Does Depressive Symptomology Moderate the Relationship Between Alexithymic Traits and Emotion Perception Ability?

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

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Abstract

While a relationship between alexithymic traits and emotion perception difficulties has been consistently demonstrated, no prior research has examined whether depressive symptomology influences this relationship. The present study examined the relationship between alexithymic traits and the ability to identify a range of dynamically displayed basic emotions (happiness, sadness, and fear), across various emotion intensity levels (20%, 60%, and 100%), and whether depressive symptomology moderated this relationship. One-hundred and twenty participants (68 females; aged 18 to 65 years, $M = 24.95$, $SD = 7.19$) completed the Toronto Alexithymia Scale, the Depression, Anxiety, and Stress Scale, and the Emotion Recognition Task. The present results indicate that higher levels of alexithymic traits may be associated with a reduced ability to identify fear at full intensity levels, which provides some limited support for the prior literature. Furthermore, higher levels of depressive symptomology may be associated with an enhanced ability to identify fear at low intensity levels, which provides tentative support for the negative bias in emotion processing typically found in depressed individuals. However, no further enhancement, attenuation, or moderation effects were evident. Future research in individuals with higher levels of alexithymic traits and depressive symptomology is required to support these findings and to better inform potential targeted treatment programs for those who may be experiencing interpersonal difficulties.

Emotions give meaning and texture to everyday life, enhance connections with others, and inform individuals about needs, frustrations, and rights (Berking et al., 2011). While the ability to accurately perceive emotions in oneself is an important enabler of social connectedness, the ability to accurately identify emotions in others helps to facilitate appropriate social responding, further enhancing this connection (Marsh, Kozak, & Ambady, 2007). Emotion perception ability, therefore, provides a foundation for pro-social behaviour, enabling the development and maintenance of interpersonal relationships, and enhancing social support and psychological wellbeing (Gratz & Roemer, 2004). In recent years, there has been an expanding interest in emotion perception difficulties due to its adverse effects on mental health and interpersonal relationships (Taylor, Bagby, & Parker, 1997). One condition thought to impede emotion perception is alexithymia (Parker, Taylor, & Bagby, 1993).

Alexithymia is a condition characterised by a reduced ability to consciously experience, identify, and describe one's emotions (Taylor et al., 1997). Furthermore, alexithymic individuals show a cognitive tendency toward detail and external events, accompanied by a lack of imagination and a high prevalence of negative emotions (Taylor, 1994). When originally coined in the 1970s, alexithymia represented a clinical condition that was categorically diagnosed (Sifneos, 1973). However, recent conceptualisations and epidemiological data support the notion that alexithymia is a stable dimensional personality trait (Mattila et al., 2010). Levels of alexithymic traits demonstrate a normal distribution in the general population, with clinical levels present in approximately 10% of individuals (Salminen, Saarijärvi, Äärelä, Toikka, & Kauhanen, 1999).

High levels of alexithymic traits are a risk factor for the onset and aggravation of a diverse range of psychological disorders including anxiety, depression, eating disorders, autism spectrum disorders, personality disorders, substance use disorders, and schizophrenia (Harrison, Sullivan, Tchanturia, & Treasure, 2009; Parker et al., 1993; Taylor et al., 1997;

van't Wout, Aleman, Bermond, & Kahn, 2007). Furthermore, individuals high in alexithymic traits typically report lower quality of life and have a higher prevalence of suicide (Hintikka et al., 2004). Whilst the etiology of alexithymia remains to be elucidated, numerous theoretical models have been proposed.

Several authors have proposed a social-developmental model, in which the etiology of alexithymia is associated with affect development in early childhood (Joukamaa et al., 2003; Lemche, Klann-Delius, Koch, & Joraschky, 2004). Lane and Schwartz' (1987) hierarchy of emotion awareness model, which aligns with Piagetian cognitive stages of development, suggests alexithymic individuals function at the preoperational level. This means they struggle to see the perspective of others, have a limited imagination, and poor language skills (Lemche et al., 2004). This developmental lag may be caused by maladaptive experiences during a critical stage of early development (Lemche et al., 2004). Indeed, numerous studies have shown alexithymia in adulthood to be linked with diminished family expressiveness, not feeling emotionally safe, trauma, and neglect (Berenbaum & James, 1994; Kench & Irwin, 2000). Whilst numerous studies support a social-developmental model, neurobiological factors have also been proposed (Tabibnia & Zaidel, 2005).

Research has consistently demonstrated that alexithymia is associated with altered functioning in several brain regions involved in the processing of emotional stimuli (van der Velde et al., 2013). According to the 'blindfeel' hypothesis by Lane, Ahern, Schwartz, and Kaszniak (1997), the emotion processing difficulties in alexithymic individuals are a result of decreased activation in the anterior cingulate cortex (ACC), an area central to emotion perception and regulation abilities. In addition to the ACC, decreased activation in the amygdala, insula, and striatum has been proposed to underlie the deficits in emotional experience in alexithymic individuals, as these areas are fundamental in the generation of emotional feelings and the detection of emotional significance (Adolphs, 2010; Bermond,

Vorst, & Moormann, 2006). Thus, the impaired emotional processing (pertaining to both emotion perception and emotion regulation) in alexithymic individuals may be due to low activation within the aforementioned areas.

Alexithymia and Social Cognition

The literature on alexithymia has focused primarily on intrapersonal consequences, which has provided ample evidence in relation to its negative impacts on mental health, such as an increased risk of psychological distress, mental illness, and suicide (Lumley, Neely, & Burger, 2007; Taylor & Bagby, 2004). In recent years, there has been an expanding interest in the impact of alexithymia on interpersonal relationships (Grynberg et al., 2012). Although dysfunction in interpersonal relationships do not define the condition of alexithymia, clinical observations and empirical research have demonstrated that those high in alexithymic traits do experience difficulties interacting with their social environment (Grynberg et al., 2012). Patterns of cold, unsympathetic and distant social functioning have been found, with a tendency for relationships to remain superficial (Guttman & Laporte, 2002). These patterns of behaviour have been shown to lead to social isolation and further maladaptive behaviours (Montebarocci, Codispoti, Baldaro, & Rossi, 2004). Furthermore, research demonstrates interpersonal problems greatly interfere with the therapeutic relationship, which is a strong marker for the effectiveness of psychological therapy (Saunders, 2001). Impairments in social cognition have been proposed to underlie the difficulties in interpersonal functioning seen in alexithymic individuals (McDonald, 2013; Parker et al., 1993).

Social cognition can be defined as the ability to adequately attend to, identify, and interpret interpersonal cues (Frith & Frith, 2007). This process enables individuals to predict other people's intent and reactions, and to communicate effectively (McDonald, 2013). These skills are therefore essential for successful social interactions, allowing individuals to establish and maintain relationships with significant others (Frith & Frith, 2007). As humans

require effective communication with others to survive, social cognition is thought to be an evolutionary imperative, which has resulted in brain development separate to that which mediates general cognition (Adolphs, 2003). There is also behavioural evidence for a double dissociation between regions of the brain that mediate general and social cognition. For example, individuals who present with frontal lesions in the brain often exhibit interpersonal functioning that is significantly impaired compared to their levels of intelligence (Blair & Cipolotti, 2000; Tranel, Bechara, & Denburg, 2002). Social cognition encompasses both higher order abilities, such as Theory of Mind (ToM), and lower order abilities, such as emotion perception (Guastella et al., 2015).

ToM refers to the ability to attribute mental states such as thoughts, attitudes, and intentions to the self or others (Guastella et al., 2015). It requires one to make and reflect upon complex social inferences, subsequently facilitating the ability to explain and predict behavior in others (Frith & Frith, 2007). Emotion perception refers to the relatively automatic capacity to identify emotions (Guastella et al., 2015). Whilst emotions can be detected through language (content and tone), 60% of human communication is based on non-verbal cues such as facial expressions and body gestures (Frith & Frith, 2007). These cues provide information that is used to infer a person's mood, level of interest, and intentions, which helps to facilitate verbal communication (Erickson & Schulkin, 2003). To relate the two, ToM is a multistep process that requires emotion perception skills (Demers & Koven, 2015). From this perspective, emotion perception is a prerequisite for the ability to engage in successful social interaction (Erickson & Schulkin, 2003). The face has been identified as the primary site of action for the display of emotions (Parker et al., 1993). Thus, it has been proposed that the social difficulties seen in alexithymic individuals may in part be due to a diminished capacity to identify other people's facial expressions (Parker et al., 1993).

The perception of emotional facial expressions is mediated by a distributed neural

system (core and extended) comprised of multiple brain regions (Haxby, Hoffman, & Gobbini, 2000). The core system is involved in processing the visual aspects of the face independent of emotional content (Jongen et al., 2014). Of more interest to the present study is the extended system, which is primarily concerned with extracting emotional content from facial expressions (Jongen et al., 2014). The extended system includes the ACC, amygdala, insula, and striatum (Haxby et al., 2000). These regions of the brain are the same regions that are implicated in alexithymia. Thus, difficulties in identifying facial expressions may be an outcome of alexithymia, which is what the literature indicates.

Alexithymia and Emotion Perception

A strong body of research has demonstrated that those high in alexithymic traits have difficulties in identifying emotional facial expressions (Cook, Brewer, Shah, & Bird, 2013; Swart, Kortekaas, & Aleman, 2009; Parker et al., 1993). Jessimer and Markham (1994) found that individuals high in alexithymic traits were significantly worse than those low in alexithymic traits at identifying all six universal emotional facial expressions of anger, fear, sadness, disgust, surprise, and happiness using the Ekman and Friesen (1976) test. In support of this, Lane, Sechrest, Riedel, Shapiro, and Kaszniak (2000) found alexithymia scores had a moderate negative correlation with the ability to identify the same six basic emotions. Parker et al. (1993) used Izard's (1971) ten emotions (anger, fear, disgust, contempt, surprise, distress, guilt, shame, interest, and joy), and reported that those high in alexithymic traits were significantly less accurate than the control participants in identifying seven of the emotions, with the exception of disgust and shame. However, some studies have produced alternative results. Mayer, DiPaolo, and Salovey (1990) found no differences between those with high and low levels of alexithymic traits in accurately labelling emotional materials. However, the methodology of this study may be criticised due to the inclusion of stimulus materials other than facial emotional expressions (i.e., colours swatches and abstract designs).

McDonald and Prkachin (1990) reported no association between alexithymic traits and identifying emotional facial expressions. However, this study used a measure of alexithymia low in validity, the Schilling-Sifneos Personality Scale (Mann, Wise, Trinidad, & Kohanski, 1994), and included only a small sample of 10 university undergraduates. In view of the major methodological limitations of studies that have produced null findings, there is general consensus in the literature is that those high in alexithymic traits do indeed experience difficulties in recognising emotional facial expressions.

Interestingly, research shows this deficit is worse for negative compared to positive valence emotions (Parker, Prkachin, & Prkachin, 2005). Prkachin, Casey, and Prkachin (2009) found that individuals with high levels of alexithymic traits were impaired in their ability to recognise the facial emotions of sadness, anger, and fear. However, the ability to detect happiness, surprise, and disgust was slightly, but not significantly, impaired. They also identified moderate negative relationships between alexithymic traits and the detection of happiness, surprise, disgust, and anger, and strong negative relationships between alexithymic traits and the detection of sadness and fear. Parker et al. (1993) found a significant interaction between alexithymic traits and emotion type, producing results consistent with Prkachin et al. (2009). Furthermore, a study by Mann et al. (1994) found that individuals high in alexithymic traits were most impaired in labelling sad facial expressions. Neuroimaging studies also support this notion, indicating that the neural correlates of emotion processing in alexithymia demonstrate a valence-specific effect (Reker et al., 2010; van der Velde et al., 2013).

The perception of sadness and fear has been consistently found to induce a response in the amygdala (Haxby et al., 2000). Studies have reported a strong negative correlation between alexithymia scores and amygdala activation when attempting to identify sad and fearful faces, but not happy and neutral faces (Kugel et al., 2008; Reker et al., 2010). Kano

and Fukudo (2013) found alexithymic individuals showed decreased activation in the insula in response to a sad face. Furthermore, Berthoz et al. (2002) found decreased activation in the ACC in response to sadness, anger, and fear, but not for happiness in individuals high in alexithymic traits. Thus, research shows that individuals high in alexithymic traits demonstrate hypo-activation in various brain regions involved in the perception of *negative* facial expressions.

People often express emotions to influence the behaviours of others (Frith & Frith, 2007). Thus, the inability to accurately identify a person's emotions could potentially lead to inaccurate interpretations of an individual's reaction and intent. Especially noteworthy, are the difficulties in identifying the negative valence emotions of sadness and fear. These are emotions that imply some degree of personal threat or vulnerability. Failure to identify these emotions and adjust ones behaviour accordingly may therefore result in a greater occurrence of interpersonal stress and negative social interaction (Prakchin et al., 2009). For example, the identification of fear and sadness in another has been linked to the inhibition of antisocial behaviours (Marsh et al., 2007). Thus, it is possible that this impairment could partially account for the relationship between alexithymic traits and dysfunction in interpersonal relationships.

