THE PERTH ALEXITHYMIA QUESTIONNAIRE AND ATTENTION-APPRAISAL MODEL: EXPLORING AN ALTERNATIVE MEASUREMENT AND CONCEPTUALISATION OF ALEXITHYMIA.

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Abstract

The construct of alexithymia, or the inability to recognise and describe one's own emotions, has gained significant interest in the field of psychology. Currently, the Toronto model and TAS-20 measure dominate as the most widely applied frameworks in alexithymia research. Recent advances in emotion research have emphasised the influence of emotional valence, or the extent to which the hedonic tone of an emotion is positive or negative. As such, biased sensitivity in the direction of negative valence has seen the TAS-20 subjected to recent criticism. To bridge this limitation, a new measure and model have been developed to assess alexithymia across both valences; the Perth Alexithymia Questionnaire and attention-appraisal model. To date, the utility of valence-specificity in alexithymia measurement has not been investigated. Hierarchical linear regression was used to compare the efficacy of the TAS-20 and PAQ as predictors of explicit and implicit positive and negative affect. The PAQ was not found to account for any significant variance in explicit and implicit affect over and above the variance accounted for by the TAS-20, providing negligible support for the added utility of valence-specific subscales in the prediction of affect. The attention-appraisal model positions appraisal as a mediator in the relationship between attention and affect response. The present study was also the first to examine this pathway, finding evidence for the indirect effect of difficulty attending to emotions on affect response via difficulty appraising feelings in the context of negative, but not positive explicit affect. Possible implications and future directions are discussed.

Declaration

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Jasmin Taylor

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September 2021

Contribution

In writing this thesis, my supervisor, Dr. Michael Proeve, and I collaborated to generate the research design. I conducted the literature search, completed the ethics application and preregistered the project. Christian Ceccoon and I worked together during participant recruitment and data collection. My supervisor and I also collaborated to conduct a mediation analysis using Hayes PROCESS. I wrote up all aspects of the thesis.

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The Perth Alexithymia Questionnaire and Attention-Appraisal Model: Exploring an Alternative Measurement and Conceptualisation of Alexithymia.

Alexithymia is a clinically derived concept broadly characterised by poor emotional insight and an inability to regulate excitement-based information (Meganck et al, 2009). Individuals high in alexithymia experience difficulties recognising, articulating, and reflecting upon emotions, scarce imaginal capacity, and a concrete, pragmatic thinking style devoid of introspection. Access to attitudes, feelings, and other phenomena relating to one's inner private mental life are obstructed (Taylor et al., 1997). Jointly, these features are indicative of deficits in emotional regulation and cognitive processing. Many researchers have come to view the construct as a multi-faceted and dimensional personality trait, rather than a diagnosis, with variations in the intensity of alexithymia denoting individual differences in the trait. Despite increased awareness, clinical treatments for alexithymia remain severely limited, and there is ongoing debate about how best to conceptualise and measure the construct.

Alexithymia was discovered by psychoanalytic practitioners and finds its origins in psychosomatic medicine (Marty & M'Uzan, 1963). As a result, early models of alexithymia were derived from psychoanalytic theory (Nemiah & Sifneos, 1970). This entailed an emphasis on unconscious inner conflict and the repression of affect. It was assumed that in the absence of expression, prolonged states of physiological arousal led to pathogenic effects on the body (Taylor, 2018). In 1948, Ruesch discovered that patients presenting with psychosomatic symptoms were also marked by limited imagination and difficulties verbalising and expressing emotion. Despite growing data of this variety, such findings were attributed to resistance against intrapsychic conflict until the early 1970s when Sifneos (1972)

developed the concept of ‘alexithymia’, of Greek origin, translating to ‘lack of words for emotion’.

In 1976, a consensus on the definition of alexithymia was reached, and Nemiah and Sifneos advanced a new deficit model based on four defining features: (1) difficulty in identifying and describing feelings; (2) difficulty distinguishing between feelings and bodily sensations accompanying emotional arousal; (3) limited imaginative processes, evidenced by scarce fantasies and an inability to evoke sensations not perceived through the senses, and (4) externally oriented cognitive styles involving a disproportionate focus on external stimuli and logical details, rather than internal feelings requiring introspection (Nemiah & Sifneos, 1970; Nemiah et al., 1976; Taylor et al., 1991). Clinically affecting an estimated ten percent of the general population, alexithymia is an important area of research in the field of psychosomatic medicine (Honkalampi et al., 2001).

The effective assessment and treatment of alexithymia is particularly important as the trait is a transdiagnostic risk factor for a wide variety of other conditions related to affect dysregulation, and a strong predictor of resistance to insight-oriented therapeutic interventions (Foran & O’Leary, 2012). Alexithymia restricts one’s capacity to process and verbally express emotional arousal and, due to poverty of fantasy, alexithymic individuals are also hindered in their ability to mitigate negative emotional experiences using imaginative strategies (Taylor et al., 1997; Foran & O’Leary, 2012). Without emotional expression as an outlet, tension is believed to pool within the body. This can lead to feelings of confusion and helplessness, misinterpretation of physiological responses, and visceral hypersensitivity (Taylor et al., 1997). Enduring physiological arousal has been shown to predispose individuals to psychiatric problems such as substance addiction and eating disorders (Taylor et al., 1997). Compulsive behaviours that regularly accompany such conditions may be understood as attempts to regulate noxious, non-differentiated states (Stern, 1985).

Challenges to manage and overcome co-existing psychological conditions are exacerbated by inabilities to communicate emotional states and effectively solicit social support (Foran & O'Leary, 2012). Intrinsic difficulties appraising inner states can lead to emotional detachment from oneself, impaired interpersonal relationships and social functioning, and a reduction in life quality and duration more generally. The literature also evidences a strong association between alexithymia and suicidality (De Beradis et al., 2017), as well as other conditions such as anxiety, depression (Lenzo et al., 2020; Li et al., 2015).

Models and measures of alexithymia

In accordance with Nemiah and Sifneos' definition, Taylor et al. (1999) constructed their Toronto model of alexithymia. To date, the Toronto model is one of the most influential within alexithymia research, as it underpins the most widely used measure of alexithymia, the TAS-20 (Taylor et al., 1994). The Toronto model was created in alignment with two cognitive theories of emotion processing, namely, Lane and Schwartz's cognitive-developmental theory of levels of emotional awareness (1987) and Bucci's multiple code theory (1997).

Lane and Schwartz's cognitive-developmental theory presents five hierarchical levels of structural transformation along which emotional awareness progresses: sensorimotor reflexive, sensorimotor enactive, preoperational, concrete operational, and formal operational (Lane & Schwartz, 1987). The lowest level is the sensorimotor reflexive, wherein awareness is restricted to bodily sensations and somatic responses. The next level is sensorimotor enactive. Here, individuals are aware of bodily sensations and display action tendencies to enhance pleasure or reduce distress. They are aware of how they want to act, but not of the emotion producing the drive. At the preoperational level, unidimensional emotions are

represented for the first time. Hence, experiences of basic emotion begin to transcend the somatic and emerge psychologically. In the concrete operational level, individuals are able to experience and explain complex and differentiated blends of emotions. It is during this stage that emotional regulation becomes possible. The final stage is formal operational, wherein subtle nuances in emotions can be detected in the self, and in others. Within this framework, alexithymia is a deficit primarily at the preoperational level. Emotions are predominantly somatic, with individuals unable to advance beyond basic psychological experiences of emotion (Taylor et al., 1997). This may explain the alexithymic individual's inability to differentiate affective states from bodily sensations, and account for the strong associations between alexithymia, somatoform disorders, substance abuse disorders and eating disorders.

Multiple code theory states that emotion schemas are represented sub-symbolically through sensation and symbolically through non-verbal imagery and verbal language. According to this theory, non-verbal emotional experience is translated into language via the referential process. The process involves a set of bidirectional functions facilitating communication between the sub-symbolic and verbal channels. Emotional meaning derived from visceral sensation must be transformed through this process before it can be verbally expressed through speech (Bucci, 1997). Alexithymia, by this view, is the result of a disrupted referential process. This can occur during development, or as a result of conflict or trauma. Disruption creates dissociation between the verbal and non-verbal systems. This results in the disorganisation of emotional schemas, the deregulation of emotional arousal, and an inability to derive emotional meaning (Bucci, 1997). Both theories emphasise the significance of language in shifting emotional experiences from a state of relative globality to a state of improved differentiation.

Within the Toronto model, components of alexithymia converge to form two broader factors. *Difficulty Identifying Feelings* (DIF) and *Difficulty Describing Feelings* (DDF) merge

to produce a more general *Affect Awareness* factor. Meanwhile, *Externally Oriented Thinking* (EOT) and *Difficulty Fantasising* (DFAN) constitute *Operative Thinking* (Bagby et al., 2006).

Despite growing interest, there is still significant ambiguity around alexithymia. This likely reflects the long absence of a psychometrically sound measure (Taylor, Ryan & Bagby, 1985). Accurate models and psychometrically sound measures of alexithymia are paramount to the advancement of future research and the development of effective mitigation and treatment strategies. For a given alexithymia measure to have research and clinical utility, adequate levels of validity and reliability must be satisfied. In addition to the model, Taylor et al. (1994) designed the Toronto Alexithymia Scale (TAS-20), a refined version of its precursors the TAS-26 (Taylor et al., 1985) and the Toronto Alexithymia Scale Revised (TAS-R; Taylor, Bagby, & Parker 1992). The 20-item self-report questionnaire was the first reliable and valid measure to be established (Bagby, Parker & Taylor**,** 1994) and one of the only instruments to be constructed using empirical and rational strategies, and heeding psychometric theory (Taylor, Ryan & Bagby, 1985). As such, the TAS-20 remains the predominant measure of alexithymia within the literature.

The TAS-20 has been examined extensively in clinical and non-clinical populations. The measure has consistently demonstrated satisfactory internal consistency, good test-retest reliability, and a stable and replicable factor structure that is theoretically congruent with the alexithymia construct (Parker, Taylor & Bagby, 2003). The TAS-20 questionnaire comprises three subscales: *Difficulty Identifying Feelings* (DIF; 7 items), *Difficulty Describing Feelings* (DDF; 5 items), and *Externally Oriented Thinking* (EOT; 8 items). In line with the Toronto model of alexithymia, the original scale initially assessed *Difficulty Fantasising* (DFAN). DFAN included items regarding daydreaming and imagination. Ongoing research provides notable support for the Toronto model and for the psychometric properties of the TAS-20. However, minimal psychometric support has been found for the models' inclusion of the

Difficulty Fantasising (DFAN) facet of alexithymia. Variations in DFAN are often inconsistent with variations in alexithymia severity (Czernecka & Szymura, 2008). Moreover, DFAN has consistently exhibited negligible correlations with other alexithymia subscales and a lack of coherence within the latent structure of alexithymia (Preece et al., 2017). This, in conjunction with DFAN's high correlation with social desirability (Bagby, Parker & Taylor, 1994) saw the subscale removed during subsequent revisions. Despite reluctancy to modify the clinical description of alexithymia proposed by Nemiah and Sifneos (1976), a lack of psychometric support has generated an air of doubt around the essentiality of *Difficulty Fantasising* as a hallmark of alexithymia (Watters, Taylor, & Bagby, 2016; Watters et al., 2016; Bausch et al., 2011).

