Links between Individual Difference Factors, Emotional Contagion, and other Empathy-Related Constructs

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Abstract

Empathy is an important socio-emotional process for interpersonal interactions, moral decision-making, and a functioning society as a whole. Emotional contagion is an unconscious process that forms the basis for empathy. While differences in levels of empathy have been reported in various clinical populations, these differences also exist in the general, non-clinical population. Two commonly-occurring personality traits, alexithymia and sensory processing sensitivity (SPS), have been linked to individual differences in empathy and its related constructs. The current study investigated the links between alexithymia and SPS, early adverse life experiences, mood, self-reported levels of empathy and related constructs, and emotional contagion induced in a behavioural task. 305 adult participants watched brief affective film clips chosen to induce positive, negative, mixed, and neutral emotional states, and rated how strongly each film made them feel various emotions. Participants also completed self-report measures of alexithymia, SPS, empathy and related constructs, childhood emotional abuse, and current mood. Alexithymia positively predicted the number of emotions experienced by participants during the behavioural task, as well as negatively predicted other-focused aspects of self-reported empathy, including perspective-taking and empathic concern. SPS positively predicted the strength of the emotions experienced by participants, the extent to which they felt their own emotions matched those of the main characters in the films, and both other-focused empathy and self-focused processes, such as experiencing feelings of personal distress or strong emotions in response to the films. The findings suggest that alexithymia reduces the other-focused component of empathy, potentially by providing mixed affective signals that are difficult for individuals to characterize. SPS, on the other hand, appears to increase both other- and self-focused empathy, potentially by increasing the strength and granularity of the individual's emotional response.

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List of Abbreviations

Abbreviation	Explanation
AES	Aesthetic sensitivity subscale of the HSPS
ANOVA	Analysis of variance
BAS	Behavioural activation system
BC	Behavioural contagion subscale of the IRI/EI
BIS	Behavioural inhibition system
BLRT	Bootstrap Likelihood Ratio Tests
CTQ	Childhood Trauma Questionnaire short form – Emotional Abuse subscale
DDF	Difficulties describing feelings subscale of the TAS-20
DIF	Difficulties identifying feelings subscale of the TAS-20
EC	Empathic concern subscale of the IRI/EI
EFA	Exploratory factor analysis
EMP	Empathy subscale of the IRI/EI
EOE	Ease of excitation subscale of the HSPS
EOT	Externally oriented thinking subscale of the TAS-20
FDR	False discovery rate
FS	Fantasy subscale of the IRI/EI
HSPS	Highly Sensitive Person Scale
IRI/EI	Interpersonal Reactivity Index/Empathy Index
LST	Low sensory threshold subscale of the HSPS
MCAR	Little's Missing Completely at Random test
MMR	Multiple multivariate regression model
OS-ATQ	Adult Temperament Questionnaire – Orienting Sensitivity subscale
PD	Personal distress subscale of the IRI/EI
PHQ-9	9-item Patient Health Questionnaire
PT	Perspective-taking subscale of the IRI/EI
SPS	Sensory processing sensitivity
TAS-20	20-item Toronto Alexithymia Scale

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Chapter 1: Introduction

Numerous researchers have attempted to define the concept of empathy, identify constructs related to empathy, and investigate the potential implications of exhibiting high or low levels of empathy on an individual's behaviour. Two personality traits, alexithymia and sensory processing sensitivity (SPS), are commonly found in the population and have been associated with atypicalities in emotional awareness and empathy. The following chapter will introduce the construct of empathy and other concepts related to empathy. The impact of variations in levels of empathy will also be discussed, as well as potential gaps in the measurement of this construct. Finally, the personality traits of alexithymia, SPS, and the relationships between these variables and empathy and related constructs will be outlined.

