 level.

† = all coefficients are standardised.

Attachment 1

PDF promotional flyer

THE UNIVERSITY of ADELAIDE

Are you interested in your emotions?

What is this study about?

- Alexithymia is a problem in identifying and describing **emotions**. Alexithymia is a key **risk factor** for a variety of problems such as depression, anxiety, and overall reduced wellbeing.
- We are looking at what are the best ways to **measure** alexithymia as well as its relationship with **meditation**, which may be a useful way to address alexithymia.

You May Qualify If You:

- Are between 18-70 years of age
- Have any amount of prior meditation experience
- Have a strong fluency in English

Why participate?

- Your participation in this study may help to advance our understanding of alexithymia and how to address it.
- Participants have an opportunity to enter into a draw to win one of two **$50 gift cards** to a store of their choosing.

Participation Involves

Completing a survey questionnaire of approximately 15 – 20 minutes in length. This can be achieved by following the link below:

https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_6QBpee0kKGPYKYS

FOR MORE INFORMATION
Please contact Dr Michael Proeve at [redacted] or student researchers, Christian Ceccon at [redacted] and Jasmin Taylor at [redacted]

School of Psychology | The University of Adelaide, Adelaide, South Australia

The study has been approved by the Human Research Ethics Sub-Committee of the School of Psychology of the University of Adelaide (approval number 21/22).

Attachment 2

Facebook/unified advertisement

Are you interested in your emotions?

You are invited to participate in a study about alexithymia, which refers to problems in identifying and describing emotions. Alexithymia is a key risk factor for a variety of problems such as depression, anxiety, and overall reduced wellbeing.

We are looking at what are the best ways to measure alexithymia as well as its relationship with meditation, which may be a useful way to address alexithymia. Your participation in this study may help to advance our understanding of alexithymia and how to address it.

You are being invited to complete this online survey if you are between the ages of 18 and 70 and *may or may not* have had experience in meditation practice. You will also be able to enter into a draw to win one of two **$50** gift cards as reimbursement for you time.

If you wish to take part in the survey, follow this link:

https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_6QBpee0kKGPYKYS

The study has been approved by the Human Research Ethics Sub-Committee of the School of Psychology of the University of Adelaide (approval number 21/22).

Attachment 3

Email to meditation groups

Subject – Conducting Study around Meditation and Alexithymia

Dear Colleague OR 'X',

I am looking for participants for an on-line questionnaire and wondered if you would be happy to publish the study on the 'X group' social media pages, mailing list and/or newsletter.

The study will investigate the relationship of meditation practice to the emotional awareness problem of Alexithymia and to emotional experience. This will help us in investigating mindfulness and bodily awareness as possible mechanisms of this relationship and may assist the development of more effective interventions for alexithymic individuals.

The study is for people who:

- practice meditation of various types as well as people who do not practice meditation
- Have a strong fluency in English
- Are between 18-70 years of age

The study is on-line, and participation is completely anonymous. The survey will take about 20 minutes to complete.

If you are happy to publish the study, please utilise one of the attached information flyers and/or this link to the questionnaire:

https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_6QBpee0kKGPYKYS

The full participant information sheet for the study is provided as a downloadable link on the survey.

The study has been approved by the Human Research Ethics Sub-Committee of the School of Psychology of the University of Adelaide (approval number 21/22).

Please feel free to contact me if you require any further information.

Thank you.

Christian Ceccon
Honours Student
School of Psychology
The University of Adelaide
North Terrace Campus
Adelaide SA 5005

Dr Michael Proeve
Senior Lecturer and Clinical Psychologist
School of Psychology
University of Adelaide

Attachment 4

Participant information sheet

PARTICIPANT INFORMATION SHEET

Models of alexithymia, and the role of mindfulness and interoception in the relationship between meditation, alexithymia, and emotional affect

HUMAN RESEARCH ETHICS SUB-COMMITTEE OF THE SCHOOL OF PSYCHOLOGY: 21/22

PRINCIPAL INVESTIGATOR: Dr. Michael Proeve

STUDENT RESEARCHERS: Christian Ceccon, Jasmin Taylor

STUDENT'S DEGREE: Honours Degree

Dear Participant,

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

What is the project about?

Alexithymia is a concept that refers to problems in identifying and describing the emotions that are experienced by oneself and others. Evidence shows that alexithymia is a key risk factor for a variety of problems such as depression, anxiety, and overall reduced wellbeing.