Despite possessing adequate psychometric properties, the TAS-20 measure has been criticised for its biased sensitivity in the direction of negative hedonic valence (Lumley, 2000). The measure is made up entirely of neutral and negatively valanced items, and no positively valanced items. Due to the affective nature of alexithymia, a case has been made for the inclusion of valence-specific items that assess alexithymia across the entire spectrum of affectivity (Preece et al., 2018). While the importance of valence warrants further investigation within the context of alexithymia, several studies have found significant discrepancies in people's abilities to differentiate positive emotions versus negative emotions (Feldman et al, 2001; Becerra et al., 2017). This indicates the potential merit of valanced measurement, which could allow more accurate and detailed profiles of emotion regulation to be derived from alexithymic and non-alexithymic individuals. This additional information could be used to inform current knowledge and guide treatment decisions. For example, psychotherapy could be specifically tailored for the needs of individuals who show greater difficulty differentiating positive rather than negative emotions.

Recently, in attempt to resolve these measurement limitations, the Perth Alexithymia Questionnaire (PAQ) was developed. The measure seeks to comprehensively assess alexithymia across both positive and negative emotional valence (Preece et al., 2018). The PAQ is underpinned by the attention-appraisal model, a progression of earlier theoretical models of alexithymia. The PAQ measure and attention-appraisal model are conceptually clear because of their alignment with established cognitive models of emotion regulation and processing. Namely, the cognitive-developmental theory of levels of emotional awareness, discussed above (Lane & Schwartz, 1987), and the process model of emotion regulation, pioneered by Gross (2015).

Using Gross's rationale, Preece et al (2017) view each alexithymia facet through the lens of a valuation systems framework. This framework features a four-stage sequence of evaluation through which meaning is derived from emotional responses (Gross, 2015). The four stages are situation-attention-appraisal-response. In the first stage (situation), an emotional reaction becomes the stimulus, and object of valuation. In the second stage (attention), focus is redirected at this response. In the third stage (appraisal), emotional meaning is derived and evaluated in relation to one's own goals. In the fourth and final stage (response), an emotional reaction ensues and has the potential to be regulated (Gross, 2015). Regulation is made possible through the use of goal activation, which motivates action to alleviate the dissonance between one's current and preferred state of the world. From this perspective, each alexithymia component is indicative of a deficit in the emotion valuation process. EOT is conceptualised as difficulty attending to internal experiences and emotions (attention stage), as opposed to a fixation on external stimuli, as theorised by Nemiah et al (1976). Meanwhile, DIF and DDF signify difficulties in the derivation of emotional meaning (appraisal stage).

Due to the lack of theoretical and statistical consistency between DFAN and the other facets of alexithymia, neither the PAQ measure nor the attention-appraisal model upon which it was formulated include the Difficulty Fantasising component (DFAN). Three interrelated subscales remain: *Difficulty Describing Feelings* (DDF), *Difficulty Identifying Feelings* (DIF), and *Externally Oriented Thinking* (EOT). Similar to the TAS-20, the attention-appraisal model conceptualises the alexithymia components as constituents of two broader factors. DDF and DIF constitute a *Difficulty Appraising* deficit. While EOT comprises *Difficulty Attending*.

According to the attention-appraisal model, emotional valence is particularly pertinent during the appraisal stage (DIF, DDF) when valence judgements are formulated (Preece et al., 2018). By contrast, valence is less significant in the preceding attention stage (EOT). Therefore, the PAQ only proposes positively and negatively valanced subscales for the *Difficulty Identifying Feelings* and *Difficulty Describing Feelings* components, resulting in five subscales: *Positive-Difficulty Identifying Feelings* (P-DIF; 4 items), *Negative-Difficulty identifying feelings* (N-DIF; 4 items), *Positive-Difficulty Describing Feelings* (P-DDF; 4 items), *Negative-Difficulty Describing Feelings* (N-DDF; 4 items), and *General-Externally Oriented Thinking* (G-EOT; 8 items). Each emotionally valanced statement for DIF and DDF begins with some adaptation of "When I'm feeling bad..." or "When I'm feeling good…". This language is reflective of low emotional awareness (Lane & Schwartz, 1987). As the statement progresses, it taps into the ability of each participant to appraise emotions at higher developmental levels of emotional awareness e.g. "When I'm feeling bad, I can't tell whether I'm sad, scared, or angry" or "When I'm feeling good, I can't tell whether I'm happy, excited, or amused". Since the P-DIF, P-DDF, N-DIF, and N-DDF subscales all relate to emotional appraisal, composite scores can be produced. Merging P-DIF with P-DDF generates a *Positive-Difficulty Appraising Feelings* composite (P-DAF; 8 items). Similarly,

merging N-DIF and N-DDF creates a *Negative-Difficulty Appraising Feelings* composite (N-DAF; 8 items). Therefore, the PAQ seems to provide more explanatory profiles of alexithymia, which may prove clinically helpful.

The majority of research on alexithymia has been conducted using the Toronto Alexithymia Scale (TAS-20), thereby assessing alexithymia with respect to negative, but not positive emotions. By contrast, research using the Perth Alexithymia Questionnaire, which assesses alexithymia across both positive and negative dimensions, is in its infancy. Hence, minimal studies have evaluated the PAQ and its utility. Fewer still have examined the merit of valence-specific subscales, which could potentially provide a more comprehensive and explanatory picture of alexithymia. Alexithymia shares a well-documented relationship with affect. As expected, alexithymia tends to correlate negatively with positive affect. Surprisingly, however, alexithymia consistently demonstrates strong positive correlations with negative affect (Turesky, 2011). This association appears paradoxical, since strong positive correlations with self-reported affect would necessitate the recognition of emotions that alexithymia, by definition, inhibits. Disparities in the extent to which alexithymia interferes with positive and negative affect may be due to differences in processing. Emotion research has demonstrated significant differences in the way positive affect is processed in comparison to negative affect. Since the body evolves in response to evolutionary pressures, it has been argued that experiences of positive affect are considerably more impeded than experiences of negative affect because the experience of negative affect is more fundamental to survival (Turesky, 2011). While this relationship is still contentious, it does lend credence to the supposition that valence-specific subscales may add utility to alexithymia profiles. The current study will look at the relationships between alexithymia, and implicit and explicit positively and negatively valanced affect. The predictive efficacy of the valence specific PAQ subscales will be compared with those of the established TAS-20 to determine which

scale better predicts implicit and explicit affect across positive and negative dimensions. Valence specificity is expected to improve the PAQ's capacity to predict affect over and above the predictive capacity of the TAS-20. It is therefore hypothesised that the PAQ will outperform the TAS-20 by accounting for a greater proportion of the variance in 1) explicit positive affect, 2) implicit positive affect, 3) explicit negative affect, and 4) implicit negative affect. This work will contribute to the limited pool of data available on the Perth Alexithymia Questionnaire (PAQ) and the value of valence-specific subscales in the measurement of alexithymia.

The PAQ and attention-appraisal model are constructed within a separate framework that omits the *Difficulty Fantasising* component. Hence, evidence in favour of the PAQ measure and the attention-appraisal model could lend credence to the potential non-essentiality of DFAN as a facet of alexithymia.

The attention-appraisal framework maps the EOT, DIF, and DDF constructs to Gross's extended process model of emotion regulation. It is within this valuation process that difficulty appraising (DDF; DIF*)* is proposed to mediate the relationship between difficulty attending (EOT) and affect response. No studies to date have examined the potentially mediating role of appraisal, postulated by the model. Hence, the applicability of the attention-appraisal framework in the context of alexithymia remains undetermined within the literature. The current study will contribute to addressing this gap in the literature by testing the mediational effect of the *Difficulty Appraising* components (DIF; DDF) between *Difficulty Attending* (EOT) and measures of affect. In line with novel research on emotion regulation, I propose two further hypotheses. Firstly, that difficulty appraising positive feelings, as measured by the Positive-Difficulty Appraising Feelings (P-DAF) composite scale, will have a significant indirect effect on the relationship between difficulty attending to emotions, as measured by the General-Externally Oriented Thinking subscale (G-EOT), and explicit

positive affect (PANAS-P). It is also hypothesised that difficulty appraising negative feelings, as measured by the Negative-Difficulty Appraising Feelings composite scale (N-DAF) will have a significant indirect effect on the relationship between difficulty attending to emotions (G-EOT) and explicit negative affect (PANAS-N).

Method

Participants

To meet the study's eligibility criteria, participants needed to be proficient in English and between the ages of 18 and 70 years. The initial sample consisted of 244 participants. 34 participants were excluded due to missing data for a final sample of 210 participants (M = 30.43, SD= 15.40). 65.2% of participants identified as female, 32.9% male, and 1.9% non-binary. For 51% of participants, their highest level of completed education was high school, for 49% it was tertiary education.

95 participants were first year psychology students from the University of Adelaide in South Australia, recruited through the university's Research Participation System (RPS) in exchange for course credit, or via the university's online student platform (Unified).

Materials

Toronto Alexithymia Scale (TAS-20; Bagby, Parker & Taylor, 1994)

Trait alexithymia was measured with the TAS-20 (See Appendix A), a 20-item self-report measure with three subscales, measuring difficulty identifying feelings (DIF; 7 items), difficulty describing feelings (DDF; 5 items), and externally oriented thinking (EOT; 8 items). Participants were asked to indicate their level of agreement with each statement using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Item statements include "I am often confused about what emotion I am feeling.", "I am able to describe my feelings easily.", and "I prefer to analyse problems rather than just describe them". Five items are reverse-scored, and the total of all items can be summed to form an

overall marker of alexithymia (Bagby, Parker & Taylor**,** 1994). Scores > 61 indicate alexithymia, scores between 50 and 60 indicate borderline or possible alexithymia, and scores < 50 indicate non-alexithymia. Cronbach's alpha coefficient is equal to .64 for the EOT subscale, .88 for the DIF subscale, .84 for the DDF subscale, and .90 for the overall scale, indicating excellent internal consistency. The TAS-20 has also demonstrated adequate concurrent and convergent validity in previous research (Bagby, Parker & Taylor, 1994).

*Perth Alexithymia Questionnaire (PAQ***;** Preece et al., 2018).

The PAQ is a 24-item self-report questionnaire (See Appendix B) based on the attention-appraisal model of alexithymia. The scale consists of five emotionally valanced subscales (Negative-Difficulty Identifying Feelings; N-DIF, Positive-Difficulty Identifying Feelings; P-DIF, Negative-Difficulty Describing Feelings; N-DDF, Positive-Difficulty Describing Feelings; P-DDF, General Externally Oriented Thinking; G-EOT). By pooling their positive and negative subscale items, composite scores can be attained for DIF (G-DIF; 8 items) and DDF (G-DDF; 8 items). Merging the negative subscale scores (N-DIF; N-DDF) generates a *Negative-Difficulty Appraising Feelings* composite (N-DAF; 8 items). Similarly, blending the positive subscale scores (P-DIF; P-DDF) creates a *Positive-Difficulty Appraising Feelings* composite (P-DAF; 8 items). Combining N-DIF, NDDF, P-DIF, and P-DDF scores results in a *General-Difficulty Appraising Feelings* composite (G-DAF; 16 items). Finally, a total alexithymia composite is produced when all five subscales are combined (ALEXI; 24 items). Participants respond to each item statement using a 7-point Likert scale that ranges from 1 (strongly disagree) to 7 (strongly agree). Item statements include "When I'm feeling bad, I can't tell whether I'm sad, angry, or scared.", "When I'm feeling good, I can't tell whether I'm happy, excited, or amused.", and "I prefer to focus on things I can actually see or touch,

rather than my emotions.”. No items are reverse-scored, and all items can be aggregated for an alexithymia composite score, with higher scores indicating higher levels of alexithymia. Cronbach’s alpha indicates excellent internal consistency reliability at .97 for the total scale, .91 for Negative-Difficulty Identifying Feelings, .918 for Positive-Difficulty Identifying Feelings, .94 for Negative-Difficulty Describing Feelings, .92 for Positive-Difficulty Describing Feelings, and .93 for General-Externally Oriented Thinking. The PAQ has demonstrated strong concurrent validity with the TAS-20 measure in the present study (r=.88) and good discriminant validity with adaptive emotion regulation in previous research (Lashkari et al., 2021).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988)

Positive and negative affect were measured using the PANAS 20-item self-report scale (See Appendix C). The measure is comprised of a series of words describing various emotions and feelings such as “Interested”, “Proud”, and “Attentive”. Using a 5-point likert scale ranging from 1 (very slightly or not at all) to 5 (extremely), respondents indicate the extent to which they have experienced each item of affect in the past week. Affect scores for the positive (PANAS-P) and negative (PANAS-N) dimensions each range from 10 to 50, with lower scores reflecting lower levels of positive/negative affect and higher scores reflecting higher levels of positive/negative affect (Watson, Clark & Tellegen, 1988). Cronbach’s alpha was excellent for the PANAS-P (α = .91) and PANAS-N (α = .91). Validation studies have shown similar results, displaying a Cronbach’s alpha of .91 for the PANAS-P and .87 for the PANAS-N (Díaz-García et al., 2020).