One limitation of the previous literature is that the effect of alexithymic traits on the recognition of facial expressions of varying emotional intensity has largely been neglected, with studies focusing primarily on the identification of static facial expressions (i.e., a still photograph) of full intensity. However, social interaction in everyday life is a highly nuanced process, requiring individuals to actively identify facial expressions presented at varying levels of emotional intensity (e.g., a subtle smile vs. a full smile) (Montagne, Kessels, De Haan, & Perrett, 2007). There is some evidence to suggest that those high in alexithymic traits have difficulties in detecting facial expressions of low-to-moderate intensity (Grynberg

et al., 2012). Ketelaars, In't Velt, Mol, Swaab, and van Rijn (2016) found those with high levels of alexithymic traits had a significantly reduced capacity to identify static facial expressions at low emotional intensity. However, this study had an important limitation being that individuals with alexithymic traits were autistic, which may have confounded the results. Starita, Borhani, Bertini, and Scarpazza (2018) conducted two experiments to assess the ability of individuals with alexithymic traits to identify static and dynamic (i.e., a morphed video of a facial expression being produced) facial expressions (sadness, fear, and happiness) ranging from 0% to 100% intensity. Their results indicated that those with high levels of alexithymic traits required more emotional intensity than those with low levels to identify static fearful emotions, but not the emotions of disgust or happiness. In contrast, individuals with high and low levels of alexithymic traits required a similar amount of emotional intensity to identify all dynamic facial expressions. Thus, further investigation may be crucial to understand whether alexithymic traits influence an individual's ability to identify subtle vs. salient dynamic displays of emotional facial expressions in others. This may help to gain a better understanding of how alexithymia contributes to interpersonal relationship difficulties.

The ability to identify emotional facial expressions in others is a fundamental first step towards modifying one's behaviour so that is socially appropriate (Prakchin et al., 2009). Thus, the emotion perception difficulties in individuals high in alexithymic traits provides a basis for understanding the social difficulties they experience. However, additional factors that may influence emotion perception difficulties in people with alexithymic traits (and that in turn also contribute to poor social communication), are poorly understood.

Depression and Alexithymia

Prior research has demonstrated a strong relationship between depression and alexithymia in both clinical samples and the general population. Honkalampi et al. (2007) found that clinically depressed individuals with high levels of alexithymic traits were more

severely depressed and more frequently attempted suicide than depressed individuals with no or low levels of alexithymic traits (33% and 6% respectively). In the general population, Honkalampi, Hintikka, Tanskanen, Lehtonen, & Viinamäki (2000) found that the prevalence of alexithymic traits was only 4.3% among participants with no depressive symptoms, whereas in participants with depressive symptoms, the prevalence of alexithymic traits was significantly higher (32%). The association between alexithymic traits and depressive symptomology has been attributed to alexithymic individual's inability to adaptively respond to emotional situations (Coyne, 1976). Without accurate identification of emotion, individuals may respond inappropriately to others and become mired in a pattern of maladaptive social interactions and negative emotions (Allen, Lu, Tsao, Hayes, & Zeltzer, 2011). Thus, it is likely that depressive symptomology will influence outcomes in alexithymic individuals.

Depression is characterised by a range of symptoms including a lack of motivation and energy, sadness and hopelessness, low self-esteem, irritability, and a loss of interest in pleasurable activities (Teasdale & Barnard, 1993). Deficits in cognition, including executive functioning, memory, attention, and processing speed are also common (McIntyre et al., 2013). Furthermore, like alexithymia, depression has been linked to substantial difficulties in interpersonal functioning (Klerman & Weissman. 1992). Coyne's (1976) interactional model of depression suggests individuals with depressive symptomology engage in aversive interactions with others which often lead to negative reactions and reduced social support. In turn, this propagates depressive symptoms and perpetuates the cycle of depression (Coyne, 1976). In support of this model, research demonstrates that depressed individuals are more likely than non-depressed individuals to report fewer intimate relationships (Segrin & Abramson, 1994), inadequate social support (Billings, Cronkite, & Moos, 1983), withdrawal from social engagements (Rubin, Coplan, & Bowker, 2009), and more negative social

interaction (Joiner & Katz, 1999). Deficits in the perception of facial expressions have been proposed to underlie these interpersonal difficulties (Bower, 1981; Gur et al., 1992).

Depression and Emotion Perception

Indeed, the literature states depression is strongly associated with impairments in the identification of emotional facial expressions (Langenecker et al., 2005; Suslow, Junghanns, & Arolt, 2001). However, it is not clear whether depressive symptomology is related to a general deficit in identifying emotions or with a bias in recognising specific facial expressions. Rubinow and Post (1992) found depressed individuals exhibited deficits in recognising the emotions of happiness, sadness, and interest when compared to non-depressed individuals. Furthermore, Persad and Polivy (1993) reported reduced accuracy in depressed individuals for happiness, sadness, surprise, fear, anger, disgust, and indifference. Alternatively, a strong body of literature indicates that individuals with elevated levels of depressive symptomology exhibit a negative or 'mood-congruent' processing bias (Bower, 1981). That is, negative emotions appear to be identified more rapidly and accurately, whilst the identification of neutral and positive emotions appears to be impaired (Gollan, Mccloskey, Sean, Hoxha, & Coccaro, 2010; Suslow et al., 2001; Lawson, MacLeod, & Hammond, 2002).

Gur et al. (1992) found that whilst depressed individuals did not show an overall deficit in recognising emotional facial expressions, they commonly misclassified neutral expressions as sad and happy expressions as neutral. Similarly, Hale (1998) found that depressed individuals identified all facial expressions as displaying more sadness than healthy individuals. Gollan et al. (2010) observed that depressed individuals were better able to correctly detect sad and fearful facial expressions in comparison to healthy individuals. Lawson et al. (2002) found similar results, with depressed individuals showing enhanced processing and identification of negative emotional content. Furthermore, other studies have

reported that depressed individuals show a specific impairment in the identification of happiness (Cavanagh & Geisler, 2006; Suslow et al., 2001; Surguladze et al., 2004). The aforementioned results have been replicated in both clinical (Nunn, Matthews, & Trower, 1997) and general populations (Lee, Ng, Tang, & Chan, 2008). These findings align with the research suggesting that individuals with high levels of depressive symptomology may be primed to recognise negative facial expressions more accurately because of the congruency of the information with depression (Bower, 1981).

As previously stated, effective processing of emotional facial expressions is dependent upon the interaction among complimentary neural systems: a core system for the basic visual analysis of face, and an extended system for processing meaning and significance (Haxby, Hoffman, & Gobbini, 2002). The main components of the extended system include the ACC, amygdala, insula, and striatum (Haxby et al., 2002). All of these brain regions, except for the ACC, have been implicated in the etiology of depression (Mayberg, 1997). Research by Suslow et al. (2010) and Victor, Furey, Fromm, Ohman, and Drevets (2010) found that depressed participants showed increased amygdala and insula activation when viewing sad and fearful facial expressions and decreased activation when viewing happy expressions when compared to healthy participants. Furthermore, Peluso et al. (2009) reported that depressed participants showed amygdala hyper-activation when viewing sad and fearful facial expressions compared to control participants. The brain activity in the striatum resembles the same pattern as the amygdala and insula. That is, hyper-activation to sad and fearful facial expressions and hypo-activation to happy facial expressions (Lawrence et al., 2004; Scheuerecker, 2010). These results indicate that people with high levels of depressive symptomology demonstrate increased responsiveness to negative facial expressions and decreased responsiveness to positive facial expressions, which is consistent with the mood-congruent processing bias (Bower, 1981).

The ability to identify facial expressions is an essential step in successful functioning in interpersonal relationships, helping to guide social behaviour (Frith & Frith, 2007). Thus, an overly negative perception of facial expressions in others may be a strong determinant of the interpersonal problems commonly observed in depressed individuals. For example, if a person imposes negative rather than neutral interpretations on an ambiguous situation with other, this may result in an unnecessary adverse interaction. Indeed, cognitive theories of depression and various therapeutic techniques have highlighted this negative bias in emotional processing as central to the onset and maintenance of depression (Beck, 1967; Bower, 1981).

Like alexithymia, research into the effect of emotional intensity in identifying facial expressions in depressed individuals has been largely neglected, with studies reporting controversial findings. Research has found that depressed individuals demonstrate difficulties in identifying all facial expressions of lower emotional intensity (Surgulaze et al., 2004; Young et al., 1997). In contrast, other research indicates depressed individuals tend to perceive negative facial expressions as more intense, and are therefore able to correctly detect these emotions at lower intensities (Gollan, Pane, McCloskey, & Coccaro, 2008). However, many of these studies used faces that expressed 50% and 100% emotional intensity, which does not allow for the identification of less intense expressions, which are frequently encountered in social interactions (Montagne et al., 2007). Thus, assessing the ability of depressed individuals to detect facial expressions at lower intensity levels is likely to provide important information regarding their difficulties in interpersonal relationships.

Alexithymia, Depression, and Emotion Perception

Whilst the link between alexithymic traits and deficits in emotion perception ability has been widely established, limited research has been conducted to identify additional factors that may moderate this relationship. Importantly, no prior research has examined

whether the association between alexithymic traits and emotion perception ability is affected by the individual's mood. Yet, this question is critical, as alexithymia and depression are highly related, and like alexithymia, depression is related to deficits in emotion perception ability. However, the nature of this deficit appears to be quite different in these two conditions. Whilst both alexithymia and depression are associated with impairments in identifying positive emotions, the identification of negative emotions exhibits a different pattern. As previously stated, individuals high in alexithymic traits are worse at detecting the negative emotions of fear and sadness (Prkachin et al., 2009; Mann et al., 1994), and show decreased activation in the ACC, amygdala, insula, and striatum in response to these emotions (Berthoz et al., 2002; Reker et al., 2010). However, research shows that people with elevated levels of depressive symptomology demonstrate a negative bias in emotional processing and are therefore more accurate in identifying the negative emotions of fear and sadness (Gollan et al., 2010; Suslow et al., 2001). Neurobiological studies support this, demonstrating increased activation in the amygdala, insula, and striatum in response to these emotions (Surglaze et al., 2005; Peluso et al., 2009). Thus, is it plausible to suggest that high levels of depressive symptomology will enhance the emotion perception impairments seen in alexithymic individuals for positive emotions. However, it appears there may be a buffering effect for negative emotions. That is, the presence of high levels of depressive symptomology may reduce the impairments in recognising negative emotions for alexithymic individuals.

Aims and Hypotheses

The present study will examine the relationship between levels of alexithymic traits and the ability to identify a range of basic dynamically displayed emotions (happiness, sadness, and fear), across various emotion intensity levels (20%, 60%, and 100%). Given that alexithymia is highly comorbid with depression, whether depression moderates the relationship between alexithymia and emotion perception ability will also be examined. Thus,

it is hypothesised that: (1) Levels of alexithymic traits will be negatively related to emotion perception ability such that, higher levels of alexithymic traits will be associated with lower performance on emotion perception ability. However, based on the prior literature this relationship is (i) expected to be strong for the negative emotions of fear and sadness, and moderate for the positive emotion of happiness. Further, (ii) there will be a moderate negative relationship between alexithymic traits and detecting emotions displayed at low-to-moderate intensity levels (20 or 60%), and a small negative relationship with detecting emotions at full intensity levels (100%). (2) For the negative emotions of fear and sadness, but not for the positive emotion of happiness, levels of depressive symptomology will moderate the relationship between levels of alexithymic traits and emotion perception ability, such that (i) when levels of depression are low, there will be a strong negative relationship, however, (ii) when levels of depression are high, there will be no relationship. This prediction is based on the notion that higher levels of depression (which is related to a negative processing bias) may diminish the effect of poor emotion perception ability for negative emotions, which is typically seen in individuals with high levels of alexithymic traits (see *Figure 1*).