Defining Empathy and Related Constructs

The term empathy has proven to be difficult to define; in fact, a review by Cuff et al. (2016) found 43 distinct definitions of empathy from various authors. From these definitions, Cuff and colleagues defined empathy as the process of identifying and sharing another person's emotional state. The important component of this definition is that, while one is identifying and experiencing the same emotion as someone else, the emotion is explicitly recognized as belonging to the other person (Bird & Viding, 2014; Cuff et al., 2016; Preckel et al., 2018). Empathy, therefore, requires two components: the first is the cognitive process of correctly identifying the emotion being experienced by the other person (*other-focused empathy*); the second is the affective sharing of the other person's emotion (*self-focused empathy*; Coll et al., 2017). Although there is evidence that these two components activate different brain regions, they are not separate from one another, and instead collaborate and affect each other to produce the overarching construct of empathy (Cuff et al., 2016).

Emotional contagion forms the basis for the conscious emotional experience involved in empathy. Emotional contagion is an automatic, affective process, and involves the replication of the emotions, expressions, and movements of another person (Zurek & Scheithauer, 2017). Whereas in emotional contagion the emotions are embraced and experienced fully by the individual without differentiating between the empathizer and the other person, empathy requires an individual to understand that the emotion they are feeling belongs to the other person (Coll et al., 2017). This self-other switch allows for a shift from emotional contagion to empathy (Bird & Viding, 2014). Emotional contagion is the most basic form of empathy and appears to be either innate or to develop at a very young age, as it has been found that newborns will begin to cry upon hearing the cries of other infants (Bird & Viding, 2014; Prochazkova & Kret, 2017).

Prochazkova and Kret (2017) presented a model representing the development of emotional contagion into empathy. According to this model, emotional contagion stems from the automatic mimicry of movements and autonomic processes. Motor mimicry is controlled by skeletal muscles and involves mimicking facial expressions or eye contact. Autonomic mimicry involves physiological linkage (e.g., between mother and infants), pupil mimicry, and blushing. When we process another's emotional expressions, automatic mimicry creates a corresponding, multi-level emotional response, termed emotional contagion (Prochazkova & Kret, 2017).

The term empathy is often used interchangeably with other terminologies such as theory of mind (ToM), compassion, sympathy, and perspective-taking; however, these concepts differ in both the information gained by the particular process and the activated neural regions (Bird & Viding, 2014). Briefly, ToM, also called mentalizing, is the process of identifying the other person's mental state (Bird & Viding, 2014; Preckel et al., 2018; Zurek & Scheithauer, 2017). ToM may play an important role in the process of empathy by providing situational cues, for

example, a person's thoughts and beliefs, in order to determine how that person may be feeling (Bird & Viding, 2014). ToM is similar to the cognitive concept of other-focused empathy; however, these two constructs are not the same, in that ToM involves identifying another person's cognitions, broadly defined, while other-focused empathy specifically involves identifying the emotions of another person. Compassion is an affective process of feeling warmth and concern towards others who are suffering (Cuff et al., 2016; Preckel et al., 2018; Zurek & Scheithauer, 2017). There is a distinction between compassion and empathy in that compassion is narrowly defined by the feeling of one emotion (i.e., concern) for others who are specifically experiencing suffering, while empathy is identifying and feeling the same emotion as the other person in any emotional state (Jordan et al., 2016). Sympathy is similar to both compassion and empathy, where one feels sorrow or concern for another person, again in any type of emotional state (Cuff et al., 2016). As described by Cuff and colleagues (2016), sympathy is "feeling for" another, while empathy is "feeling as" the other (i.e., feeling the same emotion).

Measuring Empathy and Related Constructs

The numerous definitions of the term empathy have led to an inconsistency in how empathy is measured. The large variations in the measurement of empathy limit the validity of the measures and create difficulties with attempts at making comparisons across research (Gerdes et al., 2010).