Implicit Positive and Negative Affect Test (IPANAT; Quirin et al., 2009*)*

The 36-item IPANAT is a self-report measure of implicit positive and negative affect (See Appendix D). Affect is measured indirectly via participant responses to a series of artificial words from a putative artificial language. The IPANAT draws on the theory of affect infusion (Forgas, 1995). The theory states that once activated, affect biases evaluative processes such that affectively neutral words are interpreted as positive or negative. The measure has demonstrated significant correlations with explicit affect and affect-congruent changes unrelated to changes in self-reported affect. Participants rate the extent to which six artificial words (SAFME, VIKES, TUNBA, TALEP, BELNI, SUKOV) resemble six mood adjectives (happy, cheerful, energetic, helpless, tense, inhibited), based on a 4-point Likert scale ranging from 1 (doesn't fit at all) to 4 (fits very well). Mean scores are summed for positive adjectives (happy, cheerful, energetic) for a composite positive implicit affect score (IPANAT-P). Similarly, mean scores are summed for negative adjectives (helpless, tense, inhibited) for a composite implicit negative affect score (IPANAT-N). The measure has been extensively validated across cultures and languages. Both dimensions display good internal reliability (IPANAT-P; $\alpha = .85$; IPANAT-N; $\alpha = .82$) in line with that of other studies (IPANAT-P; $\alpha = .81$; IPANAT-N; $\alpha = .78$) (Quirin et al., 2018).

Procedure

A brief description of the study was advertised to first year psychology students through Unified (24.9%) and the universities Research Participation System (36.2%). The study was also promoted on online forums and social media groups related to meditation, for the purposes of a linked study on meditation and alexithymia (38.9%). Participants were told that the purpose of the study was to explore different models of alexithymia and their relationship to affect. Informed consent (See Appendix E) and demographic information including age, gender, and education level (See Appendix F) were obtained from participants. Students participating to fulfil coursework requirements were required to provide their

student ID numbers. All participants then anonymously completed an online battery of questionnaires, created and distributed through Qualtrics™. The ordering of the questionnaires was randomised. Participants generally completed the questionnaire within 20 minutes. Following completion of the survey, each participant was thanked for their time. As compensation, participants not receiving course credit were provided the opportunity to enter in a draw to win one of two $50 gift cards. Ethical approval was sought from the University of Adelaide Human Research Ethics Committee (approval number 21/22).

Design and Analysis

The research design of this study was correlational and cross-sectional. To assess the relationship between alexithymia scores and implicit and explicit positively and negatively valanced affect, Pearson's moment correlation coefficient was used. The statistical significance of the correlation coefficient was determined using a t-test. Multiple linear regressions were conducted to assess the predictive efficacy of the TAS-20 and PAQ on implicit and explicit affect. Finally, to investigate whether the appraisal stage of emotion valuation mediates the relationship between the attention and response stage, a sequential mediation analysis was performed using SPSS. No studies to date have investigated the mediational role of appraisal (DIF; DDF) between attention (EOT) and affect response (PANAS; IPANAT). Therefore, effect size estimates were drawn from a number of limited studies looking at the correlational relationships between alexithymia subscales and the PANAS. An a-priori Monte-Carlo Power Analyses for Indirect Effects (Schoemann et al., 2020) revealed that approximately 210 participants would be required to complete the study with a power of at least 0.8 and assuming an alpha level of .05.

Results

Missing Data

Prior to analysis, a missing values analysis was conducted. The test showed that 11% of the data were missing. A little's MCAR test (Little, 1988) revealed that the data were missing at random, $\chi^2(66) = 66.08$, $p = .474$. Pairwise deletion was used to account for missing data in all statistical analyses.

Preliminary analysis

Preliminary analyses were performed to ensure no violations of the assumption of normality and linearity, and to screen for any outliers in the data. Two outliers were identified in the IPANAT-PA scale, based on the 1.5 interquartile range rule (Hoaglin et al., 1986). These data points were retained as they did not influence the results of the regression analysis. Descriptive statistics and reliabilities are reported in **Table 1**. All scales showed very high reliabilities above .82. These findings were comparable to those reported in similar research (Preece et al., 2018; Díaz-García et al., 2020; Quirin et al., 2018).

Table 1

Descriptive Statistics of the studied variables.

	M	SD	α
Age	30.43	15.40	-
TAS-20	48.27	14.86	.90
PAQ	75.09	34.00	.97
PANAS-P	30.40	8.61	.91
PANAS-N	24.12	9.06	.91
IPANAT-PA	36.67	9.11	.85
IPANAT-NA	32.22	7.89	.82

Note: TAS-20= Toronto Alexithymia Scale , PAQ=Perth Alexithymia Questionnaire, N-DAF=Negative-Difficulty Appraising Feelings, P-DAF= Positive Difficulty Appraising Feelings, PANAS-P= Positive And Negative Affect Schedule-Positive, PANAS-N= Positive And Negative Affect Schedule-Negative, IPANAT-PA= Implicit Positive And Negative Affect Test-Positive Affect, IPANAT-NA= Implicit Positive And Negative Affect Test-Negative Affect.

Table 2

Bivariate Pearson correlations: age, measures of alexithymia, and measures of affect.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Gender	_										
2. Age	-.175**	_									
3. TAS-20 Total	.085	-.280***	_								
4. PAQ Total	.103	-.260**	.879***	_							
5. G-EOT	.047	-.238***	.744***	.852***	_						
6. N-DAF	.116	-.253***	.841***	.908***	.661***	_					
7. P-DAF	.091	-.192**	.730***	.875***	.601***	.706***	_				
8. PANAS-P	-.124	.381***	-.453***	-.359***	-.314***	-.366***	-.261***	_			
9. PANAS-N	.055	-.305***	.456***	.468***	.374***	.437***	.405***	-.179**	_		
10. IPANAT-PA	.160*	-.035	-.044	-.066	-.056	-.060	-.048	.220**	.018	_	
11. IPANAT-NA	.200**	-.418***	.197**	.176*	.144*	.134	.189**	-.099	.260***	.303***	_

* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed). ***Correlation is significant at the .001 level (2-tailed). *Note*: TAS-20= Toronto Alexithymia Scale, PAQ=Perth Alexithymia Questionnaire, N-DAF=Negative-Difficulty Appraising Feelings, P-DAF= Positive Difficulty Appraising Feelings, PANAS-P= Positive And Negative Affect Schedule-Positive, PANAS-N= Positive And Negative Affect Schedule-Negative, IPANAT-PA= Implicit Positive And Negative Affect Test-Positive Affect, IPANAT-NA= Implicit Positive And Negative Affect Test-Negative Affect.

Bivariate correlations

Table 2 shows bivariate correlations between age, gender, the TAS-20 total scale, the PAQ total, PAQ composite scales, explicit positive affect, explicit negative affect, implicit positive affect, and implicit negative affect. The TAS-20 and PAQ scales were shown to be highly correlated with one another (r=.88, p <.001). The scales also showed similar size correlations with explicit measures of positive affect (TAS-20, r =-.45, p <.001; PAQ, r =-.36, p <.001) and negative affect (TAS-20, r =.46, p <.001; PAQ, r = .47, p <.001). Implicit negative affect (IPANAT-NA) showed weak correlations with most of the variables, a small positive correlation with explicit positive affect (r =.22, p <.01) and a moderate negative correlation with age (r =-.42, p <.001). Implicit positive affect (IPANAT-PA) showed negligible correlations with all variables.

Hierarchical Multiple Regression Analysis

Three hierarchical regressions were computed for explicit positive affect (PANAS-P), explicit negative affect (PANAS-N), and implicit negative affect (IPANAT-NA). Residual statistics showed that the histograms and P-P plots of the regression standardised residuals followed a normal distribution (See Appendix G), which is a requirement for the validity of the regression models. The scatter plot of the standardised residuals versus the standardised predictive value showed no clear pattern or relationship between the size of the residual and the size of the predicted value (See Appendix H). At each stage, the unique variance accounted for was quantified and tested for significance, while controlling for previously entered variables. In all analyses, demographic variables were entered in Step 1, followed by the TAS-20 measure in Step 2, and, finally, the PAQ measure in Step 3.

Table 3

Hierarchical multiple regression analyses predicting explicit positive affect (PANAS-P) from PAQ total scores and TAS-20 total scores.

Predictor	β	SE	sr^2	*p*	ΔR^2
Step 1					.172***
Control variables					
Age	.314	.042	.076	.000	
Gender	−.071	1.17	−.004	.310	
Education 1	.043	.844	.001	.542	
Education 2	.150		.017	.050	
Step 2					.112***
TAS-20 total	−.359	.039	−.112	.000	
Step 3					.009
PAQ total	.204	.034	.009	.132	

N = 196

Durbin Watson: 2.039

* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed).

***Correlation is significant at the .001 level (2-tailed). *Note*: Education1= Highest level of education year 11 or below. Education 2= Lowest level of education Year 12 or greater.

As shown in **Table 3**, the control variables of age, gender, and education, entered at Step 1, and contributed significantly to the regression model, $F(4, 181) = 9.37$, $p < .001$), accounting for 15.3% (adjusted R^2=.153) of the variation in explicit positive affect scores (PANAS-P). Introduction of TAS-20 scores in Step 2 revealed that, as hypothesised, the TAS-20 was a significant predictor, $F(1, 180)$ change = 28.10, $p < .001$, accounting for an additional 11.2% of the variation in explicit positive affect. At Step 3 of the regression model, only age (p <.01) and TAS-20 scores (p <.01) were significant predictors of explicit positive affect. Introducing PAQ scores at Step 3 explained an additional 0.9% of the variation in explicit positive affect and this change in R^2 was not significant, F (1,179) change= 2.29, $p >$ .05. Together, the five independent variables accounted for 26.9% of the variance in explicit positive affect.

Table 4

Hierarchical multiple regression analyses predicting explicit negative affect (PANAS-N) from PAQ total scores and TAS-20 total scores.