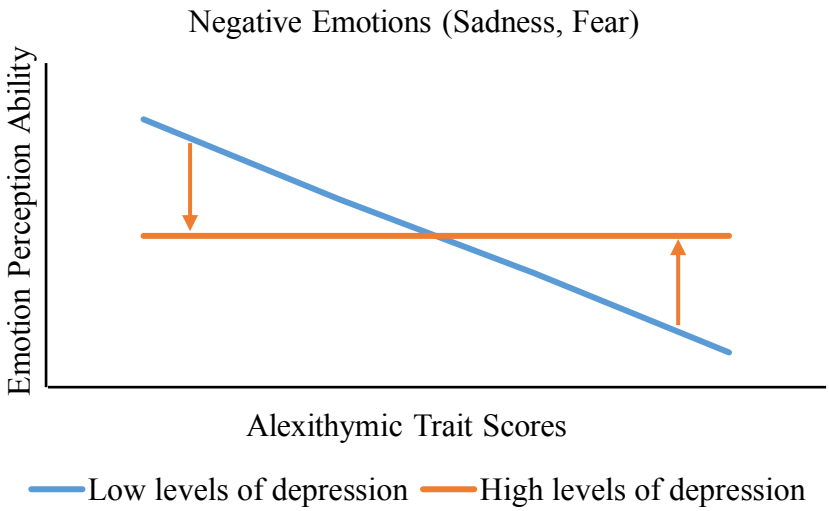

Figure 1. When levels of depression are low, there will be a strong negative relationship between levels of alexithymic traits and emotion perception ability for sadness and fear. When levels of depression are high, there will be no relationship between levels of alexithymic traits and emotion perception ability for sadness and fear.

Method

Participants

Participants consisted of 120 adults (68 females) aged between 18 and 65 years (M = 24.95, SD = 7.19). First year psychology students were recruited through SONA, a secure online electronic platform. Further recruitment proceeded via advertisements in the form of flyers displayed throughout the University of Tasmania's Newnham campus and the wider community. First year psychology students received 45 minutes of course credit, whilst additional participants went into the draw to receive one of three double movie vouchers.

Exclusion criteria included those who did not have normal or corrected to normal vision, did not speak or read English, a history of a neurological condition, a current diagnosis of a significant psychiatric illness or a score of 28 or higher on the DASS-21, a current diagnosis of a significant physical condition, and pregnancy. One-hundred and thirty-five individuals completed the online eligibility screening assessments, however, 9 of these

were excluded because they met the exclusion criteria, and 6 did not respond following the initial pre-screening. Institutional ethics was obtained for all aspects of the present study.

To determine sample size, an a priori power analysis was conducted using G*Power 3.1.9.2. An estimation of effect size from Lyvers, Lsdorf, Edwards, and Thorberg's (2017) study investigating alexithymic traits, depression, empathy, and emotion perception ability (R^2 = .18; Cohen's f = .22) was used to estimate sample size. This power analysis suggested a minimum sample of 94 participants would be required to detect significance (power = .90, α = .01). However, this study aimed to collect data from 120 participants to ensure a more robust analysis.

Design

The present study employed a cross-sectional correlational design, which examined the relationship between levels of alexithymic traits and the ability to identify three dynamically displayed emotions (sadness, fear, and happiness) at various intensity levels (20%, 60%, and 100%). Whether levels of depressive symptomology moderated the relationship between levels of alexithymic traits and emotion perception ability was also examined.

Materials

Emotion Recognition Task (*ERT*; Montagne et al., 2007): A computerised task that measures an individuals' ability to identify dynamically displayed facial expressions of the six basic universal emotions (happy, sad, surprise, angry, disgust, and fear). Each emotion appears in a video clip displayed on one of either two male or two female Caucasian faces. The video clips are presented in a predefined, random order that increase in length, morphing from a neutral facial expression (i.e., 0% intensity) to 20%, 40%, 60%, 80%, or 100% intensity. There are 120 trials in total, with each emotion presented four times at each intensity level. A six alternative forced-choice response format (including the six listed

emotions) is used for each of the 120 facial expressions. Scores for each emotion type at each intensity level are calculated by summing the number of correctly answered items (maximum scores = 4). The examination of facial expressions was restricted to happiness, fear, and sadness as prior research has indicated the identification of positive emotions differs from that of negative emotions in alexithymic and depressed individuals (Parker et al., 2005). Furthermore, sadness, and fear were included as research has demonstrated reduced responsiveness to these emotions in alexithymic individuals (Prkachin et al., 2009; Berthoz et al., 2002), and enhanced processing of these emotions in depressed individuals (Lawson et al., 2002; Suslow et al., 2001). Research has demonstrated the validity of the ERT, as it has been used successfully to assess emotion perception ability in both healthy (Kessels, Montagne, Hendriks, Perrett, & de Haan, 2013) and neurological participants (Rosenberg, McDonald, Dethier, Kessels, & Westbrook, 2014).

Self-Report Questionnaires

Toronto Alexithymia Scale-20 *(TAS-20*; Bagby, Parker, & Taylor, 1994): A 20-item self-report scale that measures levels of alexithymic traits. It is comprised of three subscales: Difficulty describing feelings to others (DDF), difficulty identifying feelings and distinguishing them from bodily sensations (DIF), and externally oriented thinking (EOT – i.e., a cognitive tendency toward detail and external events rather than feelings). The DDF subscale has 5 items (e.g., 'it is difficult for me to reveal my innermost feelings, even to close friends'), the DIF subscale has 7 items (e.g., 'I am often confused about what emotion I am feeling'), and the EOT subscale has 8 items (e.g., 'I prefer to analyse problems rather than just describe them'). Participants respond using a 5-Point Likert-type scale ranging from 1 = 'strongly disagree' to 5 = 'strongly agree'. There are 5 items that are negatively worded (4, 5, 10, 18, and 19), which are reversed scored. Total scores can range from 20 to 100, with higher scores indicating higher levels of alexithymic traits. A score of 61 has been proposed

to categorise respondents as having clinical levels of alexithymia (Taylor, 1994). The validity and replicability of the TAS-20 has been demonstrated in both clinical and non-clinical samples (Taylor et al., 1992; Parker et al., 1993). Furthermore, the TAS-20 has demonstrated acceptable test-retest reliability ($r = 0.77$) over a 3-week period, and good internal consistency ($\alpha = 0.84$) (Lane et al., 2000).

Depression, Anxiety, and Stress Scale – 21 (*DASS-21;* Lovibond & Lovibond, 1995): A 21 item self-report instrument comprised of three subscales designed to measure levels of depression, anxiety, and stress experienced in the previous week. Each subscale contains seven items (e.g., 'I felt down-hearted and blue', 'I felt scared without any good reason', and 'I found it difficult to relax' respectively). Participants respond using a 4-point Likert-type scale ranging from 0 = 'did not apply to me at all' to 3 = 'applied to me very much, or most of the time', with higher scores indicating greater levels of negative mood. The possible range of scores for each subscale is 0 to 21, which are then multiplied by two to give a total score. The DASS-21 was included to examine whether depressive symptomology moderates the relationship between alexithymic traits and emotion perception ability. The severity ratings for the depression subscale are: normal = 0 to 9, mild = 10 to 13, moderate = 14 to 20, severe = 21 to 27, extremely severe = 28+. The use of confirmatory factor analyses in both clinical and non-clinical samples has demonstrated the DASS-21 has good construct validity (Lovibond & Lovibond, 1995). Furthermore, a large scale study involving a non-clinical sample reported excellent internal consistency for the total scale ($\alpha = .93$) and the stress subscale ($\alpha = .90$), and good internal consistency for the depression scale ($\alpha = .88$) and the anxiety subscale ($\alpha = .82$) (Henry & Crawford, 2005).

Interpersonal Reactivity Index (*IRI;* Davis, 1980): A 28 item self-report scale designed to measure multi-dimensional empathic tendencies. It includes four subscales of fantasy, perspective taking, personal distress, and empathic concern, all containing seven

items. The fantasy subscale assesses the extent to which an individual identifies with fictitious characters and situations (e.g., 'when I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me'). The perspective taking subscale measures the ability to understand other people's viewpoints (e.g., 'I sometimes try to understand my friends better by imagining how things look from their perspective'). The personal distress subscale measures how a person feels when observing another person's suffering (e.g., 'being in a tense emotional situation scares me'). The empathic concern subscale measures a person's level of compassion for others (e.g., 'I often have tender, concerned feelings for people less fortunate than me'). Responses are rated on a 5-point Likert-type scale ranging from A = 'does not describe me well' to E = 'describes me very well'. There are 9 negatively worded items (3, 4, 7, 12, 13, 14, 15, 18, and 19), which are reversed scored. The possible range of scores for each subscale is 0 to 28, with higher scores indicating greater levels of empathic tendencies. The IRI was included in the present study to further profile participants (i.e., by assessing the relationship between alexithymic traits and empathy). The validity and replicability of the four-factor structure of the IRI has been consistently demonstrated via the use of confirmatory factor analysis (Davis, 1980; Carey, Fox, & Spraggins, 1988). Moreover, the IRI has demonstrated acceptable test-retest reliability (r = .62) (Bernstein & Davis, 1982), overall internal consistency (α = .74), and internal consistency for each subscale (fantasy, α = .71, perspective taking, α = .74, personal distress, α = .70, empathic concern, α = .76) (Davis, 1980; Delič, Novak, Kovačič, & Avsec, 2011).

Rosenberg Self-Esteem Scale (*RSES*; Rosenberg, 1965): A 10-item instrument designed to measure levels of positive (e.g., 'on the whole, I am satisfied with myself') and negative (e.g., 'at times I think I am no good at all') feelings of self-worth. Participants responses are rated on a 4-point Likert-type scale, ranging from 1 = 'strongly agree' to 4 =

'strongly disagree'. There are 5 items that are negatively worded (2, 5, 6, 8, and 9), which are reverse scored. All items are summed to give a total score ranging from 0 to 40, with higher scores indicating greater levels of self-esteem. As alexithymic traits have been identified to correlate negatively with self-esteem in both clinical (Carano et al., 2006) and non-clinical samples (Sasai, Tanaka, & Hishimoto, 2010), the RSES was included in this study to investigate current self-esteem as a possible covariate. Furthermore, the RSES has good internal consistency ($\alpha = .88$), as demonstrated in a large study involving undergraduate university students (Gray-Little, Williams, & Hancock, 1997).

Procedure

Participants completed a pre-screening questionnaire via Survey Monkey. Information collected in the pre-screening questionnaire included demographic information, medical history relevant to eligibility, and the DASS-21. Following confirmation of eligibility, participants were allocated an anonymous identification number, and a time for the experimental session was arranged. In the experimental session, participants read the participant information sheet and gave informed consent. Next, participants completed a demographic questionnaire and the subsequent baseline assessments: TAS-20, DASS-21, IRI, and the RSES. Participants then completed the ERT on the computer.

Statistical Analyses

Statistical analysis of the data was conducted through IBM SPSS version 24. Correlational analyses were conducted to assess the relationship between alexithymic traits and self-esteem and demographic variables including age, sex, and education. All correlations between alexithymic traits and the RSES, sex, and education were statistically non-significant and indicated minimal effect ($r < .20$), and were therefore not included in the moderation analyses as a covariate. However, the correlation between alexithymic traits and

age was statistically significant (r = -.27, p = .003), therefore age was included as a covariate in all moderation analyses.

A series of seven hierarchical multiple regression analyses with moderation were conducted to examine the moderating effect of depressive symptomology on the relationship between alexithymic traits and emotion perception ability (according to emotion type: fear, sadness, and happiness and intensity level: 20%, 60%, and 100%). Due to the high mean value and limited variability for the identification of happiness at 60% and 100% intensity levels (i.e., nearly all participants correctly identified happiness), happiness could not be examined at varying intensity levels. Thus, the 20%, 60%, and 100% intensity levels were combined into a total score for happiness, which normalised the distribution of responses. Alpha values of less than .05 were deemed significant for all statistical analyses. Correlations were interpreted using the following values: .10 indicates a small effect, .30 a moderate effect and .50 a large effect (Cohen, 1992). For semi-partial correlation squared (sr^2), values were interpreted according to Cohen (1988): .01 indicates a small effect, .09 a moderate effect, and .25 a large effect. Both unstandardised Beta (B) (with confidence intervals) and standardised Beta (β) were reported for all moderation analyses. Given there is evidence of a negative response bias in emotion perception in depressed individuals, labelling errors were calculated as a percentage to examine the type of misclassification errors made by those with no depressive symptomology and mild-to-severe levels of depressive symptomology across the three intensities in each emotion type.

Assumptions were checked for all analyses. This included independence of observations, outliers, linearity, multicollinearity, homoscedasticity, and normality of residuals. Independence of observations was assumed as the Durbin-Watson statistic was in the 1.5 to 2.5 range. For the moderation analysis predicting fear at 100% intensity, no assumptions were violated. Whilst all other assumptions were met, there was evidence of

non-normality of residuals for all other moderation analyses. Thus, a non-parametric bootstrapping procedure was performed using 1000 bias corrected samples. The bootstrapping procedure for the moderation analysis for identifying fear at 20% intensity revealed a quantitatively significant value, therefore alternate bootstrapping analysis significance values were reported. There were no meaningful differences in significance values between all other original moderation models, and these models with bootstrapping, therefore the original moderation analyses were reported. Furthermore, the variables were centered and an interaction term between alexithymic traits and depressive symptomology was created to overcome potentially problematic multicollinearity with the interaction term (Aiken & West, 1991).