While theoretical models and measures have been proposed to explain and assess alexithymia, their true accuracy and applicability remain uncertain. There is also a lack of explanation for interventions that aid in the management of alexithymia, such as meditation.

This project will be assessing different measures of alexithymia as well as meditation practice and emotional states in an attempt to remedy these issues. Your participation in this study may help to advance existing understandings of alexithymia and help guide future developments for more effective treatment in order to improve outcomes for alexithymic individuals.

Who is undertaking the project?

This project is being conducted by Christian Ceccon and Jasmin Taylor and will form the basis of a thesis for the degree of Honours Psychology at the University of Adelaide, under the supervision of Dr. Michael Proeve.

Why am I being invited to participate?

You are being invited to complete this survey because you are between the ages of 18 and 70, may or may not have had experience in meditation practice.

If you are not fluent in English, it is requested that you do not participate in the study due to the nature of the questions being asked and the understanding required to effectively contribute.

What am I being invited to do?

You are invited to complete an online questionnaire via Qualtrics. This survey can and should be completed in a time and place of your own choosing. It is recommended that participants set aside approximately 20 minutes to allow sufficient time for completion. The questionnaire should be undertaken in a suitable location with limited disruptions to allow for adequate concentration and reflection on the questions contained. There will be no follow-up requirements for participants in this study.

How much time will my involvement in the project take?

The questionnaire should take approximately 20 minutes to fully complete, but this will vary from participant to participant depending on the time taken to read and comprehend each individual question.

Are there any risks associated with participating in this project?

There is a low risk that questions relating to psychological experiences described in the questionnaires *may* trigger discomfort. If this is the case for you, you are encouraged to make an appointment with your local GP, talk to someone you trust, or to reach out to the mental health services provided below:

- Beyond Blue:
    - 1300 22 4636
- Lifeline Australia:
    - 13 11 14
- Head to Health:
    - https://headtohealth.gov.au/

What are the potential benefits of the research project?

Participation in this study also has the potential to improve current understandings of the interrelationships between alexithymia, interoception, meditation practice, and emotional

experience. Through this understanding, we may be able to contribute to therapeutic interventions for people who are adversely affected by high levels of alexithymia.

First year psychology students at the University of Adelaide are eligible to receive 0.5 course credit for their involvement, and all other participants have the opportunity to enter their email address in the draw to win one of two $50 gift cards (to a store of their choice) as reimbursement for their time.

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.

What will happen to my information?

No identifiable information will be collected or stored as a requirement of this study. Completed responses will be separated from any identifiable information, such as email addresses, prior to analysis. Completed responses will be stored in a secure location, accessible only to the researchers of this study.

If you wish to be included in the draw to receive one of two $50 gift cards offered as compensation for taking part in the survey, then you will be required to provide an email address.. Only the two winners of the draw will be contacted. No other information will be identified.

A summary of the results can be provided if requested. If you would like a summary of the results, you will need to supply an email address.

The data collected as part of this survey will be retained for up to 5 years after the submission date of the project thesis that it will form (September 2021), in line with the University of Adelaide's Research Data and Primary Materials Policy. The data gained from this project may be later published in a journal article; however, no identifying information will be divulged in this process. The data gained may also be used in later research projects by any other researchers. Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

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

If you have any questions or concerns about the nature of the study being conducted you can contact any of the researchers listed below:

- Dr Michael Proeve (Principal Supervisor)
- Christian Ceccon (student researcher)
-
- Jasmin Taylor (student researcher)

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Sub-Committee of the School of Psychology of the University of Adelaide (approval number 21/22). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the convenor of the Human Research Ethics Sub-Committee of the School of Psychology of the University of Adelaide, Professor Paul Delfabbro.

- Phone: +61 8 8313 4936
- Email: paul.delfabbro@adelaide.edu.au
- Post: Room 5.06, Level 5, Hughes building, University of Adelaide, North Terrace, Adelaide SA 5005

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?

If you wish to participate in the current study, you can follow the link below.

Once the survey has loaded, please carefully read the consent information, and complete the questionnaire in a sincere and honest way.

https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_6QBpee0kKGPYKYS

Yours sincerely,

Dr. Michael Proeve – Principal Investigator

Christian Ceccon – Student Researcher

Jasmin Taylor – Student Researcher