Predictor	β	SE	sr^2	*p*	ΔR^2
Step 1					.142***
Control variables					
Age	−.263	.046	−.053	.001	
Gender	.029	1.28	.001	.680	
Education 1	−.150	.919	−.020	.040	
Education 2	−.148	1.01	−.017	.059	
Step 2					.130***
TAS-20 total	.386	.042	.130	.000	
Step 3					.015
PAQ total	.261	.036	.015	.056	

N = 194

Durbin Watson: 1.954

* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed). ***Correlation is significant at the .001 level (2-tailed). *Note*: Education1= Highest level of education year 11 or below. Education 2= Lowest level of education Year 12 or greater.

As shown in **Table 4**, the control variables of age, gender, and education, entered at Step 1, contributed significantly to the regression model, F (4,180) =7.44, $p < .001$), accounting for 12.3% (adjusted R^2=.123) of the variation in explicit negative affect scores (PANAS-P). Introduction of TAS-20 scores in Step 2 revealed that, as hypothesised, the TAS-20 is a significant predictor of negative affect, F (1,179) change=31.88, $p < .001$, accounting for an additional 13% of the variation. At stage 3 of the regression model, only age (p<.01) and education (p<.05) remained as significant predictors of explicit negative affect. Introducing PAQ scores at Step 3 explained an additional 1.5% of the variation in explicit negative affect and this change in R^2 was not significant, F (1,178) change =3.69, $p >$ .05. Together, the five independent variables accounted for 26.2% of the variance in explicit negative affect.

Table 5

Hierarchical multiple regression analyses predicting implicit negative affect (IPANAT-NA) from PAQ total scores and TAS-20 total scores

Predictor	β	SE	sr^2	p	ΔR^2
Step 1 Control variables					.212***
Age	- .369	.039	- .106	.000	
Gender	.149	1.08	.021	.032	
Education 1	- .099	.778	- .009	.161	
Education 2	- .094	.856	- .007	.217	
Step 2 TAS-20 total	.061	.038	.003	.399	.003
Step 3 PAQ total	- .038	.034	.000	.795	.000

N = 187

Durbin Watson: 2.187

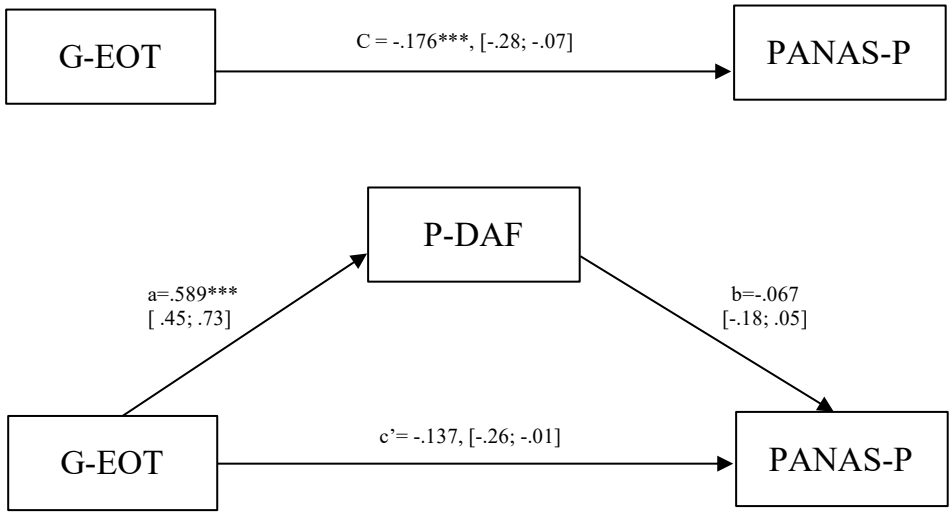
* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed). ***Correlation is significant at the .001 level (2-tailed). *Note*: Education1= Highest level of education year 11 or below. Education 2= Lowest level of education Year 12 or greater.

As shown in **Table 5**, the control variables of age, gender, and education, entered at Step 1, contributed significantly to the regression model, F (4,175) =11.77, $p < .001$), accounting for 19.4% (adjusted R^2=.194) of the variation in implicit negative affect scores (IPANAT-PA). Introduction of TAS-20 scores in Step 2 revealed that the TAS-20 was not a significant predictor of implicit negative affect, F (1,174) change=.714, $p > .05$, accounting for an additional 0.3% of the variation. Introducing PAQ scores at Step 3 did not explain any of the variation in implicit negative affect (R^2 change = .000) which was not significant, F (1,173) change =.068 $p > .05$. Together, the five independent variables accounted for 21.6% of the variance in implicit negative affect.

Mediation

Figure 1.

Standardised Regression Coefficients for the Relationship Between Externally Oriented Thinking (G-EOT) and Explicit Positive Affect (PANAS-P) as Mediated by Difficulty Appraising Positive Feelings (P-DAF)

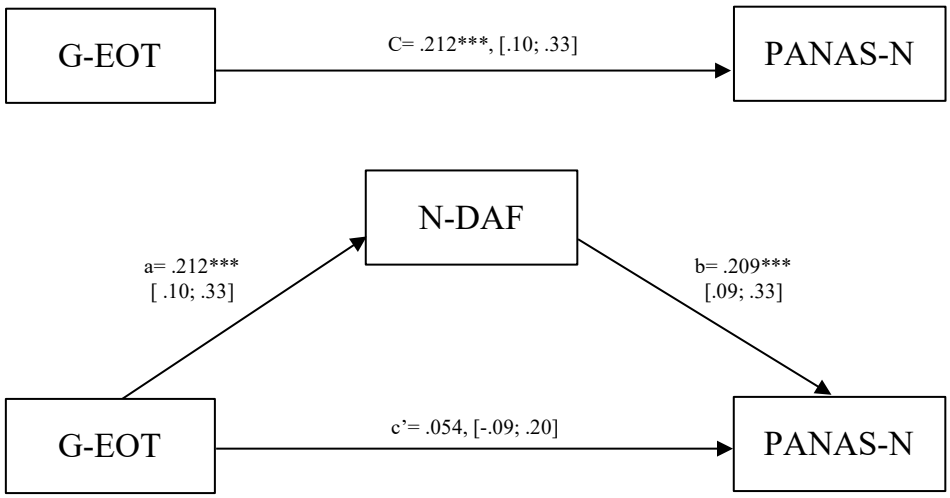


* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed). ***Correlation is significant at the .001 level (2-tailed). Simple mediation diagram: a, b, C and c' are path coefficients representing unstandardised regression weights and 95% confidence intervals [in square brackets]. The c path coefficient represents the total effect of externally oriented thinking scores (G-EOT) on explicit positive affect scores (PANAS-P). The ab path represents the indirect effect of G-EOT on PANAS-P scores. The c-prime path coefficient refers to the direct effect of G-EOT on PANAS-P scores. Paths a, C, and c' were significant, path b was not significant.

To investigate the mediational hypothesis that difficulty appraising positive feelings (P-DAF) mediates the relationship between difficulty attending to emotions (G-EOT) and explicit positive affect (PANAS-P), a mediation analysis was performed using PROCESS. As shown in **Figure 1**, the total effect of difficulty attending to emotion on explicit positive affect was significant (β = -.176, $t(159)=-3.39 = p <.01$). The direct effect was also shown to be significant (β = -.137, $t(159)=-2.20 = p <.05$) though the explained variance in explicit positive affect was reduced. The indirect effect path (β = -.039) was not significant 95% CI [-.120, .041]. A Sobel test indicated that there was no significant indirect effect in the model ($z = -1.11$, $p >.05$). Overall, P-DAF was not found to significantly reduce the total effect of G-EOT on PANAS-P scores.

Figure 2.

Standardised Regression Coefficients for the Relationship Between Externally Oriented Thinking (G-EOT) and Explicit Negative Affect (PANAS-N) as Mediated by Difficulty Appraising Negative Feelings (N-DAF)



* Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed). ***Correlation is significant at the .001 level (2-tailed).

Simple mediation diagram: a, b, C and c' are path coefficients representing unstandardised regression weights and 95% confidence intervals [in square brackets]. The c path coefficient represents the total effect of externally oriented thinking scores (G-EOT) on explicit negative affect scores (PANAS-N). The c-prime path coefficient refers to the direct effect of externally oriented thinking on explicit negative affect. Paths a, b, and C were significant, path c' was not significant.

Figure 2 shows the mediation analysis used to test the hypothesis that difficulty appraising negative feelings (N-DAF) mediates the relationship between difficulty attending to emotions (G-EOT) and explicit negative affect (PANAS-N). The total effect of difficulty attending to emotions on explicit negative affect was significant (β = .212, $t(163)=-3.39 = p < .01$). Controlling for the mediator, the direct effect was not found to be significant (β = .054, $t(159)=.745= p > .05$). The indirect effect of difficulty attending to emotion on explicit negative affect through difficulty appraising negative feelings was significant, β = .158, 95% CI [.074, .264]. A Sobel test was conducted and found mediation in the model ($z = 3.23$, $p < .001$). Overall, N-DAF was shown to the reduce the variance explained in the total effect path between G-EOT and PANAS-N.

Discussion

Literature regarding the Perth Alexithymia Questionnaire remains scarce. Moreover, there are no previous studies examining the practical contribution of valence-specific subscales in alexithymia measurement and the attention-appraisal framework's application to alexithymia more broadly. Accordingly, the first aim of this study was to address the lack of evidence on the utility of valence-specific subscales in the prediction of affect. The second objective was to explore the attention-appraisal pathway. This study provides much needed data around the functionality of the PAQ measure in predicting affect. The study also provides insight into the applicability of the attention-appraisal framework. Research that supplements prior PAQ studies predominantly investigating the psychometric properties of the measure. Along with sound measurement, accurate conceptual understanding is critical to the development of future research and the improvement of efficacy evaluations for current treatment modalities.

Following recent shifts in the literature highlighting the influence of valence in emotion regulation, hedonically valanced subscales have been proposed in the measurement of alexithymia to potentially enable the derivation of more comprehensive emotion regulation profiles (Preece et al., 2017). To test this idea, the relationship between alexithymia and affect was examined using the TAS-20 measure of alexithymia; the PAQ measure of alexithymia; the PANAS measure of explicit affect; and the IPANAT measure of implicit affect. It was predicted that valence-specific subscales would allow the PAQ to account for a larger proportion of the variance in affect than the non-valence-specific TAS-20.

The study also sought to investigate the mediational role of appraisal presumed by the attention-appraisal model that forms the conceptual foundation of the PAQ. The study hypothesised that the appraisal stage of emotion valuation, as measured by P-DAF in the first model, and N-DAF in the second model, would mediate the relationship between the

attention stage of emotion valuation, as measured by G-EOT, and the emotion response, as measured by the PANAS-P and PANAS-N. The results are discussed in the following sections.

As expected, a strong positive correlation was evident between the TAS-20 and the PAQ (See **Table 2**). This further evidences the construct validity of the PAQ and shows that both instruments are high-quality measures of alexithymia. The measures also demonstrated comparable correlation patterns with affect. Both the TAS-20 and PAQ displayed moderate positive correlations with explicit negative affect, supporting the well documented association between alexithymia and heightened aversive states (Lundh & Simonsson-Sarnecki, 2001). Consistent with the established relationship between alexithymia and lack of positive affect, both measures displayed moderate negative correlations with explicit positive affect (Lundh & Simonsson-Sarnecki, 2001). Implicit positive affect (IPANAT-PA) showed negligible correlations with all variables except gender and positive explicit affect. As such, the measure was thereafter excluded from further analyses. The implicit negative affect measure (IPANAT-NA) was retained due to its small but significant correlations with age, gender, alexithymia, and negative explicit affect.