Self-report measures of empathy are most commonly used due to their simplicity and feasibility (Gerdes et al., 2010; Ilgunaite et al., 2017). By their very nature, self-report measures rely on self-assessment; however, some individuals may not be able to accurately evaluate their own empathic abilities (Murphy & Lilienfeld, 2019). For example, individuals possessing high levels of narcissism have been found to be inaccurately over-confident regarding their other-

focused empathic abilities (Ames & Kammrath, 2004). Therefore, there are limits to the reliability and accuracy of self-report measures of empathy. Moreover, Murphy and Lilienfeld (2019) completed a meta-analysis of the measures used in studies of other-focused empathy and found that scores on self-report measures of other-focused empathy did not relate to performance on behavioural measures of other-focused empathy. This suggests that the relationship of self-report measures to real-world actions must be considered.

This approach was used in a recent study by Jordan et al. (2016). These authors administered the Interpersonal Reactivity Index (IRI), which is a commonly administered self-report measure of the multidimensional aspects of empathy. This measure includes subscales tapping into the extent to which one feels empathic concern and personal distress, and is able to adopt the perspectives of other people and fictional characters (Davis, 1983). Jordan et al. (2016) introduced the Empathy Index (EI) as an addition to the IRI, finding that the use of these two measures together provided a better overview of empathy as a whole construct, as the EI includes subscales measuring self-focused empathy and behavioural contagion to the IRI. They reported that the six subscales of the combined IRI and EI load onto two factors: Factor 1, including the self-focused empathy (EMP), behavioural contagion (BC), and personal distress (PD) subscales, captured aspects of one's awareness of how others affect *oneself* (self-focused "contagion"); whereas Factor 2, including the perspective-taking (PT) and empathic concern (EC) subscales, reflected the ability to understand others' perspectives and feel concern for *them* (i.e., to be "other-focused"). A subscale measuring the ability of an individual to imagine the feelings of fictitious characters (FS) loaded similarly on both factors. Importantly, Jordan et al. (2016) found that the other-focused factor was a stronger predictor of prosocial action in the form of altruistic decision-making. Moreover, their findings suggested that the self-focused component of empathy

may actually be detrimental to prosocial behaviour, as individuals personally feel distressed and therefore are less likely to act in an altruistic manner.

The findings from Jordan et al. (2016) highlight the importance of obtaining measures of both how the participant thinks someone else feels (other-focused empathy) and how the participant feels personally (self-focused empathy). Many behavioural measures of empathy fail to meet these requirements, measuring one stage without the other, or measuring a construct related to empathy (e.g., sympathy or ToM; Coll et al., 2017). For example, behavioural tasks measuring empathy often involve showing pictures of people or facial expressions and asking participants to identify the emotion being felt in the picture (Ilgunaite et al., 2017). These tasks are therefore able to measure the emotion labelling (i.e., other-focused) component of empathy, but not affect sharing (i.e., self-focused empathy). A potential solution allowing for the measurement of both other- and self-focused empathy involves performing a behavioural task to elicit an emotional experience for the individual and then asking the participant to identify the emotion(s) they feel, and the extent to which these match the emotion(s) being felt by the empathy target. By combining information gleaned from such a task with self-report measures, one can obtain a more comprehensive assessment of empathy and related constructs (Gerdes et al., 2010; Ilgunaite et al., 2017; Murphy & Lilienfeld, 2019).

Personality and Experiential Factors that Contribute to Individual Differences in Empathy and Related Constructs

Whereas empathy is important for social interactions and moral decision-making, experiencing high levels of empathy can also be detrimental, for example, during periods of conflict (Zurek & Scheithauer, 2017). If a receiver feels an emotion more strongly than the target, this can lead to feelings of personal distress (Coll et al., 2017). Depression severity has

been positively associated with increased feelings of personal distress but has not been associated with more other-focused empathy processes, such as perspective-taking (Banzhaf et al., 2018; Thoma et al., 2011). Therefore, the ability to identify and feel the same emotion as another is not impaired in individuals with depression; however, these individuals are more likely to end up feeling the emotion more strongly and potentially experiencing distress due to the emotion.