Results

Descriptive Statistics

Descriptive statistics for the self-report measures of the TAS-20 and DASS-21, and additional measures to assist with sample characterisation including the IRI and RSES are reported in Table 1. The frequency of participants who had moderate-to-severe levels of depressive symptomology (i.e., DASS-21 score equal to or > 14), mild levels of depressive symptomology (i.e., DASS-21 scores ranging from 10 to 13), and no depressive symptomology (i.e., DASS-21 scores ranging from 0 to 9) were $n = 18$, $n = 13$, and $n = 89$, respectively. Descriptive statistics for overall ERT performance are reported in Table 2.

Table 1

Descriptive Statistics for Self-Report Measures

	M	*SD*
IRI		
Fantasy	15.90	5.69
Perspective Taking	18.43	4.28
Empathic Concern	20.14	4.35
Personal Distress	10.79	4.78
RSES	15.06	2.15
TAS-20	48.52	10.57
DASS-21		
Depression	6.97	7.25
Anxiety	5.32	6.62
Stress	11.63	8.24

Note. DASS-21 = Depression, Anxiety, and Stress Scale, IRI = Interpersonal Reactivity Index, RSES = Rosenberg Self-Esteem Scale, TAS-20 = Toronto Alexithymia Scale.

Table 2

Descriptive Statistics for ERT Performance

	M	*SD*
Happy 20%	2.42	.86
Fear 20%	.73	.81
Sad 20%	.65	.84
Happy 60%	3.91	.29
Fear 60%	1.33	1.08
Sad 60%	1.86	1.25
Happy 100%	3.98	.16
Fear 100%	1.77	1.14
Sad 100%	2.58	1.07
Happy combined	10.30	1.03

Note. With the exception of the combined score for happiness, the total range of scores for each ERT variable = 0 to 4.

Self-Report Questionnaire Correlations

To further assist in characterising the present sample, Pearson correlations were conducted to assess the linear relationship between the various self-report measures and alexithymic traits (see Table 3). These analyses indicated the three DASS-21 subscales had moderate significant positive relationships with alexithymic traits. The IRI subscales of empathic concern, perspective taking, and personal distress had significant negative correlations with alexithymic traits, indicating small-to-moderate relationships. The IRI fantasy subscale had a small non-significant negative relationship with alexithymic traits. The

RSES was not significantly correlated with alexithymic traits, indicating a small positive relationship.

Table 3

Correlations for Self-Report Measures and Alexithymic Traits

	TAS-20	
	r	*p*
DASS-21		
Depression	.36	<.001
Anxiety	.33	<.001
Stress	.34	<.001
IRI		
Fantasy	-.12	.194
Perspective Taking	-.24	.008
Empathic Concern	-.19	.041
Personal Distress	-.31	<.001
RSES	.13	.153

Note. DASS-21 = Depression, Anxiety, and Stress Scale, IRI = Interpersonal Reactivity Index, RSES = Rosenberg Self-Esteem Scale, TAS-20 = Toronto Alexithymia Scale.

Moderation Analyses

To examine the moderating effect of depressive symptomology on the relationship between alexithymic traits and emotion perception ability, seven hierarchical multiple regression analyses with moderation were conducted. In the first Step, age was entered. Age accounted for a non-significant amount of variance in identifying fear at 20% intensity (see

Table 4), sadness at 20% intensity (see Table 5), fear at 60% intensity (see Table 6), sadness at 60% intensity (see Table 7), sadness at 100% intensity (see Table 9), and happiness (see Table 10). However, age accounted for a significant amount of variance in identifying fear at 100% intensity (see Table 8).

At Step 2, alexithymic traits, depressive symptomology, and the interaction term between alexithymic traits and depressive symptomology were added to the regression model. These variables did not account for a significant amount of additional variance in identifying fear at 20% intensity (see Table 4), sadness at 20% intensity (see Table 5), fear at 60% intensity (see Table 6), sadness at 60% (see Table 7), fear at 100% intensity (see Table 8), sadness at 100% intensity (see Table 9), and happiness (see Table 10).

Although the moderation regression models at Step 2 were not significant, there was an indication of a unique small-to-moderate significant negative relationship between alexithymic traits and identifying fear at 100% intensity (see Table 8), indicating that higher levels of alexithymic traits may be associated with a reduced ability to detect fear at full intensity levels. Additionally, there was an indication of a unique small-to-moderate significant positive relationship between depressive symptomology and identifying fear at 20% emotional intensity (see Table 4), indicating that higher levels of depressive symptomology may be associated with a greater ability to identify fear at low intensity levels.

Table 4

A Moderation Regression Analysis Predicting Fear at 20% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	-.01 [-.03, .01]	-.09	-.09	.01	.249
Age	-.01 [-.04, .01]	-.12	-.09	.01	.158
DASS Depression	.02 [.00, .05]	.21	.14	.03	.024
TAS20	-.01 [-.02, .01]	-.09	.01	.01	.416
Interaction	-.05 [-.20, .09]	-.08	.03	.00	.341

Note. Step 1: R^2 = .01, adjusted R^2 = .00, $F(1, 118)$ = .88, p = .351. Step 2: ΔR^2 = .03, $\Delta F(3, 115)$ = 1.18, p = .323. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation. Probability values from the bootstrapped analysis were reported.

Table 5

A Moderation Regression Analysis Predicting Sadness at 20% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	.00 [-.02, .02]	-.02	-.02	.00	.859
Age	.00 [-.03, .02]	-.02	-.02	.01	.874
DASS Depression	.00 [-.03, .03]	.01	.02	.00	.915
TAS20	.00 [-.02, .02]	.00	.00	.00	.930
Interaction	.02 [-.14, .18]	.02	.03	.00	.842

Note. Step 1: R^2 = .00, adjusted R^2 = .00, $F(1, 118)$ = .032, p = .859. Step 2: ΔR^2 = .00, $\Delta F(3, 115)$ = .03, p = .992. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Table 6

A Moderation Regression Analysis Predicting Fear at 60% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	-.01 [-.03, .02]	-.04	-.04	.00	.687
Age	-.01 [-.04, .02]	-.04	-.04	.00	.681
DASS Depression	.02 [-.02, .05]	.11	.14	.02	.340
TAS20	-.01 [-.03, .02]	-.06	.00	.00	.555
Interaction	-.08 [-.11, .28]	.09	.15	.00	.394

Note. Step 1: R^2 = .00, Adjusted R^2 = .00, $F(1, 118)$ = .16, p = 687. Step 2: ΔR^2 = .03, $\Delta F(3, 115)$ = 1.17, p = .338. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Table 7

A Moderation Regression Analysis Predicting Sadness at 60% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	-.02 [-.05, 0.1]	-.12	-.12	.01	.205
Age	-.02 [-.05, .01]	-.12	-.12	.01	.214
DASS Depression	.00 [-.03, .05]	.04	.07	.00	.750
TAS20	.00 [-.03, .02]	-.08	-.02	.00	.443
Interaction	.12 [-.11, .34]	.12	.14	.00	.295

Note. Step 1: R^2 = .01, adjusted R^2 = .01, $F(1, 118)$ = 1.62, p = .205. Step 2: ΔR^2 = .02, $\Delta F(3, 115)$ = .83, p = .480. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Table 8

A Moderation Regression Analysis Predicting Fear at 100% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	.04 [.01, .06]	.22	.22	.05	.015
Age	.03 [-.00, .06]	.16	.22	.02	.090
DASS Depression	.02 [-.02, .05]	.10	.02	.00	.376
TAS20	-.03 [-.05, .00]	-.24	-.24	.04	.020
Interaction	.02 [-.18, .22]	.02	.03	.00	.839

Note. Step 1: R^2 = .05, adjusted R^2 = .04, $F(1, 118) = 6.05$, p = .015. Step 2: ΔR^2 = .05, $\Delta F(3, 115) = 2.00$, p = .118. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Table 9

A Moderation Regression Analysis Predicting Sadness at 100% Emotional Intensity

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	.03 [.00, .05]	.18	.18	.03	.055
Age	.03 [.00, .06]	.19	.18	.03	.054
DASS Depression	.00 [-.04, .03]	-.06	-.01	.00	.631
TAS20	.00 [-.02, .02]	-.03	-.09	.00	.759
Interaction	.14 [-.05, .33]	.16	.10	.02	.149

Note. Step 1: R^2 = .03, adjusted R^2 = .02, $F(1, 118) = 3.74$, p = .055. Step 2: ΔR^2 = .02, $\Delta F(3, 115) = .81$, p = .493. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Table 10

A Moderation Regression Analysis Predicting Happiness

	B [95% CI]	*β*	*r*	sr^2	*p value*
Age	.01 [-.02, .04]	.07	.07	.00	.469
Age	.01 [-.02, .04]	.07	.07	.00	.450
DASS Depression	-.01 [-.05, .02]	-.10	-.05	.00	.384
TAS20	.00 [-.02, .02]	-.04	-.08	.00	.726
Interaction	.11 [-.07, .30]	.13	.07	.01	.237

Note. Step 1: R^2 = .00, adjusted R^2 = .00, $F(1, 118)$ = .53, p = .469. Step 2: ΔR^2 = .02, $\Delta F(3, 115)$ = .67, p = .574. *B* = unstandardised beta, *β* = standardised beta, *r* = zero-order correlation, *sr* = semi-partial correlation.

Misclassification Errors

Frequency values were produced to qualitatively examine the pattern of mislabeling errors of emotions across participants with no levels of depressive symptomology, and mild, moderate, and severe levels of depressive symptomology (i.e., 'possible depression group'; See table 11). Participants with mild, moderate, and severe levels of depressive symptomology were grouped together given the low numbers of participants in these groups. Visual inspection of this information revealed there was a similar pattern of mislabeling errors across both groups. Ninety percent of participants in the no depression group and 89% in the possible depression group labelled happiness correctly. Misclassifications for happiness appeared to be equally distributed across all other emotion types. Both groups were able to correctly label surprise 60% of the time. Surprise was primarily misclassified as happy for both groups. Fear was labelled correctly 28% of the time for the no depression group, and 30% of the time for the possible depression group. Both groups predominantly

misclassified fear as surprise. A slightly higher percentage of participants correctly labelled anger in the no depression group compared to the possible depression group (81% and 74% respectively). Both groups tended to misclassify anger as disgust. Forty-five percent of participants in the no depression group and 40% in the possible depression group labelled sadness correctly. Sadness was predominantly misclassified as fear followed by disgust for both groups.

Table 11

Misclassification of Emotions in the ERT Across Participants With No Depressive Symptomology and Participants With Mild to Severe Levels of Depressive Symptomology

		Labelled provided by participant %					
Group	Actual Emotion	Happy	Surprise	Fear	Anger	Disgust	Sad
No Depressive Symptomology	Happy	**90**	2	1	2	3	2
	Surprise	30	**60**	3	1	3	3
	Fear	4	56	**28**	3	5	4
	Anger	3	1	2	**81**	10	3
	Disgust	1	1	1	23	**70**	4
	Sad	4	10	20	8	13	**45**
Mild-Severe Depressive Symptomology	Happy	**89**	3	1	2	3	2
	Surprise	29	**60**	3	2	3	3
	Fear	4	57	**30**	3	3	3
	Anger	3	3	3	**74**	12	4
	Disgust	2	1	1	21	**72**	3
	Sad	5	11	23	7	14	**40**

Discussion

The present study sought to examine the relationship between levels of alexithymic traits and the ability to identify a range of basic dynamically displayed emotions (happiness, sadness, and fear), across various emotion intensity levels (20%, 60%, and 100%). Given that alexithymia is highly comorbid with depression, whether depressive symptomology moderated the relationship between alexithymic traits and emotion perception ability was also examined. The first hypothesis that higher levels of alexithymic traits will be associated with lower performance on emotion perception ability, particularly for the negative emotions of fear and sadness and at low to moderate intensity levels, was only partly supported by the results. This was based on the unique small-to-moderate negative relationship between alexithymia scores and identifying fear at 100% emotional intensity. This specific finding is consistent with the prior literature indicating that individuals with higher levels of alexithymic traits have a diminished capacity to detect fear at full intensity levels (Parker et al., 2005; Parker et al., 2009). Furthermore, this result provides some support for the neurobiological research indicating that those with high levels of alexithymic traits have decreased activity in various brain regions involved in the identification of fearful facial expressions (van der Velde et al., 2013; Reker et al., 2010).

Various brain structures have been implicated in the processing of facial emotion perception information in individuals with high levels of alexithymic traits (Adolphs, 2003). Kugel et al. (2008) found that those high in alexithymic traits had significantly attenuated activation in the amygdala when identifying sad and fearful faces, but not happy and neutral faces. Furthermore, Berthoz et al. (2002) found attenuated activation in the ACC in response to sadness, anger, and fear, but not happiness, in individuals high in alexithymic traits. The slightly impaired ability of individuals with higher levels of alexithymic traits to detect fearful facial expressions at full intensity in this study may therefore be due to hypo-

activation in various brain regions involved in the identification of negative facial expressions.