Although the TAS-20 and PAQ measures both emerged as significant predictors of explicit affect, this observation did not hold for implicit affect. As shown by the regression analysis in **Table 5,** only age and gender accounted for significant portions of the variance in explicit negative affect. Paired with our negligent findings on implicit positive affect, this seems to suggest a relatively insignificant relationship between alexithymia and implicit affect. This is surprising given the documented relationship between alexithymia and affect. The IPANAT has been shown to account for effects over and above that of explicit affect measures and coincide with physiological measures such as cortisol and blood pressure in the anticipated directions (Martin et al., 2019). Nevertheless, implicit measures are often

criticised for a variety of reasons (Fazio et al., 2003) such as the emergence of trends exhibiting unpromisingly low correlations among implicit measures (Fazio et al., 2003; Bosson et al., 2000). The findings of the present study cast some doubt on the ability of the IPANAT to accurately capture preconscious affective states and affect regulation processes in alexithymic individuals, as theorised by some researchers (Quirin & Bode, 2014). Our findings correspond with the work of Suslow and Donges (2017) who found no evidence for an association between any of the alexithymia features and implicit positive or negative affectivity in the general population. The authors emphasised that such findings could be due to a lack of clinically pertinent alexithymia within the sample. In our sample, the TAS-20 measure identified 46 participants as alexithymic, while the PAQ identified 30 participants. This is approximately 15-23% of the sample. Hence, it may be that relationships involving implicit positive affect are more observable in predominantly highly alexithymic samples, and that this degree of alexithymia and severity was simply not present in the current study.

Alternatively, alexithymic deficits could amplify conscious experiences of negative emotions and suppress conscious experiences of positive affect, while experiences of affect at the lower automatic response level remain relatively unchanged. This coincides with the findings of Friedlander et al's (1997) who found minimal alexithymia-related differences in stress-related reactivity, a strong correlate of implicit affect, despite alexithymic individuals self-reporting higher levels of negative affect and lower levels of positive affect (Friedlander et al., 1997).

In studies involving the IPANAT, participants are typically exposed to affective priming (Van der Ploeg et al., 2016). It is therefore possible that the IPANAT detects only more drastic preconscious affective states while failing to detect milder states. Perhaps a certain threshold of emotion must be incited before the expected relationships emerge. For example, Suslow et al (2019) found significant correlations between explicit and implicit

negative affect in a sample of acutely depressed participants. Yet, no correlation between the two variables in a non-depressed sample, suggesting that relationships between conscious and non-conscious affect may be more perceptible amidst more radical degrees of negative affect. Similarly, after exposing participants to fear-inducing clips, Van der Ploeg et al (2016) detected significant changes in explicit negative affect, and non-significant but affect congruent changes in implicit negative affect. When these same participants reported higher levels of explicit negative affect following an anger-inducing clip, significant changes in implicit negative affect were detected by the IPANAT. Since the participants in our study were not exposed to any emotional priming, the degree of emotion experienced during completion of the IPANAT may have been insufficient to produce the expected relationships.

It may also be the case that the IPANAT is not be measuring the construct it purports to. For example, participant responses could be driven by pre-existing preferences for certain letter pairings or sounds. It is also possible that the nonsense words used in the measure were not truly meaningless to participants. The words could in some way resemble existing words that hold emotional value for the participants, and this is what motivated their response, and not the automatic activation of cognitive representations of affective experiences.

The first research objective was to assess whether valence-specific subscales would allow the PAQ measure to predict explicit affect better than the established TAS-20. Considering recent criticisms that the sensitivity of the TAS-20 is biased in the direction of negative valence, it was expected that the PAQ would account for a greater proportion of the variance in positive affect. Overall, the data found negligible support for the added utility of valence-specific subscales in the prediction of explicit positive and negative affect. Contrary to our hypothesis, **(See Tables 3 and 4)**, the addition of the PAQ measure added no significant contribution to the regression models. Hence, the PAQ did not account for any

significant variance in positive or negative affect over and above the variance accounted for by the TAS-20.

Even when the PAQ was entered at step 2 of the regression model and the TAS-20 at step 3, the significance of the variance in positive and negative affect accounted for by the PAQ held only until the TAS-20 was entered into the model at which point, the contribution of the TAS-20 acquired significance while the PAQ's contribution to the model was rendered nonsignificant. This implies that the PAQ failed to capture positive affect more effectively than the TAS-20 measure. At step 3 of the regression model in **Table 3**, a residual nonsignificant positive relationship can be observed between the PAQ and positive affect. This could indicate, as Preece et al (2018) suggest, that the PAQ is capturing some feature of explicit positive affect that the TAS-20 measure is not. However, the insignificance of the association implies the trivial nature of this detail. This is further evidenced by direct comparisons of the beta estimates, which indicate that positive affect shares a stronger relationship with the TAS-20 than the PAQ. While the data demonstrate that theoretically the PAQ might capture some aspect of positive affect that the TAS-20 does not, the value of that additional information is not reflected in the practical ability of the measure. Hence, the TAS-20 still surpasses the contribution of the PAQ, and accounts for a greater proportion of the variance in explicit positive affect. These findings run counter to Preece et al's (2018) argument promoting valence-specific subscales as a mechanism to better capture the relationship between alexithymia and positive affect, and thereby allowing more detailed emotion regulation profiles to be derived.

The second objective of the study was to assess whether difficulty appraising emotions is a potentially mediating factor in the relationship between difficulty attending to emotions and emotional affect. In line with the specifications of the attention-appraisal model, G-EOT was used to reflect difficulties attending to emotions. Difficulty appraising

feelings was operationalised using the PAQ's P-DAF and N-DAF composite scales. The composite scales were selected for use over the individual subscales due to their compounded value. P-DAF is made up of *Positive-Difficulty Identifying Feelings* and *Positive-Difficulty Describing Feelings* which both correspond to difficulties at the appraisal stage of valuation, wherein positive emotions are appraised in terms of what they are and what they mean for the individual. Hence, the construct of interest, difficulty appraising positive feelings, is best captured when these subscales are considered in tandem. Similarly, the N-DAF scale was selected because it is comprised of *Negative-Difficulty Identifying Feelings* and *Negative-Difficulty Describing Feelings* which together gauge an individuals' difficulties appraising negative feelings.

At the bivariate level, difficulty attending to emotions shared a moderate negative correlation with explicit positive affect; a moderate negative correlation with negative affect; and a large positive correlation with difficulty appraising positive feelings and difficulty appraising negative feelings. Overall, we found partial support for the hypothesis that difficulty appraising emotions has an influential effect on the relationship between difficulty attending to emotions and explicit positive and negative affect.

As shown in **Figure 1**, the mediation model indicated that difficulty attending to emotions has a significant negative total and direct effect on positive affect suggesting that people who are unable to attend to their emotions report lower positive affect than those with improved introspective abilities. Contrary to the hypothesis that difficulty appraising positive feelings would mediate this relationship, no significant indirect effect was found for the path from G-EOT to PANAS-P through P-DAF. These results indicate that difficulty appraising positive feelings did not significantly alter the relationship between difficulty attending to feelings and positive affect, as measured by PANAS-P. This conflicts with the attention-

appraisal approach outlined in Preece et al's (2017) paper. Alternatively, we may have failed to observe this effect because the PAQ was unable to adequately capture positive affect.

The mediation model shown in Figure 2 supported our hypothesis and the attention-appraisal framework, indicating a significant and positive total and indirect effect of difficulty attending to emotion on explicit negative affect. The total effect was suppressed after controlling for difficulty appraising negative emotions and the direct effect for the path from difficulty attending to emotions to explicit negative affect was found to be nonsignificant. In accordance with the attention-appraisal model, this demonstrates that difficulty appraising negative emotion is an important link in the relationship between difficulty attending to emotions and negative affect as measured by PANAS-N. This finding corroborates Li et al's (2015) meta-analysis which demonstrated strong links between difficulty identifying and describing feelings and depressive symptoms, and weak links between externally oriented thinking and depressive symptoms. Similar relationships between patterns of appraisal and emotion outcomes have also been demonstrated in several other studies (Ellsworth & Scherer, 2003; Roseman et al., 1996).

Overall, our findings provide differential support for the role of difficulty appraising feelings in the observed relationship between difficulty attending to emotions and emotional affect depending on the valence of the emotion. The data seem to support the relational link in the context of negative affect, but not positive affect. It could be that the role of appraisal shares a differential relationship with negative affect and positive affect. This relationship and the influence of valence in this context seems to warrant further exploration.

This study has several limitations. Although the sample showed diversity in age and education level, the participants were predominantly Australian females, which limits the generalisability of the study to some extent. Moreover, less than a quarter of the sample were

identified as alexithymic. A more highly alexithymic sample may have shown different patterns of relations among the variables.

Another limitation of the study was the lack of prior research on the application of hedonically valanced subscales and the attention-appraisal framework to the context of alexithymia. Insufficient research made it difficult to locate estimate values for the initial power analysis. A post-hoc Monte Carlo Power Analysis for Indirect Effects using the standardised coefficients from our study estimated that 233 participants would be needed to detect an effect with a power of .80. Given the number of missing data in our sample, it is possible that our study may have been slightly underpowered which may have affected our ability to detect meaningful relationships among some of the variables. Hopefully our study can provide important groundwork for future research into the applicability of the attention-appraisal model in alexithymia research.

The absence of an objective measure to corroborate the survey information obtained for alexithymia and explicit affect via self-report is another limitation. Self-reported methods of data collection are known to contain several sources of bias. In the assessment of alexithymia, the application of self-report measures has been criticised, as they require a level of emotional awareness that alexithymia, by definition, inhibits (Suslow & Junghanns, 2002). However, the TAS-20 strives to circumvent this limitation by incorporating items centred around external social feedback such as *"People tell me to describe my feelings more"*. TAS-20 total scores have also demonstrated high correspondence with observer-rated measures (Bagby et al., 1994). It could also be argued that alexithymic individuals do not possess the emotional insight necessary to complete the PANAS, as they may not be able to provide reliable data on their emotions. Nevertheless, studies continue to identify relationships between alexithymia and affect in the expected directions. Our study employed an implicit affect measure to bolster our confidence in the measure of explicit affect and capture aspects

of affect not consciously available to the participants. However, the measure demonstrated mainly negligible relationships with the variables of interest.

Since the design of the study was cross-sectional, there are limitations with mediation analyses. We are limited in our ability to draw conclusions about the causal nature of the relationships observed. We can say only that difficulty attending to emotions demonstrated a stronger indirect effect on explicit negative affect via difficulty appraising negative feelings, but not that difficulty appraising negative feelings necessarily mediates the relationship between difficulty attending to emotions and explicit negative affect.

Despite these limitations, our study has some important implications. Currently no single therapy has been designed to treat the effects associated with alexithymia. This is surprising given the association between alexithymia, depression, and suicidality (Lenzo et al., 2020; De Beradis et al., 2017). Learning about the stages of the attention-appraisal model and their real-world application could provide a more accurate picture of alexithymia, from which more practical measures could be developed which take into account the entire spectrum of affectivity. This could potentially inform mitigation strategies such that the focus of therapy shifts from being relatively diffuse to more targeted toward improving emotional understanding at the impaired stage of emotion valuation. For deficits in the appraisal stage, hedonically valanced subscales could help narrow and define difficulties such that therapy could be more individually tailored to suit patients.