Deficits in empathy have been identified in certain populations, such as individuals with autism spectrum disorder, psychopathy, or antisocial, borderline, or narcissistic personality disorders (Baron-Cohen & Wheelwright, 2004; Blair, 2005; Decety & Moriguchi, 2007). Deficits in empathy can occur due to problems with either feeling with the other person (i.e., generating an affective response) or recognizing and categorizing another's response (Coll et al., 2017). An individual's ability to complete these processes not only depends on that individual's emotional reactivity and awareness, but also on the environmental context and cues provided to the individual (Coll et al., 2017).

Individuals with autism spectrum disorder have more difficulty correctly labelling another's emotions than consciously experiencing those emotions (Baron-Cohen & Wheelwright, 2004; Decety & Moriguchi, 2007); those with antisocial personality disorder show the reverse pattern (Blair, 2005; Decety & Moriguchi, 2007); and individuals with borderline and narcissistic personality disorders have problems in both areas (Decety & Moriguchi, 2007). Identifying the cause of empathy deficits in different clinical populations is important as it could influence treatment (Coll et al., 2017).

While both high and low levels of empathy are found across different clinical populations, there also exist individual empathic differences in the general population that can

lead to social difficulties or distress. These individual differences are thought to have an innate genetic component (e.g., personality traits), arise from environmental factors (e.g., early adversity), or both. Identifying individual difference factors could allow for preventative intervention for individuals possessing these factors, as well as assist with the creation of theories regarding emotional processing and empathy. The following sections address two commonly-found personality traits associated with atypicalities in emotional processing – alexithymia and SPS – and how these traits are affected by adverse childhood environments and relate to empathy.

Alexithymia

Alexithymia is a personality trait identified in approximately 10% of the population. It is defined by difficulties with identifying and expressing one's feelings, as well as possessing a cognitive style that is externally oriented and concrete (Sifneos, 1973). As described by Hogeveen and Grafman (2021), the perception of emotions requires receiving an unconscious arousal signal and then consciously processing and understanding the signal. These authors describe the emotion-processing difficulties experienced in alexithymia as reflecting a disconnect between the reception of the arousal signal and the understanding of this signal. Alexithymia has also been related to a deficit in interoceptive processing, in other words, difficulties separating interoceptive states from emotions (Brewer et al., 2016). Therefore, some individuals with alexithymia may confuse changes in their internal bodily state, such as increased temperature or nausea, for emotion (Jakobson & Rigby, 2021). Additionally, alexithymic individuals have difficulties identifying emotionally-arousing scenes and emotional facial expressions (Grynberg et al., 2012; Rigby et al., 2020).

There is a higher prevalence of alexithymia in major depressive disorder, various personality disorders, alcohol use disorders, eating disorders, traumatic brain injury, and autism spectrum disorder (to name a few) (Aaron et al., 2015; Honkalampi et al., 2010; Lyvers et al., 2017; Poquérusse et al., 2018). Some research suggests that co-occurring alexithymia better explains difficulties with emotional awareness than clinical diagnoses such as depression or autism spectrum disorder (Valdespino et al., 2017). Thus, alexithymia is considered an important transdiagnostic risk factor for a range of conditions.

Researchers have found a significant effect of childhood trauma on the development of alexithymia in adults; thus, there is an increased prevalence of alexithymia in individuals who have experienced trauma or adverse environments growing up (Karaca Dinç et al., 2021; Kopera et al., 2020; Özsoy & Taşcı, 2020; Xie et al., 2021). Guttman and Laporte (2002) found that the prevalence of abuse in their group of participants with clinical levels of alexithymia ranged from 62 to 68% depending on the type of abuse (i.e., verbal, physical or sexual); in contrast, the prevalence of abuse ranged from 24 to 27% in their control/non-alexithymic group. Although this difference did not reach a level of statistical significance, it is clinically significant (Guttman & Laporte, 2002). Trauma may impair the development of a child's cognitive and affective processing, thereby interfering with their ability to synthesize thoughts and feelings (Kopera et al., 2020). Alexithymia has recently been found to mediate the relationship between childhood trauma and psychopathology, including depression, anxiety, and negative self-esteem (Karaca Dinç et al., 2021). Therefore, trauma impairs an individual's ability to process arousal signals and to identify or differentiate between conscious emotions, leading to difficulties with regulating emotions and pathological negative affectivity (Hogeveen & Grafman, 2021; Karaca Dinç et al., 2021).