The ability to accurately identify facial expressions in others is an essential first step towards modifying one's behaviour so that is socially appropriate (Prakchin et al., 2009). Given the expression of fear implies some degree of personal threat, an inability to correctly identify this emotion and adjust one's behaviour accordingly may result in a greater occurrence of negative social interaction, thereby contributing to dysfunction in interpersonal relationships (Marsh et al., 2007). Thus, it is possible that an impaired ability to recognise fear at full intensity could partially account for the commonly reported relationship between alexithymic traits and dysfunction in interpersonal relationships. The understanding that alexithymic traits is related to the identification of fear could assist in tailoring therapeutic approaches to remediate poor interpersonal skills in alexithymic individuals. Indeed, there is increasing evidence that teaching individuals with autism spectrum disorder and schizophrenia (both of which are highly comorbid with alexithymia) to identify emotional facial expressions can improve their interpersonal relationships (Combs et al., 2007; Silver, Goodman, Knoll, & Isakov, 2004).

With the exception of the small-to-moderate negative relationship between alexithymic traits and identifying fear at 100% intensity, the present study's findings in relation to the first hypothesis are largely in contrast to the prior literature. No associations were found between alexithymic traits and identifying happiness, which is inconsistent with previous research that identified a moderate negative relationship between these variables (Lane et al., 2000; Prakchin et al., 2009). Furthermore, no relationships were found between alexithymic traits and identifying sadness at full intensity (100%), and both fear and sadness at low-to-moderate intensity levels (20% and 60%), where emotion perception ability was predicted to be most impaired (Mann et al., 1994; Parker et al., 2005; Prakchin et al., 2009).

Thus, it is important to consider explanations for this disparity. One such explanation may be linked to the distribution of alexithymia scores in the present study. As the sample was best characterised by low-to-moderate levels of alexithymic traits, this may have reduced the likelihood of observing more pronounced deficits in emotion perception ability. Indeed, the majority of the prior literature used samples with an even distribution of alexithymia scores, such that they had many participants with high or even clinical levels of alexithymic traits (Cook et al., 2013; Jessimer & Markhamm, 1997; Lane et al., 2000; Parker et al., 1993; Prkachin et al., 2009). It is likely that more severe levels of alexithymic traits occur in clinical populations in comparison to the non-clinical sample used in the present study. Thus, future research should replicate this study, and extend the sample to clinical contexts. Furthermore, self-report measures such as the TAS-20 should be used in conjunction with observer-rated measures of alexithymic traits such as the Toronto Structured Interview for Alexithymia (Bagby, Taylor, Parker, & Dickens, 2006). This would allow for the identification of individuals at the more severe end of the alexithymia continuum who may lack the ability to accurately rate their deficits in emotional awareness on the TAS-20.

Another potential explanation of why stronger relationships between alexithymic traits and emotion perception ability were not observed is the absence of a time constraint in the emotion recognition task used. Whilst most prior studies, with all methodological heterogeneity considered, have demonstrated consistent deficits in detecting emotional facial expressions in people high in alexithymic traits (Cook et al., 2013; Jessimer & Markhamm, 1997; Kano et al., 2003; Lane et al., 2000; Parker et al., 1993), some research suggests this impairment may be exacerbated by speeded processing demands (Starita et al., 2018). For example, Parker et al. (2005) conducted two studies to assess the ability of individuals with low and high levels of alexithymic traits to identify the emotions of sadness, anger, and fear under fast (1 second) and slow conditions (3 seconds). Their results indicated that those high

in alexithymic traits were significantly impaired in the fast condition, and slightly impaired in the slow condition. Similarly, a study by Ihme et al. (2014) found that identifying facial expressions for fear, sadness, and happiness presented for 66 or 100ms was more negatively related to alexithymic traits than emotions presented for 3 seconds. These findings suggest that deficits in emotion perception ability in individuals high in alexithymic traits may be mediated by excessive emotion-processing demands. To further clarify the impact of processing demands on alexithymic individuals, future research should incorporate time constraints into their study design.

The results of the present study did not support the second hypothesis that, for the negative emotions of fear and sadness, but not for the positive emotion of happiness, depressive symptomology will moderate the relationship between alexithymic traits and emotion perception ability. However, there was some indication of a unique small-to-moderate positive relationship between levels of depressive symptomology and identifying fear at 20% emotional intensity. This indicates that higher levels of depressive symptomology may be associated with a greater ability to identify fear at low intensity levels. Whilst this finding is inconsistent with previous research demonstrating that depressive symptomology is associated with a general deficit in identifying emotional facial expressions (Persad & Polivy, 1993; Rubinow & Post, 1992), it provides tentative support for the research indicating that individuals high in depressive symptomology demonstrate a negative bias in emotional processing (Hale, 1998; Gollan et al., 2010; Lawson et al., 2002). That is, these individuals may be primed to recognise negative facial expressions more accurately because of the congruency of the emotional information with depression (Bower, 1981). Additionally, this result further aligns with a study conducted by Gollan et al. (2008) demonstrating that, due to the negative processing bias, individuals with higher levels of depressive symptomology tend to perceive fearful facial expressions as more intense, and are therefore able to correctly

detect this emotion at lower intensities. This specific finding also provides some support for the neurobiological research indicating that elevated levels of depressive symptomology is related to increased responsiveness to fearful facial expressions (Lawrence et al., 2004; Peluso et al., 2009).

Suslow et al. (2010) and Victor et al. (2010) found that depressed participants showed increased activation in the amygdala and insula in response to sad and fearful facial expressions and decreased activation in response to happy expressions when compared to controls. Furthermore, Lawrence et al. (2004) and Scheuerecker et al. (2010) found hyper-activation in the insula in response to sad and fearful expressions and hypo-activation to happy expressions. The slightly enhanced ability of individuals with depressive symptomology to detect fearful facial expressions at low intensity in this study may therefore be due to hyper-activation in brain regions involved in the identification of negative facial expressions.

The marginally enhanced ability of individuals higher in depressive symptomology to identify fear at lower intensities may indicate a propensity for these individuals to perceive this emotion as more intense and thus respond to it more readily. This may in turn increase the likelihood of the presence of antisocial behaviours and poorer interpersonal relationships. Indeed, cognitive theories of depression have highlighted this negative bias in emotional processing as central to the onset and maintenance of depression and poor social outcomes (Beck, 1967; Bower, 1981).

Whilst some limited evidence of a negative bias in emotional processing was identified, such that high levels of depressive symptomology were associated with an enhanced ability to detect fear at low intensity levels, the same pattern of results was not apparent for the identification of sadness at 20% intensity, or both fear and sadness at 60% and 100% intensity. Thus, these findings are inconsistent with the prior literature suggesting a

negative processing bias (i.e., negative emotions appear to be identified more accurately) in depressed individuals (Gollan et al., 2010; Suslow et al., 2001). Furthermore, there was a similar pattern of mislabeling errors for individuals with no depressive symptomology, and those with mild-to-severe depressive symptomology. This finding is also inconsistent with the prior literature on the negative processing bias, which indicates that individuals with higher levels of depressive symptomology have a tendency to misinterpret happy facial expressions as negative (Hale, 1998; Gur et al., 1992).

A likely explanation of the relatively small relationship between depressive symptomology and identifying fear at 20% intensity, and the lack of associations for the alternative emotions and intensity levels, is the limited variability of depression scores in the present study. As the sample was best characterised by negligible-to-mild levels of depressive symptomology, the results may not accurately reflect the true pattern or severity of emotion perception impairments seen in those with high levels of depressive symptomology. Indeed, the majority of the prior research used samples of clinically depressed individuals (Gollan et al., 2010; Suslow et al., 2001; Surglaze et al., 2004). Furthermore, the pattern of misclassification errors in the present study appear very similar to those found in a recent study of healthy and alcohol intoxicated individuals using the same emotion recognition task (Honan, Skromanis, Johnson, & Palmer, 2018). Whilst the second hypothesis was not supported, those higher in alexithymic traits had a slightly reduced ability to detect fear at 100% intensity, and those higher in depressive symptomology had a marginally enhanced ability to detect fear at 20% intensity. The opposing directions of these relationships suggest there may be potential for depressive symptomology to moderate the relationship between alexithymic traits and emotion perception ability, and thus diminish the effect of poor emotion perception ability for negative emotions typically seen in individuals with high in alexithymic traits. It is likely that more pronounced effects may be observed with a sample

higher in levels of both alexithymic traits and depressive symptomology. Thus, the present study should be replicated and extended to clinical contexts.

Limitations and Future Directions

There are a few noteworthy limitations of the present study. Firstly, although a power analysis was conducted and adhered to, the study still may have been limited by the small sample size. No consistent patterns in the data suggests the sample may not have been powerful enough to detect significant effects. This is evidenced by the non-significant models for the identification of fear at 20% and 100%, despite the presence of unique significant main effects. Furthermore, as previously stated, the sample was best characterised by low-to-moderate levels of alexithymic traits and negligible-to-low levels of depressive symptomology. Thus, the present results may apply only to a restricted sample of people, limiting the generalisability of the results. Future research may benefit from a larger sample with higher levels of alexithymic traits and depressive symptomology.

Another limitation of the present study was the presence of ceiling effects for the identification of happiness at 60% and 100% intensity levels. This ceiling effect has been consistently demonstrated in previous research (Montagne et al., 2007; Palermo & Coltheart, 2004), and may be a result of emotion recognition tasks including only one clear positively valenced emotion (i.e., happiness). Some researchers consider surprise to be a positive emotion (Babbage et al., 2011), however, others argue that is it neither positive or negative (Kreibig, 2010). Consistent with this, individuals consistently misclassified the surprise items as happy in this study. Indeed, research on emotion perception ability in alexithymic and depressed individuals typically uses tasks with an imbalance of positive and negative valence emotions. There is potential for a more balanced investigation of emotional valence to produce differential attenuation or enhancement effects depending on the type of valence being examined. Due to the inclusion of a broader and more balanced range of emotions (i.e.,

11 negative and 11 positive expressions), the recently developed Complex Audio-Visual Emotion Assessment Task (CAVEAT; Rosenberg, McDonald, Rosenberg, & Westbrook, 2016) has been argued to overcome the limitations related to ceiling effects, and may thus be used in future research.

Social interaction in everyday life is a highly nuanced process, requiring individuals to actively identify facial expressions presented at varying levels of emotional intensity (Montagne et al., 2007). Thus, the examination of various emotion intensities for each emotion type is a strength of the present study. Furthermore, the ERT used in the present study *dynamically* displayed all emotional facial expressions, which is also consistent with how emotions may be presented and identified in everyday social interactions. Despite this, it remains likely that context may impact emotion perception ability, and this was not investigated in the present study. For example, in a high-stakes context (e.g., job interview), there may be increased incentive for alexithymic and depressed individuals to pay closer attention to social cues so as to respond in an appropriate manner. In comparison, there may be little incentive to do so in a low-stakes context (e.g., time with family). Furthermore, everyday emotion perception is a multi-modal process that involves the identification of emotion through social cues other than facial expressions, such as language tone and body gestures (Schirmer & Adolphs, 2017). The integration of these cues provide individuals with additional information, which may in turn improve their ability to identify emotions (Barrett, Lindquist, & Gendron, 2007). As such, it would be beneficial for future research to assess emotion perception ability using more ecologically valid measures displaying real life interactions such as The Awareness of Social Inference Test Emotion Perception subtest (Honan, McDonald, Sufani, Hine, & Kumfor, 2016) or the CAVEAT (Rosenberg, McDonald, Rosenberg, & Westbrook, 2016).

Emotion perception is a lower-order social cognitive ability thought to contribute to higher-order cognitive abilities such as ToM. However, it is important to highlight other factors that may contribute to higher-order social cognitive functions and/or interact with emotion perception ability. In line with the literal meaning of alexithymia ('no words for emotion'), there is increasing evidence demonstrating that individuals high in alexithymic traits have more difficulty and use fewer words when describing their emotions in comparison to those with low levels (Lecours, Robert, & Desruisseaux, 2009; Roedema & Simons, 1999). Research conducted on the relationship between alexithymic traits and verbal ability has revealed inconsistent results, with some studies finding a negative association (Louth, Hare, & Linden, 1998; Wood, & Williams, 2007), whereas others found no association (Koelkebeck et al., 2010; Paradiso, Vaidya, McCormick, Jones, & Robinson, 2008). A study by Montebarocci, Surcinelli, Rossi, and Baldaro (2010) in the general population demonstrated that the relationship between alexithymic traits and the ability to accurately label emotional facial expressions was mediated by verbal ability. Thus, individuals high in alexithymic traits may have deficits in verbalising emotional information, which in turn suggests that verbal abilities may be a source of confounds for the effect of alexithymic traits on the ability to label emotional facial expressions. To clarify these findings, it would be beneficial for future research to overtly examine the influence of verbal abilities on emotion perception ability as a potential consideration for targeted treatment.