Our findings demonstrated that the difficulty identifying feelings and describing feelings facets of alexithymia shared a stronger relationship with negative emotion than with positive emotion. This could indicate that alexithymia is inherently negatively skewed, and that alexithymia exacerbates negative affect to a greater extent than it inhibits positive affect. This finding could have significant implications for the practicality of the PAQ's valence

specific approach to alexithymia and may also explain why the PAQ was unable to capture more of the variance in affect than its TAS-20 counterpart.

In order to address alexithymia, we first need to understand it. Implicit measures of affect such as the IPANAT have great potential to advance our understandings of alexithymia and underlying emotion regulation processes. However, the underlying mechanism of the IPANAT remains unclear. Further research is needed to ensure that the IPANAT is an adequate index of preconscious affective processes both outside of laboratory contexts and in the absence of intense affective priming. Considering the irregular findings and intermittently small effect sizes between the IPANAT and other variables, future studies should aim to demystify the nature of implicit affect and tease apart its relationship with physiological measures such that we are able to more accurately define the types of information obtainable from the measure.

While Preece et al (2017) maintain that the PAQ is able to produce more hedonically valanced detail in alexithymia profiles, this is yet to be established. More research is needed to understand the aspects of positive affect captured by the PAQ. While our findings lend some support to the notion that the *difficulty identifying*- and *difficulty describing feelings* facets of alexithymia could be hedonically valanced, additional research is warranted to substantiate or falsify this claim. In future, studies should examine more highly alexithymic samples and compare the corresponding P-DAF and N-DAF scores of each participant to examine whether their abilities to identify and describe emotions vary with the hedonic valence of the emotion.

Further research is also needed to understand the merit of hedonically valanced detail in alexithymia profiles, particularly as it pertains to treatment. It is unclear from the results and the existing literature on alexithymia whether learning to better identify and label positively valanced feelings would have a significant effect on overall affect, particularly

positive affect. Though, past studies have shown alexithymic individuals to be somewhat responsive to both group therapy and cognitive behavioural therapy (Spek et al., 2008; Ogrodniczuk et al., 2011). This seems to suggest that alexithmic individuals have at least some ability to advance their recognition and verbalisation of emotions around others and utilise this knowledge to promote more adaptive behaviour. In addition, the broaden-and-build theory of positive emotion maintains that experiences of positive emotion tend to mount, leading to greater levels of other positive emotions (Fredrickson, 2001). Hence, if alexithymic individuals are able to improve their ability to differentiate and verbalise emotions, there is potential for this to lead to an increase in the frequency and degree of positive affect experienced, which in turn could create a feedback loop of positive emotion. Possible avenues for future study could implement targeted therapies for individuals who experience difficulties with the positive or negative appraisal of emotions. For example, therapies that involve cultivating awareness of positive emotions through repeatedly exercising emotional vocabularies in accordance with the accompanying bodily sensations for that emotion. The effectiveness of such interventions to improve participant abilities to identify and describe their emotions should be assessed, and their effect on affect related outcomes should subsequently be observed.

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Appendix A

Toronto Alexithymia Scale (TAS-20)

* 8. Using the scale provided as a guide, indicate how much you agree or disagree with each of the following statements by selecting the corresponding number.

	Strongly disagree	Moderately disagree	Neither disagree nor agree	Moderately agree	Strongly agree
I am often feeling confused about what emotion I am feeling.	○	○	○	○	○
It is difficult for me to find the right words for my feelings.	○	○	○	○	○
I have physical sensations that even doctors don't understand.	○	○	○	○	○
I am able to describe my feelings easily.	○	○	○	○	○
I prefer to analyse problems rather than just describe them.	○	○	○	○	○
When I am upset, I don't know if I am sad, frightened, or angry.	○	○	○	○	○
I am often puzzled by sensations in my body.	○	○	○	○	○
I prefer to just let things happen rather than to understand why they turned out that way.	○	○	○	○	○
I have feelings that I can't quite identify.	○	○	○	○	○
Being in touch with emotions is essential.	○	○	○	○	○
I find it hard to describe how I feel about people.	○	○	○	○	○
People tell me to describe my feelings more.	○	○	○	○	○
I don't know what's going on inside me.	○	○	○	○	○
I often don't know why I am angry.	○	○	○	○	○
I prefer talking to people about their daily activities rather than their feelings.	○	○	○	○	○
I prefer to watch "light" entertainment shows rather than psychological dramas.	○	○	○	○	○
It is difficult for me to reveal my innermost feelings, even to close friends.	○	○	○	○	○
I can feel close to someone, even in moments of silence.	○	○	○	○	○
I find examination of my feelings useful in solving personal problems.	○	○	○	○	○
Looking for hidden meanings in movies or plays distracts from their enjoyment.	○	○	○	○	○

Appendix B

The Perth Alexithymia Questionnaire (PAQ)

PAQ **Name:** **Date:**

This questionnaire asks about how you perceive and experience your emotions. Please score the following statements according to **how much you agree or disagree that the statement is true of you**. Circle one answer for each statement.

Some questions mention *bad* or *unpleasant* emotions, this means emotions like sadness, anger, or fear. Some questions mention *good* or *pleasant* emotions, this means emotions like happiness, amusement, or excitement.

		Strongly disagree	----	---	Neither agree nor disagree	----	---	Strongly agree
1	When I'm feeling *bad* (feeling an unpleasant emotion), I can't find the right words to describe those feelings.	1	2	3	4	5	6	7
2	When I'm feeling *bad*, I can't tell whether I'm sad, angry, or scared.	1	2	3	4	5	6	7
3	I tend to ignore how I feel.	1	2	3	4	5	6	7
4	When I'm feeling *good* (feeling a pleasant emotion), I can't find the right words to describe those feelings.	1	2	3	4	5	6	7
5	When I'm feeling *good*, I can't tell whether I'm happy, excited, or amused.	1	2	3	4	5	6	7
6	I prefer to just let my feelings happen in the background, rather than focus on them.	1	2	3	4	5	6	7
7	When I'm feeling *bad*, I can't talk about those feelings in much depth or detail.	1	2	3	4	5	6	7
8	When I'm feeling *bad*, I can't make sense of those feelings.	1	2	3	4	5	6	7
9	I don't pay attention to my emotions.	1	2	3	4	5	6	7
10	When I'm feeling *good*, I can't talk about those feelings in much depth or detail.	1	2	3	4	5	6	7
11	When I'm feeling *good*, I can't make sense of those feelings.	1	2	3	4	5	6	7
12	Usually, I try to avoid thinking about what I'm feeling.	1	2	3	4	5	6	7

		Strongly disagree	----	---	Neither agree nor disagree	----	---	Strongly agree
13	When something *bad* happens, it's hard for me to put into words how I'm feeling.	1	2	3	4	5	6	7
14	When I'm feeling *bad*, I get confused about what emotion it is.	1	2	3	4	5	6	7
15	I prefer to focus on things I can actually see or touch, rather than my emotions.	1	2	3	4	5	6	7
16	When something *good* happens, it's hard for me to put into words how I'm feeling.	1	2	3	4	5	6	7
17	When I'm feeling *good*, I get confused about what emotion it is.	1	2	3	4	5	6	7
18	I don't try to be 'in touch' with my emotions.	1	2	3	4	5	6	7
19	When I'm feeling *bad*, if I try to describe how I'm feeling I don't know what to say.	1	2	3	4	5	6	7
20	When I'm feeling *bad*, I'm puzzled by those feelings.	1	2	3	4	5	6	7
21	It's not important for me to know what I'm feeling.	1	2	3	4	5	6	7
22	When I'm feeling *good*, if I try to describe how I'm feeling I don't know what to say.	1	2	3	4	5	6	7
23	When I'm feeling *good*, I'm puzzled by those feelings.	1	2	3	4	5	6	7
24	It's strange for me to think about my emotions.	1	2	3	4	5	6	7

Appendix C

Positive and Negative Affect Schedule (PANAS)

Q7 This scale consists of a number of words that describe different feelings and emotions. Please read each item and then indicate to what extent you have felt this way in the **past week**.

	very slightly or not at all (1)	a little (2)	moderately (3)	quite a bit (4)	extremely (5)
interested (1)	○	○	○	○	○
distressed (2)	○	○	○	○	○
excited (3)	○	○	○	○	○
upset (4)	○	○	○	○	○
strong (5)	○	○	○	○	○
guilty (6)	○	○	○	○	○
scared (7)	○	○	○	○	○
hostile (8)	○	○	○	○	○
enthusiastic (9)	○	○	○	○	○
proud (10)	○	○	○	○	○
irritable (11)	○	○	○	○	○
alert (12)	○	○	○	○	○
ashamed (13)	○	○	○	○	○
inspired (14)	○	○	○	○	○
nervous (15)	○	○	○	○	○
determined (16)	○	○	○	○	○
attentive (17)	○	○	○	○	○
jittery (18)	○	○	○	○	○
active (19)	○	○	○	○	○
afraid (20)	○	○	○	○	○

Appendix D

Implicit Positive and Negative Affect Test (IPANAT)

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"BELNI"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"SUKOV"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"SAFME"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"VIKES"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

Q15

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"TUNBA"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

Q14

For the following made-up word, please describe how well you think it fits with each of the 6 listed emotions:

"TALEP"

	Doesn't fit at all (1)	Fits somewhat (2)	Fits quite well (3)	Fits very well (4)
Happy (1)	○	○	○	○
Helpless (2)	○	○	○	○
Energetic (3)	○	○	○	○
Tense (4)	○	○	○	○
Cheerful (5)	○	○	○	○
Inhibited (6)	○	○	○	○

Appendix E

Consent

Exploring Alexithymia, Affect and the Influence of Meditation Practice

Start of Block: Participant Information and Consent

00 Before commencing, please follow the link below in order to download and review the Participant Information Sheet.

placeholder.link

Participant Consent: I have read the attached information sheet and agree to take part in the following research project (Ethics Approval Number: 1234). I understand that involvement may not be of any benefit to me. I understand that, while information gained during the study may be published, I will not be identified, and my personal results will not be shared. I provide 'extended' consent for the use of my data in future research projects that are: an extension of or are closely related to the original project,or are in the same general area of research. I understand that I am free to withdraw from the project at any time without consequence.

1. By continuing you agree to the above statements and you provide your consent to participate in the current study.

- ○ I agree, and continue. (1)
- ○ I disagree, and will not continue. (2)

Skip To: End of Survey If By continuing you agree to the above statements and you provide your consent to participate in th... != I agree, and continue.

Appendix F

Demographic Information

Q1 What gender do you identify with?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary (3)
- ○ Other (please specify): (4) _____

Q2 What is your age (in whole years)?

_____

Q18 Is English your first language?

- ○ Yes (1)
- ○ No (2)
- ○ If no, what is your first language? (3)

_____

Q28 What is your country of birth?