Conclusion

While a relationship between alexithymic traits and emotion perception difficulties has been consistently demonstrated, no prior research has examined whether depressive symptomology influences this relationship. The present study found that high levels of alexithymic traits may be associated with a reduced ability to identify fear at full intensity levels. Such an effect was not demonstrated on alternative intensity levels and alternative

emotions. Furthermore, depressive symptomology was not found to moderate the relationship between alexithymic traits and emotion perception ability. Whilst some limited evidence of a negative bias in emotional processing was identified, such that high levels of depressive symptomology were associated with an enhanced ability to detect fear at low intensity levels, most of the observed relationships were inconsistent with the prior literature. Thus, compelling support was not gained for research demonstrating emotion perception deficits in alexithymic individuals, or negative biases in emotional processing due to depressive symptomology. However, in view of the aforementioned limitations regarding the sample of participants in this study who were relatively low in alexithymic traits and depressive symptomology, any conclusions can be tentative at best. Thus, future research should address these limitations to gain a deeper understanding of how alexithymic traits and depressive symptomology may interact to influence emotion perception ability and interpersonal relationships.

References

Adolphs, R. (2003). Cognitive neuroscience of human social behaviour. *Nature Reviews Neuroscience, 4,* 165-178. doi: 10.1038/nrn1056

Adolphs, R. (2010). What does the amygdala contribute to social cognition? *Annals of The New York Academy of Sciences, 1191*, 42-61. doi: 10.1111/j.1749-6632.2010.05445.x

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA, US: Sage Publications, Inc.

Allen, L., Lu, Q., Tsao, J., Hayes, L., & Zeltzer, L. (2011). Depression partially mediates the relationship between alexithymia and somatization in a sample of healthy children. *The Journal of Pain, 12,* 16-21. doi: 10.1016/j.jpain.2011.02.063

Babbage, D. R., Yim, J., Zupan, B., Neumann, D., Tomita, M. R., & Willer, B. (2011). Meta-analysis of facial affect recognition difficulties after traumatic brain injury. *Neuropsychology, 25*, 277-285. doi: 10.1037/a0021908

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

Bagby, R., Taylor, G., Parker, J., & Dickens, S. (2006). The development of the Toronto structured interview for alexithymia: Item selection, factor Structure, reliability and concurrent validity. *Psychotherapy and Psychosomatics, 75,* 25-39. doi: 10.1159/000089224

Barrett, L. F., Lindquist, K. A., & Gendron, M. (2007). Language as context for the perception of emotion. *Trends in Cognitive Sciences, 11*, 327-332. doi:10.1016/j.tics.2007.06.003

Beck, A. T. (1967). *Depression: Clinical, experimental and theoretical aspects.* New York, NY: Harper & Row.

Berenbaum, H., & James, T. (1994). Correlates and retrospectively reported antecedents of alexithymia. *Psychosomatic Medicine, 56,* 353-359. doi: 10.1097/00006842-199407000-00011

Berking, M., Margraf, M., Ebert, D., Wupperman, P., Hofmann, S., & Junghanns, K. (2011). Deficits in emotion-regulation skills predict alcohol use during and after cognitive–behavioral therapy for alcohol dependence. *Journal of Consulting and Clinical Psychology, 79,* 307-318. doi: 10.1037/a0023421

Bermond, B., Vorst, H., & Moormann, P. (2006). Cognitive neuropsychology of alexithymia: Implications for personality typology. *Cognitive Neuropsychiatry, 11,* 332-360. doi: 10.1080/13546800500368607

Bernstein, W., & Davis, M. (1982). Perspective-taking, self-consciousness, and accuracy in person perception. *Basic and Applied Social Psychology, 3*, 1-19. doi: 10.1207/s15324834basp0301_1

Berthoz, S., Artiges, E., Van de Moortele, P., Poline, J., Rouquette, S., Consoli, S., & Martinot, J. (2002). Effect of impaired recognition and expression of emotions on frontocingulate cortices: An fMRI study of men with alexithymia. *American Journal of Psychiatry, 159,* 961-967. doi: 10.1176/appi.ajp.159.6.961

Billings, A., Cronkite, R., & Moos, R. (1983). Social-environmental factors in unipolar depression: Comparisons of depressed patients and non-depressed controls. *Journal of Abnormal Psychology, 92,* 119-133. doi: 10.1037/0021-843x.92.2.119

Blair, R., & Cipolotti, L. (2000). Impaired social response reversal: A case of `acquired sociopathy'. *Brain, 123,* 1122-1141. doi: 10.1093/brain/123.6.1122

Bower, G. H. (1981). Mood and memory. *American Psychologist, 36,* 129-148. doi: 10.1037/0003-066X.36.2.129

Carano, A., De Berardis, D., Gambi, F., Di Paolo, C., Campanella, D., & Pelusi, L., Sepede, G., … Ferro, F. M. (2006). Alexithymia and body image in adult outpatients with binge eating disorder. *International Journal of Eating Disorders, 39*, 332-340. doi: 10.1002/eat.20238

Carey, J. C., Fox, E. A., & Spraggins, E. F. (1988). Replication of structure findings regarding the interpersonal reactivity index. *Measurement and Evaluation in Counseling and Development, 21,* 102-105. Retrieved from: IRI%20psychometrics.pdf

Cavanagh, J., & Geisler, M. (2006). Mood effects on the ERP processing of emotional intensity in faces: A P3 investigation with depressed students. *International Journal of Psychophysiology, 60,* 27-33. doi: 10.1016/j.ijpsycho.2005.04.005

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.

Cohen, J. (1992). A power primer. *Psychological bulletin, 112,* 155-161. doi: 10.1037/0033-2909.112.1.155

Combs, D., Adams, S., Penn, D., Roberts, D., Tiegreen, J., & Stem, P. (2007). Social cognition and interaction training (SCIT) for inpatients with schizophrenia spectrum disorders: Preliminary findings. *Schizophrenia Research, 91*, 112-116. doi: 10.1016/j.schres.2006.12.010

Cook, R., Brewer, R., Shah, P., & Bird, G. (2013). Alexithymia, not autism, predicts poor recognition of emotional facial expressions. *Psychological Science, 24*, 723–732 10.1177/0956797612463582

Coyne, J. C. (1976). Depression and the response of others. *Journal of Abnormal Psychology, 85,* 186-193. doi: 10.1037/0021-843X.85.2.186

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10*, 85. Retrieved from: http://www.uv.es/~friasnav/Davis_1980.pdf

Delič, L., Novak, P., Kovačič, J., & Avsec, A. (2011). Self-reported emotional and social intelligence and empathy as distinctive predictors of narcissism. *Psychological Topics, 20,* 477-488. Retrieved from: http://hrcak.srce.hr/78734

Demers, L., & Koven, N. (2015). The relation of alexithymic traits to affective theory of mind. *The American Journal of Psychology, 128,* 31-37. doi: 10.5406/amerjpsyc.128.1.0031

Ekman, P., & Friesen, W. (1976). *Pictures of facial affect.* Palo Alto, Calif: Consulting Psychologists Press.

Erickson, K., & Schulkin, J. (2003). Facial expressions of emotion: A cognitive neuroscience perspective. *Brain and Cognition, 52,* 52-60. doi: 10.1016/s0278-2626(03)00008-3

Frith, C., & Frith, U. (2007). Social Cognition in Humans. *Current Biology, 17*, 724-732. doi: 10.1016/j.cub.2007.05.068

Gollan, J., McCloskey, M., Hoxha, D., & Coccaro, E. (2010). How do depressed and healthy adults interpret nuanced facial expressions? *Journal of Abnormal Psychology, 119,* 804-810. doi: 10.1037/a0020234

Gollan, J., Pane, H., McCloskey, M., & Coccaro, E. (2008). Identifying differences in biased affective information processing in major depression. *Psychiatry Research, 159,* 18-24. doi: 10.1016/j.psychres.2007.06.011

Gratz, K., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment, 26,* 41-54. doi: 10.1023/b:joba.0000007455.08539.94

Gray-Little, B., Williams, V. S., & Hancock, T. D. (1997). An item response theory analysis of the Rosenberg self-esteem scale. *Personality and Social Psychology Bulletin, 23,* 443-451. doi: 10.1177/0146167297235001

Grynberg, D., Chang, B., Corneille, O., Maurage, P., Vermeulen, N., Berthoz, S., & Luminet, O. (2012). Alexithymia and the processing of emotional facial expressions (EFEs): Systematic review, unanswered questions and further perspectives. *Plos ONE, 7,* 453-462. doi: 10.1371/journal.pone.0042429

Guastella, A., Gray, K., Rinehart, N., Alvares, G., Tonge, B., Hickie, I., Keating, C. M., … Einfeld, S. L. (2015). The effects of a course of intranasal oxytocin on social behaviors in youth diagnosed with autism spectrum disorders: A randomized controlled trial. *Journal of Child Psychology and Psychiatry, 56,* 444-452. doi: 10.1111/jcpp.12305

Gur, R., Erwin, R., Gur, R., Zwil, A., Heimberg, C., & Kraemer, H. (1992). Facial emotion discrimination: II. Behavioral findings in depression. *Psychiatry Research, 42*, 241-251. doi: 10.1016/0165-1781(92)90116-k

Guttman, H., & Laporte, L. (2002). Alexithymia, empathy, and psychological symptoms in a family context. *Comprehensive Psychiatry, 43*, 448-455. doi: 10.1053/comp.2002.35905

Hale, W. (1998). Judgment of facial expressions and depression persistence. *Psychiatry Research, 80,* 265-274. doi: 10.1016/s0165-1781(98)00070-5

Harrison, A., Sullivan, S., Tchanturia, K., & Treasure, J. (2009). Emotion recognition and regulation in anorexia nervosa. *Clinical Psychology & Psychotherapy, 16*, 348-356. doi: 10.1002/cpp.628

Haxby, J., Hoffman, E., & Gobbini, M. (2000). The distributed human neural system for face perception. *Trends in Cognitive Sciences, 4,* 223-233. doi: 10.1016/s1364-6613(00)01482-0

Haxby, J., Hoffman, E., & Gobbini, M. (2002). Human neural systems for face recognition and social communication. *Biological Psychiatry, 51*, 59-67. doi: 10.1016/s0006-3223(01)01330-0

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the depression anxiety stress scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British journal of clinical psychology, 44,* 227-239. doi: 10.1348/014466505X29657

Hintikka J., Honkalampi K., Koivumaa-Honkanen H., Antikainen R., Tanskanen A., Haatainen, K., & Viinamäki, H. (2004). Alexithymia and suicidal ideation: A 12-month follow-up study in a general population. *Comprehensive Psychiatry 45*, 340–345. doi: 10.1016/j.comppsych.2004.06.008

Honan, C. A., McDonald, S., Sufani, C., Hine, D. W., & Kumfor, F. (2016). The awareness of social inference test: Development of a shortened version for use in adults with acquired brain injury. *The Clinical Neuropsychologist, 30,* 243-264. doi: 10.1080/13854046.2015.1136691

Honan, C. A., Skromanis, S., Johnson, E. G., & Palmer, M. A. (2018). Alcohol intoxication impairs recognition of fear and sadness in others, and metacognitive awareness of emotion recognition ability. *Emotion, 18,* 842-854. doi: 10.1037/emo0000404.

Honkalampi, K., Hintikka, J., Koivumaa-Honkanen, H., Antikainen, R., Haatainen, K., & Viinamäki, H. (2007). Long-Term alexithymic features indicate poor recovery from depression and psychopathology. *Psychotherapy and Psychosomatics, 76*, 312-314. doi: 10.1159/000104709

Honkalampi, K., Hintikka, J., Tanskanen, A., Lehtonen, J., & Viinamäki, H. (2000). Depression is strongly associated with alexithymia in the general population. *Journal of Psychosomatic Research, 48,* 99–104. doi: 10.1016/S0022-3999(99)00083-5

Ihme, K., Sacher, J., Lichev, V., Rosenberg, N., Kugel, H., & Rufer, M., Hans-Jörgen, G., … Suslow, T. (2014). Alexithymia and the labeling of facial emotions: Response slowing and increased motor and somatosensory processing. *BMC Neuroscience, 15*, 40. doi: 10.1186/1471-2202-15-40

Izard, C. E. (1971). *The face of emotion*. East Norwalk, CT, US: Appleton-Century-Crofts.