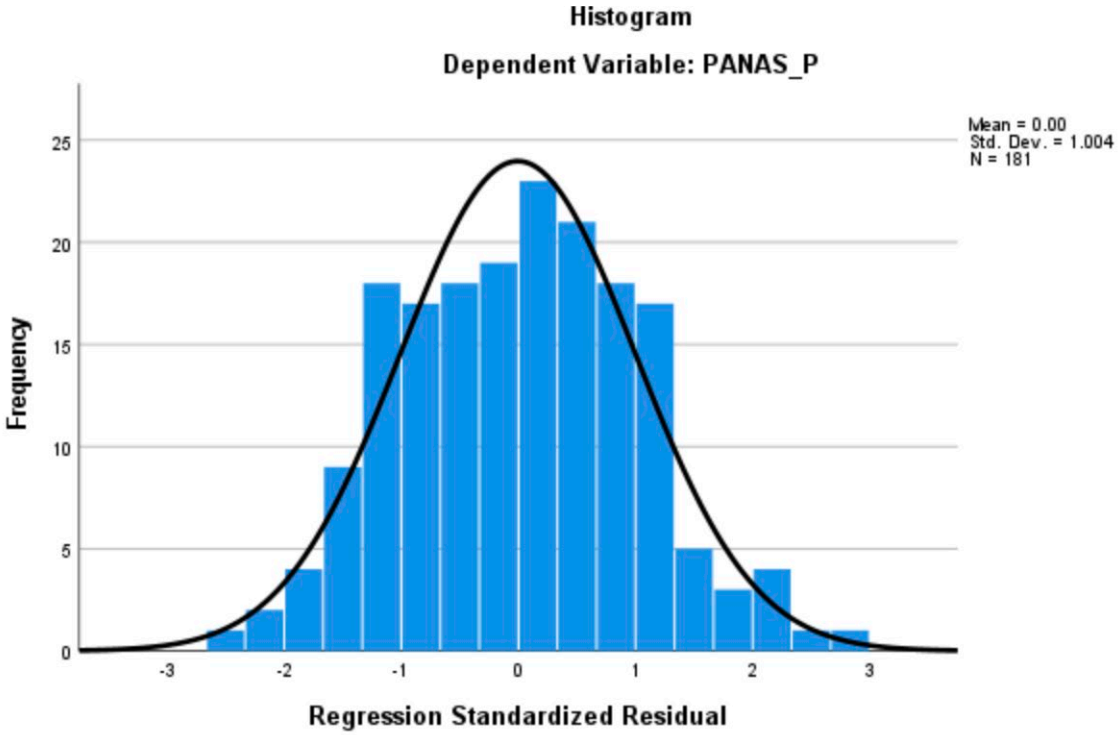
_____

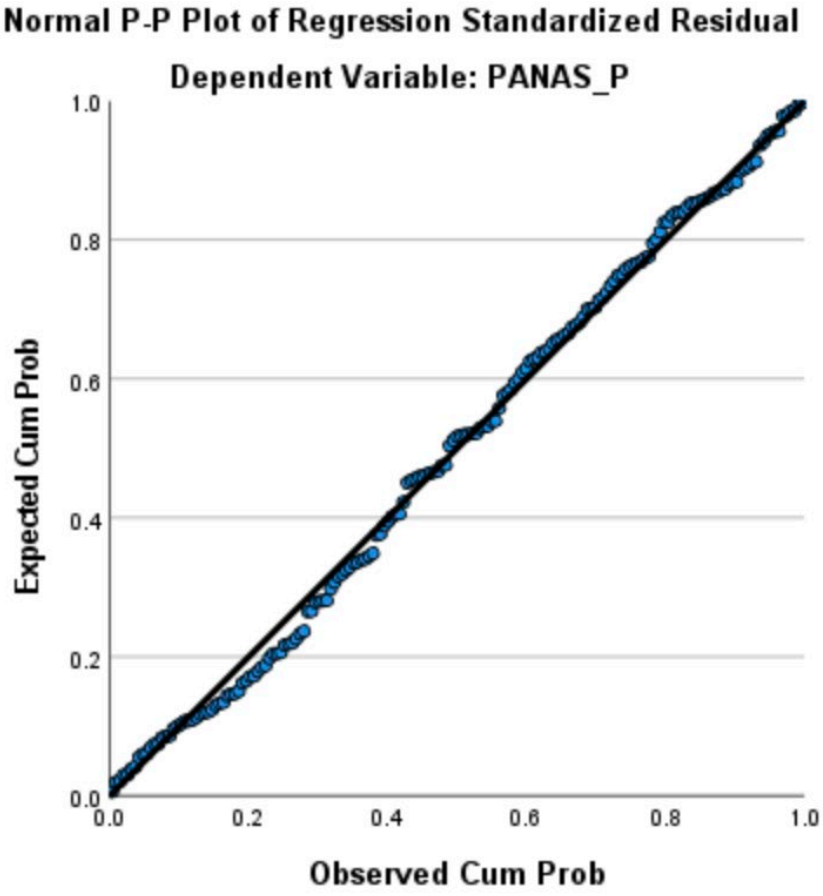
Q19 What is your highest level of education completed?

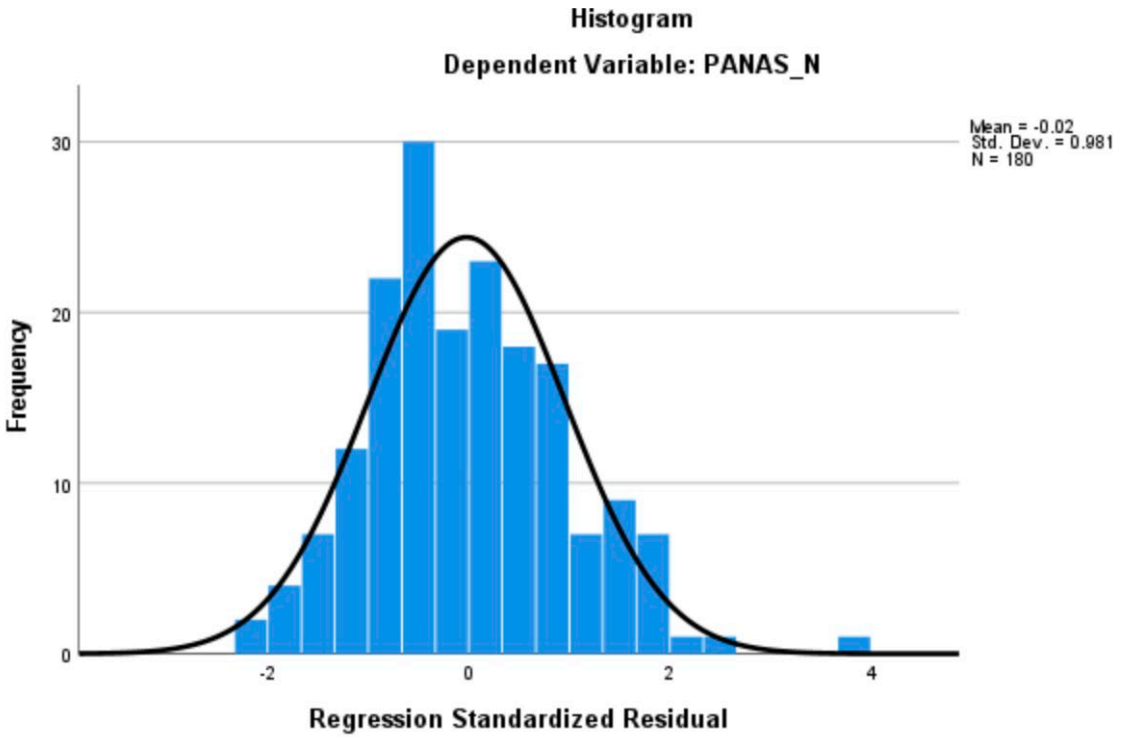
- ○ Primary School (1)
- ○ High School (2)
- ○ Graduated from High School (3)
- ○ Post-Secondary Certificate or Diploma (7)
- ○ Trade Certificate (4)
- ○ Bachelor Degree (5)
- ○ Postgraduate Degree (6)
- ○ Other (please specify): (8) _____

Appendix G

Histograms and P-P Plots



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Dependent Variable: PANAS_N
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20
10
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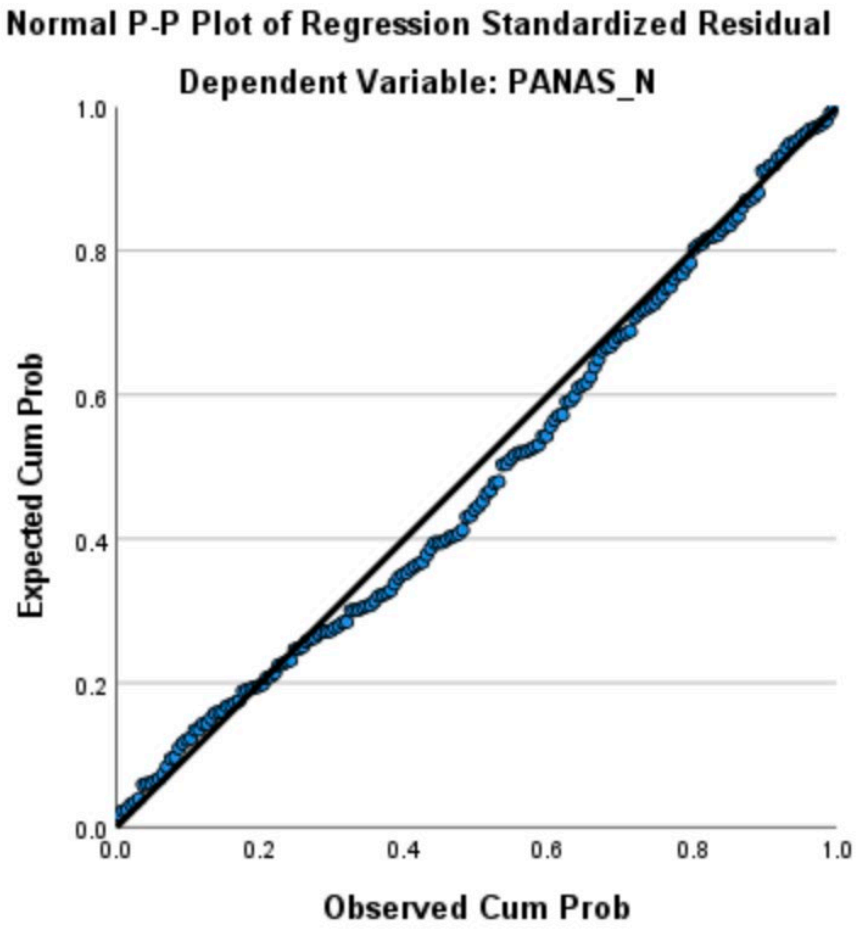
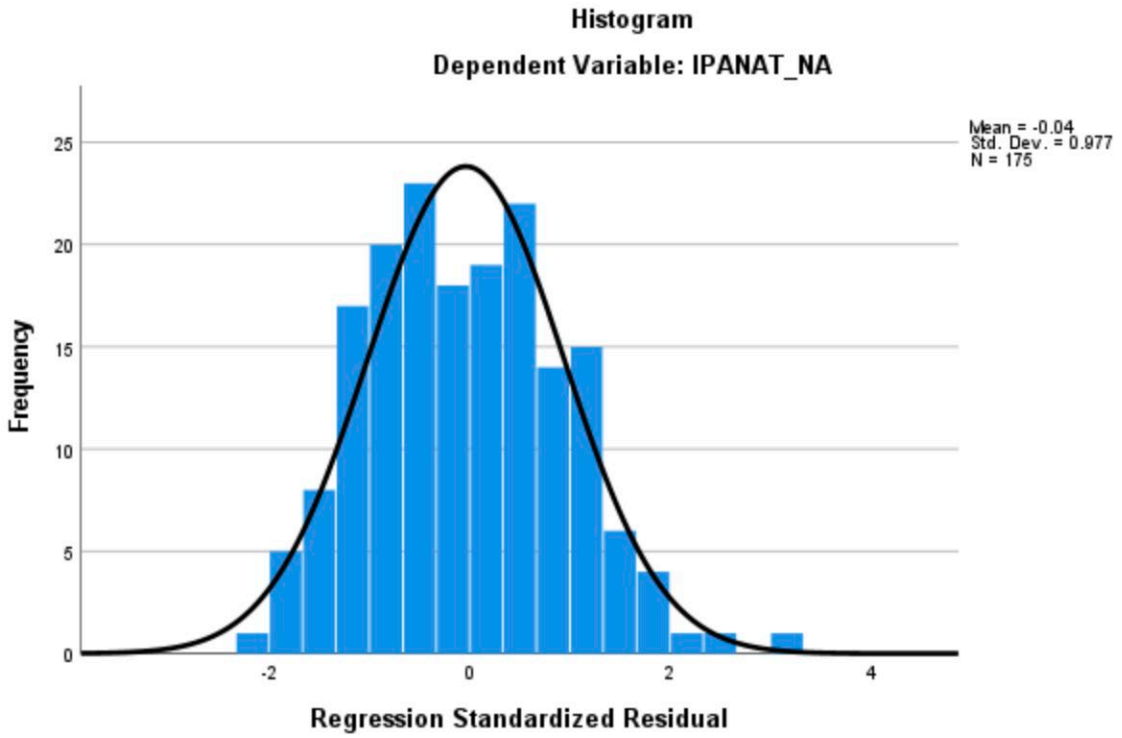
-2
0
2
4
Regression Standardized Residual