Jessimer, M., & Markham, R. (1994). Alexithymia: A right hemisphere dysfunction specific to recognition of certain facial expressions? *Brain and Cognition, 34,* 246-258. doi: 10.1006/brcg.1997.0900

Joiner, T., & Katz, J. (1999). Contagion of depressive symptoms and mood: Meta-analytic review and explanations from cognitive, behavioral, and interpersonal viewpoints. *Clinical Psychology: Science and Practice, 6,* 149-164. doi: 10.1093/clipsy.6.2.149

Jones, D. N., & Paulhus, D. L. (2013). Introducing the short dark triad (SD3) a brief measure of dark personality traits. *Assessment, 21,* 28-41. doi: 10.1177/1073191113514105

Jongen, S., Axmacher, N., Kremers, N., Hoffmann, H., Limbrecht-Ecklundt, K., Traue, H., & Kessler, H. (2014). An investigation of facial emotion recognition impairments in alexithymia and its neural correlates. *Behavioural Brain Research, 271*, 129-139. doi: 10.1016/j.bbr.2014.05.069

Joukamaa, M., Kokkonen, P., Veijola, J., Läksy, K., Karvonen, J., Jokelainen, J., & Järvelin, M. (2003). Social situation of expectant mothers and alexithymia 31 years later in

their offspring: A prospective study. *Psychosomatic Medicine, 65,* 307-312. doi: 10.1097/01.psy.0000030389.53353.bc

Kano, M., Fukudo, S. (2013). The alexithymic brain: The neural pathways linking alexithymia to physical disorders. *Biopsychosocial Medicine, 7,* 345-369. doi: 10.1186/1751-0759-7-1

Kench, S., & Irwin, H. (2000). Alexithymia and childhood family environment. *Journal of Clinical Psychology, 56,* 737-745. doi: 10.1002/(sici)1097-4679(200006)56:6<737::aid-jclp4>3.0.co;2-u

Kessels, R., Montagne, B., Hendriks, A., Perrett, D., & de Haan, E. (2013). Assessment of perception of morphed facial expressions using the Emotion Recognition Task: Normative data from healthy participants aged 8-75. *Journal of Neuropsychology, 8,* 75-93. doi: 10.1111/jnp.12009

Ketelaars, M. P., In't Velt, A., Mol, A., Swaab, H., & van Rijn, S. (2016). Emotion recognition and alexithymia in high functioning females with autism spectrum disorder. *Research in Autism Spectrum Disorders, 21,* 51–60. doi: 10.1016/j.rasd.2015.09.006

Kim, J., Lee, S., Rim, H., Kim, H., Bae, G., & Chang, S. (2008). The relationship between alexithymia and general symptoms of patients with depressive disorders. *Psychiatry Investigation, 5,* 179-184. doi: 10.4306/pi.2008.5.3.179

Klerman, G. L., & Weissman, M. M. (1992). The course, morbidity, and costs of depression. *Archives of General Psychiatry, 49,* 831-834. doi: 10.1001/archpsyc.1992.01820100075013

Koelkebeck, K., Pedersen, A., Suslow, T., Kueppers, K., Arolt, V., & Ohrmann, P. (2010). Theory of mind in first-episode schizophrenia patients: Correlations with cognition and personality traits. *Schizophrenia Research, 119,* 115-123. doi: 10.1016/j.schres.2009.12.015

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. *Biological psychology, 84,* 394-421. doi: 10.1016/j.biopsycho.2010.03.010

Kugel, H., Eichmann, M., Dannlowski, U., Ohrmann, P., Bauer, J., & Arolt, V., Heindel, W., & Suslow, T. (2008). Alexithymic features and automatic amygdala reactivity to facial emotion. *Neuroscience Letters, 435,* 40-44. doi: 10.1016/j.neulet.2008.02.005

Lane, R. D., & Schwartz, G. E. (1987). Levels of emotional awareness: A cognitive-developmental theory and its application to psychopathology. *American Journal of Psychiatry, 144,* 133-143. doi: 10.1176/ajp.144.2.133

Lane, R., Ahern, G., Schwartz, G., & Kaszniak, A. (1997). Is alexithymia the emotional equivalent of blindsight? *Biological Psychiatry, 42,* 834-844. doi: 10.1016/s0006-3223(97)00050-4

Lane, R., Sechrest, L., Riedel, R., Shapiro, D., & Kaszniak, A. (2000). Pervasive emotion recognition deficit common to alexithymia and the repressive coping style. *Psychosomatic Medicine, 62,* 492-501. doi: 10.1097/00006842-200007000-00007

Langenecker, S., Bieliauskas, L., Rapport, L., Zubieta, J., Wilde, E., & Berent, S. (2005). Face emotion perception and executive functioning deficits in depression. *Journal of Clinical and Experimental Neuropsychology, 27,* 320-333. doi: 10.1080/13803390490490515720

Lawrence, N., Williams, A., Surguladze, S., Giampietro, V., Brammer, M., & Andrew, C., Frangou, S., … Phillips, M. L. (2004). Subcortical and ventral prefrontal cortical neural responses to facial expressions distinguish patients with bipolar disorder and major depression. *Biological Psychiatry, 55,* 578-587. doi: 10.1016/j.biopsych.2003.11.017

Lawson, C., MacLeod, C., & Hammond, G. (2002). Interpretation revealed in the blink of an eye: Depressive bias in the resolution of ambiguity. *Journal of Abnormal Psychology, 111,* 321-328. doi: 10.1037//0021-843x.111.2.321

Lecours, S., Robert, G., & Desruisseaux, F. (2009). Alexithymia and verbal elaboration of affect in adults suffering from a respiratory disorder. *European Review of Applied Psychology, 59,* 187–195. doi: 10.1016/j.erap.2009.03.001

Lee, T., Ng, E., Tang, S., & Chan, C. (2008). Effects of sad mood on facial emotion recognition in Chinese people. *Psychiatry Research, 159,* 37-43. doi: 10.1016/j.psychres.2007.04.022

Lemche, E., Klann-Delius, G., Koch, R., & Joraschky, P. (2004). Mentalizing language development in a longitudinal attachment sample: Implications for alexithymia. *Psychotherapy and Psychosomatics, 73,* 366-374. doi: 10.1159/000080390

Louth, S., Hare, R., & Linden, W. (1998). Psychopathy and alexithymia in female offenders. *Canadian Journal of Behavioural Science, 30,* 91-98. doi: 10.1037/h0085809

Lovibond, S. H. & Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales* (2nd ed.). Sydney: Psychology Foundation.

Lumley, M. A., Neely, L. C., & Burger, A. J. (2007). The assessment of alexithymia in medical settings: Implications for understanding and treating health

problems. *Journal of Personality Assessment, 89,* 230–246. doi: 10.1080/00223890701629698

Lyvers, M., Kohlsdorf, S. M., Edwards, M. S., & Thorberg, F. A. (2017). Alexithymia and mood: Recognition of emotion in self and others. *The American Journal of Psychology, 130,* 83-89. doi: 10.5406/amerjpsyc.130.1.0083

Mann, L., Wise, T., Trinidad, A., & Kohanski, R. (1994). Alexithymia, affect recognition, and the five-factor model of personality in normal subjects. *Psychological Reports, 74,* 563-567. doi: 10.2466/pr0.1994.74.2.563

Marsh, A., Kozak, M., & Ambady, N. (2007). Accurate identification of fear facial expressions predicts prosocial behavior. *Emotion, 7,* 239-251. doi: 10.1037/1528-3542.7.2.239

Mattila, M., Hurtig, T., Haapsamo, H., Jussila, K., Kuusikko-Gauffin, S., & Kielinen, M. et al. (2010). Comorbid psychiatric disorders associated with asperger syndrome/high-functioning autism: A community and clinic based Study. *Journal of Autism and Developmental Disorders, 40,* 1080-1093. doi: 10.1007/s10803-010-0958-2

Mayberg, H. S. (1997). Limbic-cortical dysregulation: A proposed model of depression. *The Journal of Neuropsychiatry and Clinical Neurosciences, 9,* 471-481. doi: 10.1176/jnp.9.3.471

Mayer, J., DiPaolo, M., & Salovey, P. (1990). Perceiving affective content in ambiguous visual stimuli: A component of emotional intelligence. *Journal of Personality Assessment, 54,* 772-781. doi: 10.1207/s15327752jpa5403&4_29

McDonald, P., & Prkachin, K. (1990). The expression and perception of facial emotion in alexithymia: A pilot study. *Psychosomatic Medicine, 52,* 199-210. doi: 10.1097/00006842-199003000-00007

McDonald, S. (2013). Impairments in social cognition following severe traumatic brain injury. *Journal of the International Neuropsychological Society, 19,* 231-246. doi: 10.1017/s1355617712001506

McIntyre, R., Cha, D., Soczynska, J., Woldeyohannes, H., Gallaugher, L., & Kudlow, P., Alsuwaidan, M., & Baskaran, A. (2013). Cognitive deficits and functional outcomes in major depressive disorder: Determinants, substrates, and treatment interventions. *Depression and Anxiety, 30,* 515-527. doi: 10.1002/da.22063

Montagne, B., Kessels, R. P., De Haan, E. H., & Perrett, D. I. (2007). The emotion recognition task: A paradigm to measure the perception of facial emotional expressions at different intensities. *Perceptual and motor skills, 104,* 589-598. doi: 10.2466/pms.104.2.589-598

Montebarocci, O., Codispoti, M., Baldaro, B., & Rossi, N. (2004). Adult attachment style and alexithymia. *Personality and Individual Differences, 36,* 499-507. doi: 10.1016/s0191-8869(03)00110-7

Montebarocci, O., Surcinelli, P., Rossi, N., & Baldaro, B. (2010). Alexithymia, verbal ability and emotion recognition. *Psychiatric Quarterly, 82,* 245-252. doi: 10.1007/s11126-010-9166-7

Nunn, J. D., Mathews, A., & Trower, P. (1997). Selective processing of concern-related information in depression. *British Journal of Clinical Psychology, 36*, 489-503. doi:10.1111/j.2044-8260.1997.tb01256.x

Palermo, R., & Coltheart, M. (2004). Photographs of facial expression: Accuracy, response times, and ratings of intensity. *Behavior Research Methods, 36*, 634-638. doi:10.3758/BF03206544

Paradiso, S., Vaidya, J., McCormick, L., Jones, A., & Robinson, R. (2008). Aging and alexithymia: Association with reduced right rostral cingulate volume. *The American Journal of Geriatric Psychiatry, 16,* 760-769. doi: 10.1097/jgp.0b013e31817e73b0

Parker, J., Taylor, G., & Bagby, M. (1993). Alexithymia and the recognition of facial expressions of emotion. *Psychotherapy and Psychosomatics, 59,* 197-202. doi: 10.1159/000288664

Parker, P., Prkachin, K., & Prkachin, G. (2005). Processing of facial expressions of negative emotion in alexithymia: The influence of temporal constraint. *Journal of Personality, 73,* 1087-1107. doi: 10.1111/j.1467-6494.2005.00339.x

Peluso, M., Glahn, D., Matsuo, K., Monkul, E., Najt, P., & Zamarripa, F., Lancaster, J. L., … Soares, J. C. (2009). Amygdala hyper-activation in untreated depressed individuals. *Psychiatry Research: Neuroimaging, 173,* 158-161. doi: 10.1016/j.pscychresns.2009.03.006

Persad, S. M., & Polivy, J. (1993). Differences between depressed and non-depressed individuals in the recognition of and response to facial emotional cues. *Journal of Abnormal Psychology, 102,* 358-368. doi: 10.1037/0021-843X.102.3.358

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

Reker, M., Ohrmann, P., Rauch, A., Kugel, H., Bauer, J., Dannlowski, U., Arolt, V., … Suslow, T. (2010). Individual differences in alexithymia and brain response to masked emotion faces. *Cortex, 46,* 658-667. doi: 10.1016/j.cortex.2009.05.008

Roedema, T., & Simons, R. (1999). Emotion-processing deficit in alexithymia. *Psychophysiology, 36*, 379-387. doi: 10.1017/s0048577299980290

Rosenberg, H., McDonald, S., Dethier, M., Kessels, R. P., & Westbrook, R. F. (2014). Facial emotion recognition deficits following moderate–severe traumatic brain injury (TBI): Re-examining the valence effect and the role of emotion intensity. *Journal of the International Neuropsychological Society, 20,* 994-1003. doi: 10.1017/S1355617714000940

Rosenberg, H., McDonald, S., Rosenberg, J., & Westbrook, R. F. (2016). Measuring emotion perception following traumatic brain injury: The complex audio visual emotion assessment task (CAVEAT). *Neuropsychological Rehabilitation,* 1-19. doi:10.1080/09602011.2016.1273118

Rosenberg, M. (1965). Rosenberg self-esteem scale (RSES). Acceptance and commitment therapy. *Measures package, 61*, 52. Retrieved from: http://www.integrativehealthpartners.org/downloads/ACTmeasures.pdf#page=61

Rubin, K. H., Coplan, R. J., & Bowker, J. C. (2009). Social withdrawal in childhood. *Annual Review of Clinical Psychology, 60, 141*-171. doi: 10.1146/annurev.psych.60.110707.

Rubinow, D., & Post, R. (1992). Impaired recognition of affect in facial expression in depressed patients. *Biological Psychiatry, 31,* 947-953. doi: 10.1016/0006-3223(92)90120-o

Salminen, J., Saarijärvi, S., Äärelä, E., Toikka, T., & Kauhanen, J. (1999). Prevalence of alexithymia and its association with sociodemographic variables in the general population of Finland. *Journal of Psychosomatic Research, 46,* 75-82. doi: 10.1016/s0022-3999(98)00053-1

Sasai, K., Tanaka, K., & Hishimoto, A. (2010). Alexithymia and its relationships with eating behavior, self-esteem, and body esteem in college women. *The Kobe journal of medical sciences, 56,* 231-238. doi: 10.2466/PR0.82.1.35-41

Saunders, S. (2001). Pretreatment correlates of the therapeutic bond. *Journal of Clinical Psychology, 57,* 1339-1352. doi: 10.1002/jclp.1101

Scheuerecker, J. (2010). Orbitofrontal volume reductions during emotion recognition in patients with major depression. *Journal of Psychiatry and Neuroscience, 35,* 311-320. doi: 10.1503/jpn.090076

Schirmer, A., & Adolphs, R. (2017). Emotion perception from face, voice, and touch: Comparisons and convergence. *Trends in Cognitive Sciences, 21*, 216-228. doi: 10.1016/j.tics.2017.01.001

Segrin, C., & Abramson, L. (1994). Negative reactions to depressive behaviors: A communication theories analysis. *Journal of Abnormal Psychology, 103,* 655-668. doi: 10.1037/0021-843x.103.4.655

Sifneos, P. E. (1973). The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychotherapy and Psychosomatics, 22,* 225-262. doi: 10.1159/000286529

Silver, H., Goodman, C., Knoll, G., & Isakov, V. (2004). Brief emotion training improves recognition of facial emotions in chronic schizophrenia: A pilot study. *Psychiatry Research, 128,* 147-154. doi: 10.1016/j.psychres.2004.06.002

Starita, F., Borhani, K., Bertini, C., & Scarpazza, C. (2018). Alexithymia is related to the need for more emotional intensity to identify static fearful facial expressions. *Frontiers in Psychology, 9,* 9-15. doi: 10.3389/fpsyg.2018.00929

Surguladze, S., Young, A., Senior, C., Brébion, G., Travis, M., & Phillips, M. (2004). Recognition accuracy and response bias to happy and sad facial expressions in patients with major depression. *Neuropsychology, 18,* 212-218. doi: 10.1037/0894-4105.18.2.212

Suslow, T., Junghanns, K., & Arolt, V. (2001). Detection of facial expressions of emotion in depression. *Perceptual and Motor Skills, 92*, 857-868. doi: 10.2466/PMS.92.3.857-868

Suslow, T., Konrad, C., Kugel, H., Rumstadt, D., Zwitserlood, P., & Schöning, S., Ohrmann, P., … Dannlowski, U. (2010). Automatic mood-congruent amygdala responses to masked facial expressions in major depression. *Biological Psychiatry, 67,* 155-160. doi: 10.1016/j.biopsych.2009.07.023

Swart, M., Kortekaas, R., & Aleman, A. (2009). Dealing with feelings: Characterization of trait alexithymia on emotion regulation strategies and cognitive-emotional processing. *Plos ONE, 4,* 5751-5764. doi: 10.1371/journal.pone.0005751

Tabibnia, G., & Zaidel, E. (2005). Alexithymia, interhemispheric transfer, and right hemispheric specialization: A critical review. *Psychotherapy and Psychosomatics, 74,* 81-92. doi: 10.1159/000083166

Taylor, G. J. (1994). The alexithymia construct: Conceptualization, validation, and relationship with basic dimensions of personality. *New Trends in Experimental and Clinical Psychiatry, 10*, 61-74. doi: 10.4236/psych.2011.25080

Taylor, G. J., Bagby, R. M. (2004). New trends in alexithymia research. *Psychotherapy and Psychosomatics, 73*, 68–77. doi: 10.1159/000075537

Taylor, G., Bagby, M., & Parker, J. (1992). The revised Toronto alexithymia scale: Some reliability, validity, and normative Data. *Psychotherapy and Psychosomatics, 57*, 34-41. doi: 10.1159/000288571

Taylor, G., Bagby, R., & Parker, J. (1997). *Disorders of affect regulation.* Cambridge: Cambridge University Press.

Teasdale, J. D., & Barnard, P. J. (1993). *Essays in cognitive psychology. Affect, cognition, and change: Re-modelling depressive thought.* Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Tranel, D., Bechara, A., & Denburg, N. (2002). Asymmetric functional roles of right and left ventromedial prefrontal cortices in social conduct, decision-making, and emotional processing. *Cortex, 38,* 589-612. doi: 10.1016/s0010-9452(08)70024-8

van 't Wout, M., Aleman, A., Bermond, B., & Kahn, R. (2007). No words for feelings: Alexithymia in schizophrenia patients and first-degree relatives. *Comprehensive Psychiatry, 48,* 27-33. doi: 10.1016/j.comppsych.2006.07.003

van der Velde, J., Servaas, M. N., Goerlich, K. S., Bruggeman, R., Horton, P., Costafreda, S. G., & Aleman, A. (2013). Neural correlates of alexithymia: A meta-analysis of emotion processing studies. *Neuroscience and Biobehavioral Reviews, 37,* 1774–1785. doi: 10.1016/j.neubiorev.2013.07.008

Victor, T., Furey, M., Fromm, S., Öhman, A., & Drevets, W. (2010). Relationship between amygdala responses to masked faces and mood state and treatment in major depressive disorder. *Archives of General Psychiatry, 67*, 1128-1135. doi: 10.1001/archgenpsychiatry.2010.144

Wood, R., & Williams, C. (2007). Neuropsychological correlates of organic alexithymia. *Journal of The International Neuropsychological Society, 13,* 471-479. doi: 10.1017/s1355617707070518

Young, A., Rowland, D., Calder, A., Etcoff, N., Seth, A., & Perrett, D. (1997). Facial expression megamix: Tests of dimensional and category accounts of emotion recognition. *Cognition, 63*, 271-313. doi: 10.1016/s0010-0277(97)00003-6

Appendices

Appendix A: Ethics approval letter

Sent: Wed 21/03/2018 1:01 PM
To: Cynthia Honan
Cc: Bonnie Dell; Liam Spicer; Nikki Turner
Subject: Ethics Amendment Approved: H0016480 An investigation of emotion recognition ability and metacognitive judgements of emotion recognition performance in trait narcissism

Dear Dr Honan

Ethics Ref: H0016480
Title: An investigation of emotion recognition ability and metacognitive judgements of emotion recognition performance in trait narcissism

This email is to confirm that the following amendment was approved by the Chair of the Tasmania Social Sciences Human Research Ethics Committee on 21/3/2018:

1. Personnel changes - remove Nikki Turner and add Liam Spicer and Bonnie Dell
2. Research Question - inclusion of an additional research question
3. Change in Methodology - relating to participant recruitment

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the National Statement on Ethical Conduct in Human Research (NHMRC 2007, updated May 2015).

This email constitutes official approval. If your circumstances require a formal letter of amendment approval, please let us know.

Should you have any queries please do not hesitate to contact me.

Kind regards

Natasha Jones
Admin Officer

Appendix B: Participant Recruitment Flyer

UNIVERSITY of TASMANIA

Research Volunteers Wanted: Personality, Emotion Perception, and Perceptions of Ability

Are you aged between 18-65 years?

We are looking for volunteers to participate in a study investigating certain personality traits on emotion perception ability and perceptions of ability.

As a participant, you will be asked to complete some brief baseline questionnaires, and undertake a computer-based emotion recognition task. The questionnaires and testing should take no longer than 45 minutes to complete.

To volunteer or for more information, please email: liam.spicer@utas.edu.au

Go into the draw to win one of three double movie vouchers

(KHA111/112 Students may receive 45 mins course credit)

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee (#H0016480)

Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**	**Personality, Emotion Perception and Perceptions of Ability Study liam.spicer@utas.edu.au**

Appendix C: Information Sheet

Personality, Emotion Perception, and Perceptions of Ability

Information Sheet for Participants

Invitation

You are invited to participate in a research project examining the relationship between specific personality traits and emotion perception ability. This research is being conducted in partial fulfillment of an Honours degree in psychology for Liam Spicer and Bonnie Dell under the supervision of Dr. Cynthia Honan, a Lecturer and Clinical Neuropsychologist in the Discipline of Psychology, School of Medicine, University of Tasmania.

What is the purpose of this study?

The purpose of this study is to examine the relationship between personality and how emotions in other people are perceived. It is possible that the way we appraise the emotions of others is dependent on a person's specific personality traits.

Why have I been invited to participate?

You have been invited to participate because you meet the following criteria:

- ✓ Are aged between 18 and 65 years of age.
- ✓ Have normal or corrected-to-normal vision.
- ✓ Are fluent in English.
- ✓ Are not pregnant.
- ✓ You have no history of traumatic brain injury or other neurological condition.
- ✓ You are able to spend approximately 20 minutes to complete questionnaires and a further 20 minutes to complete an emotion perception task.

What will I be asked to do?

You will be asked to complete some standard questionnaires which will ask you for basic demographic information, and information relating to current mood, personality traits and social functioning. You will also be asked to complete an emotion recognition task on the computer. You may complete the questionnaires up to 7 days prior to completing the emotion perception task. A mutually suitable appointment time will be arranged with you to complete the emotion perception task. It is expected that the questions and task together will take approximately 45 minutes to complete.

Are there any possible benefits from participation in this study?

Your participation will help us to understand the way in which personality traits may be related to the perception of emotions in others. This will allow us to identify whether specific personality groups exhibit specific social difficulties and will inform future research into the possible mechanisms that may underlie social difficulties.

University of Tasmania students who are undertaking the KHA111/KHA112 course will receive 45 minutes of course credit for their time. Participants who are not undertaking the KHA111/KHA112 course will go into the draw to win one of three double movie passes.

Are there any possible risks from participation in this study?

We do not expect there will be any risks associated with participation in this study. The data collected will be in no way identifiable to you.

What if I change my mind during or after the study?

Participation in this research project is voluntary and you are free to withdraw at any time. Participants who withdraw during the research process are free to do so with no explanation. Your withdrawal will not in any way affect your relationship with the researchers involved in this study or the School of Medicine. Should you withdraw from participating at any time, your data will be destroyed and will not be included in the final study results.

What will happen to the information when this study is over?

The data from this study will be stored securely within the Discipline of Psychology, School of Medicine. Your data will also be stored anonymously using a unique ID code. Identifiable information such as your name and contact details will only be used for the purpose of arranging a testing session. Once your testing session has been arranged any identifying information will be destroyed. You will be provided with a unique ID code, which you will use to complete the questionnaires and testing session.

Data you provide in this research will be stored for a period of five years following the completion of the study. After this period, all data will be destroyed.

How will the results of the study be published?

The results will be published in Honours theses by Liam Spicer and Bonnie Dell. This will be available at the University of Tasmania library after the 3rd November, 2018. A summary of the research results will also be available on the discipline of Psychology, University of Tasmania webpage (http://www.utas.edu.au/courses/study/psychology).

No participants will be identifiable in the publication of the results. Research results may be published in a peer-reviewed academic journal. Research results can also be obtained by contacting the researchers directly.

What if I have questions about this study?

If you have any questions regarding this research, please contact Liam Spicer or Bonnie Dell (liam.spicer@utas.edu.au). Alternatively, you can contact Dr Cynthia Honan on 03 6324 3266 or email cynthia.honan@utas.edu.au.

This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on +61 3 6226 6254 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [H0016480]."

This information sheet is for you to keep. If you would like to participate in the research, please ask the researcher for a participant consent form to complete.

Thank you for taking the time to read this information sheet.

Appendix D: Consent Form

Personality, Emotion Perception and Perceptions of Ability

Consent form for participants

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that the study involves completing questionnaires to determine demographic information, current mood, empathy levels, personality traits, and social cognitive functioning. Participants will then be asked to complete an emotion recognition task on the computer.
5. I understand that participation involves no foreseeable risks to participants.
6. I understand that all research data will be securely stored on the Psychology Department, School of Medicine premises for five years from the publication of the study results, and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher(s) will maintain confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I understand that the results of the study will be published so that I cannot be identified as a participant.
10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.

    If I so wish, I may request that any data I have supplied be withdrawn from the research during testing. I understand that I will not be able to withdraw my data after completing the testing session, as data will be anonymous.

Participant's name: _____

Participant's signature: _____

Date: _____

Statement by Investigator

☐ I have explained the project and the implications of participation in this study to this volunteer, and I believe that the consent is informed and that he/she understands the implications of participation.

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the information sheet where my details have been provided so participants have had the opportunity to contact me prior to consenting to participate in this project.

Investigator's name: _____

Investigator's signature: _____

Date: _____