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PANAS_N
Expected Cum Prob
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob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Std. Dev. = 0.977
N = 175
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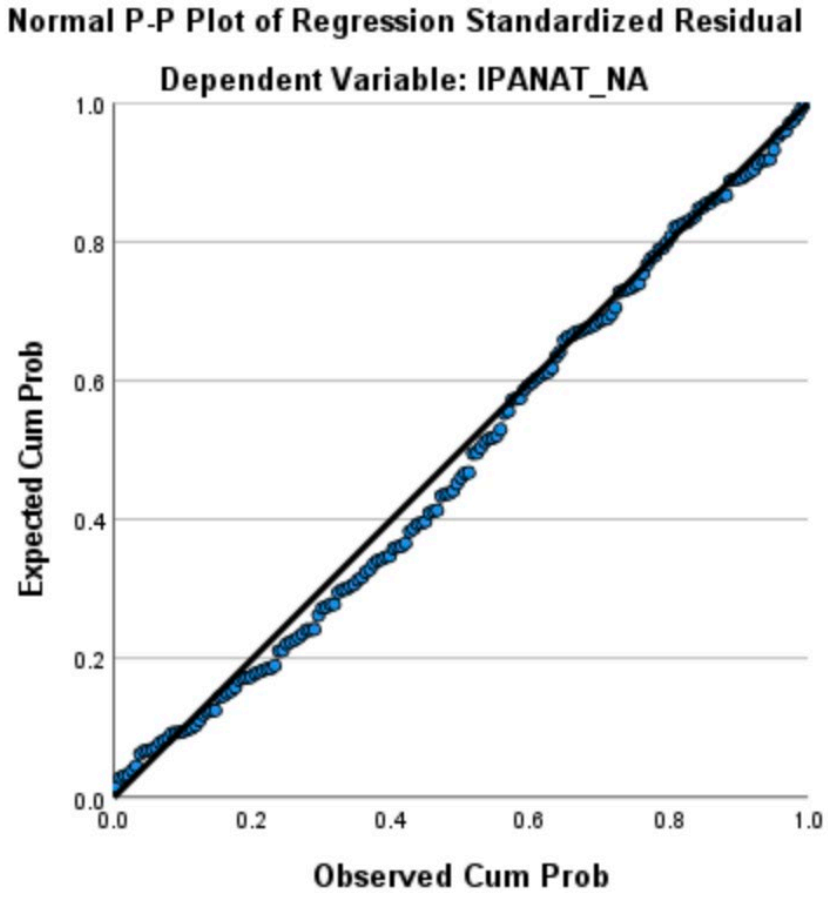
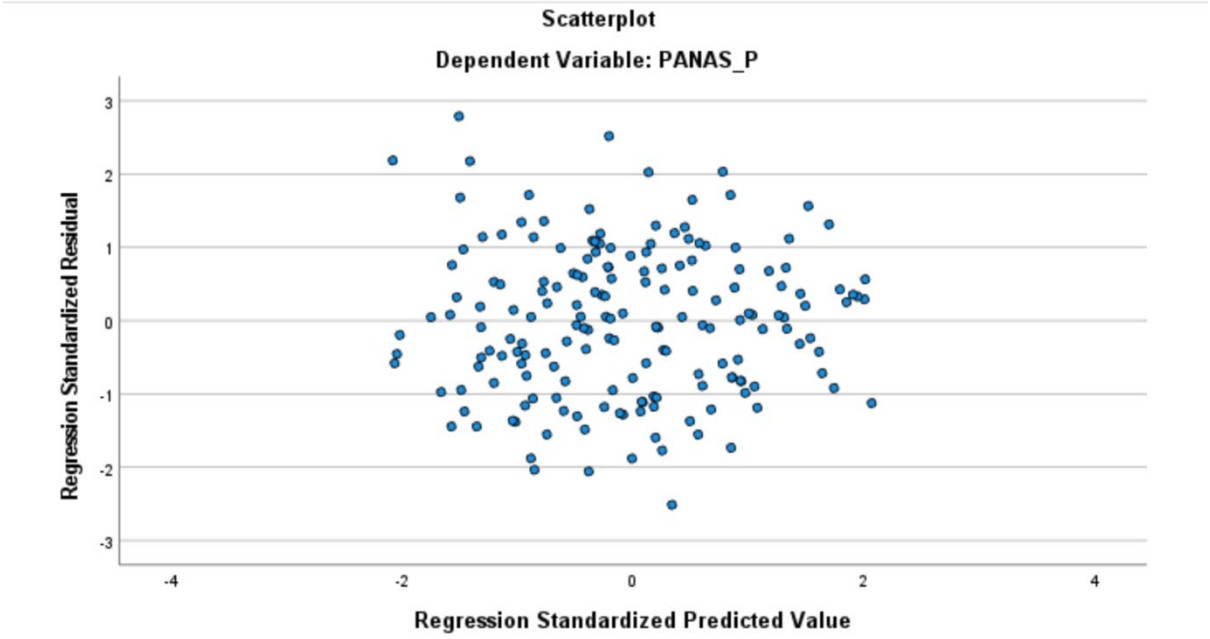
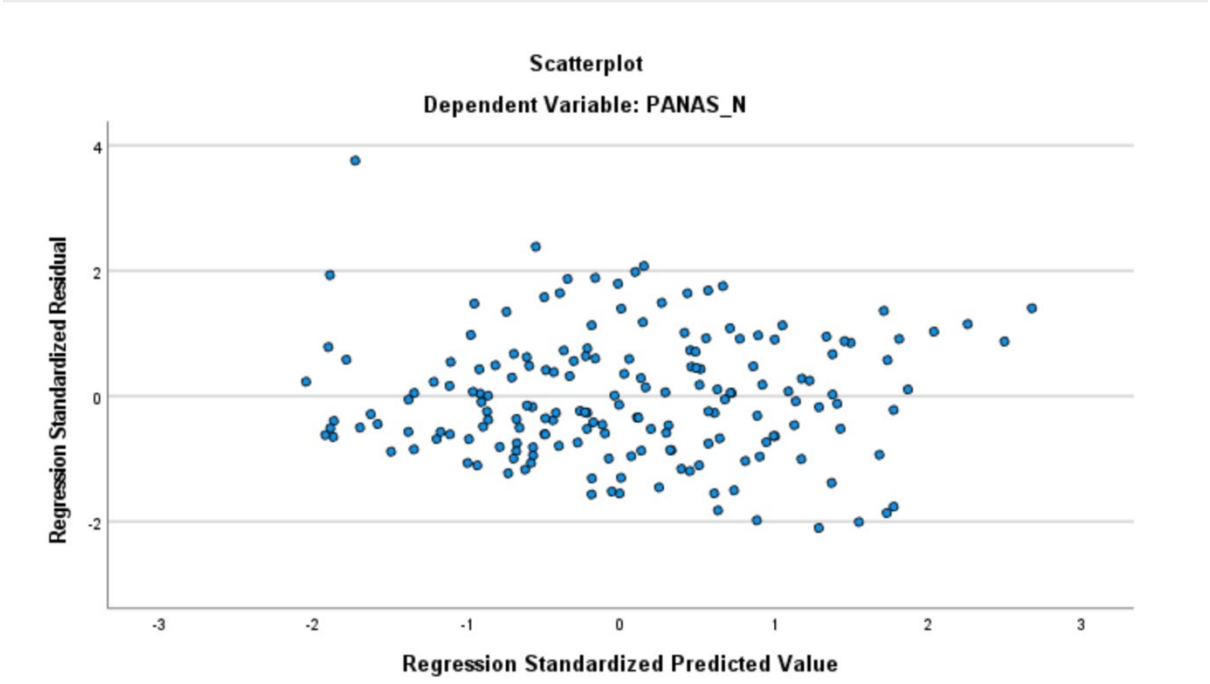
20
15
10
5
0
-2
0
2
4
Regression Standardized Residual

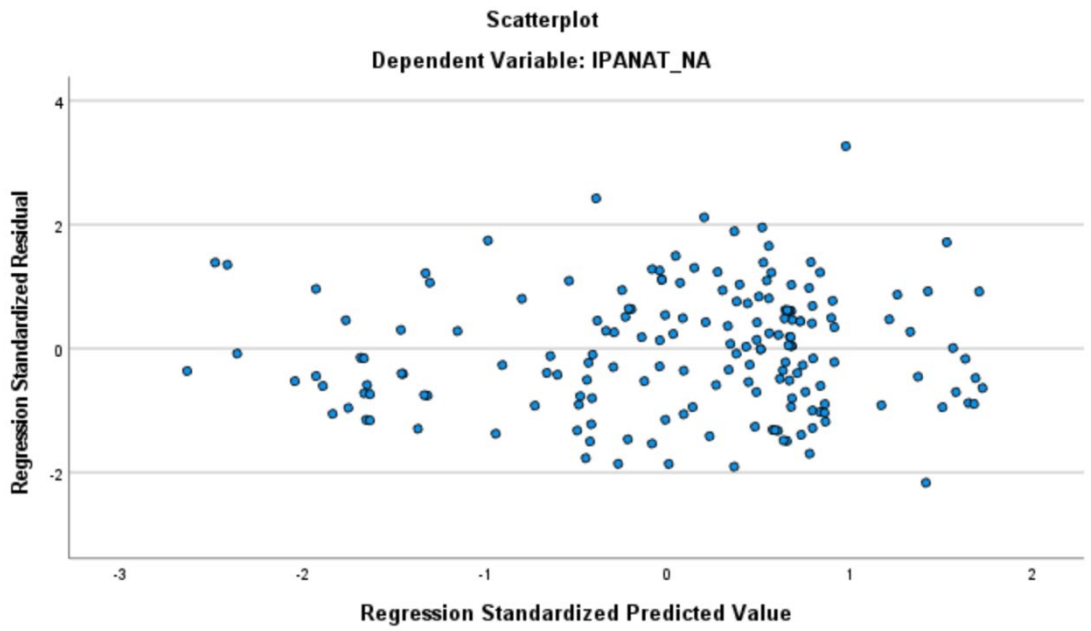

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: IPANAT_NA
Expected Cum Prob
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob

Appendix H

Scatterplots






Scatterplot
Dependent Variable: IPANAT_NA
Regression Standardized Residual
Regression Standardized Predicted Value
4
2
0
-2
-3
-2
-1
0
1
2