Alexithymia and Empathy Deficits. The emotional deficit characteristics of alexithymia have led researchers to investigate specific relationships between alexithymia and levels of empathy. In general, studies have found a negative relationship between levels of alexithymia and levels of empathy (e.g., Aslan et al., 2020; Bird et al., 2010; Demers & Koven, 2015; Grynberg et al., 2010; Lyvers et al., 2018, 2020; Yang et al., 2020). Alexithymia has also been associated with decreased activity in neural regions associated with empathy, self-other perception, emotional resonance, and emotional expression (Bird et al., 2010; Goerlich-Dobre et al., 2015; Lassalle et al., 2019; Moriguchi et al., 2007).

Many studies have found that alexithymia negatively predicts other-focused empathy (Aaron et al., 2015; Banzhaf et al., 2018; Brett & Maybery, 2022; Brewer et al., 2019; Di Tella et al., 2020; Goerlich-Dobre et al., 2015; Guttman & Laporte, 2002; Lyvers et al., 2017; MacDonald & Price, 2017; Moriguchi et al., 2007; Patil & Silani, 2014a; Shah et al., 2019; Sonnby-Borgström, 2009). Therefore, increased alexithymia appears to lead to a decreased ability to identify the emotional state of another person. This relationship has been shown through multiple self-report and behavioural tasks (e.g., Mul et al., 2018); however, Beadle et al. (2013) did not find this negative association between alexithymia and other-focused empathy, and Härtwig et al. (2020) identified this effect on a self-report measure of empathy, but not during a behavioural task measuring other-focused empathy.

The relationship between alexithymia and self-focused empathy is still under debate. Some studies have identified a negative relationship between these variables, with increased levels of alexithymia relating to decreased self-focused empathy (Goerlich-Dobre et al., 2015; Härtwig et al., 2020; Moriguchi et al., 2007; Mul et al., 2018; Shah et al., 2019). Again, this relationship has been established through both self-report and behavioural measures. However,

other studies have not identified this relationship (Banzhaf et al., 2018; Bogdanov et al., 2013; Brett & Maybery, 2022; MacDonald & Price, 2017).

The one aspect of self-focused empathy that has been consistently related to alexithymia in the positive direction is the personal feeling of distress from empathizing with another person, with increased levels of alexithymia leading to increased personal distress during empathic situations (Banzhaf et al., 2018; Beadle et al., 2013; Brewer et al., 2019; Di Tella et al., 2020; Guttman & Laporte, 2002; Moriguchi et al., 2007; Patil & Silani, 2014; however, note that Brett & Maybery, 2022 did not find this significant relationship). This may be due to poor emotional regulation, an inability to regulate the emotional contagion experienced during empathy, or a lack of self-other separation required to reduce personal distress during empathy (Beadle et al., 2013; Brewer et al., 2019).

In summary, the current literature indicates that individuals with the trait alexithymia also experience atypicalities in empathy (e.g., Aaron et al., 2015). More specifically, alexithymia has often been negatively related to other-focused empathy and positively related to an aspect of self-focused empathy, namely experiencing personal distress during empathic tasks (e.g., Banzhaf et al., 2018).

Sensory Processing Sensitivity (SPS)

SPS is a personality trait defined by in-depth processing of stimuli, as well as by a nervous system that is easily overwhelmed by environmental stimuli and is more sensitive to subtleties, pain, others' moods, and the arts (Aron & Aron, 1997; Aron et al., 2012). Although SPS shares features with the traits of introversion and neuroticism, it is at least partially independent from these traits (Aron & Aron, 1997). SPS is a hereditary trait, with 47% of the

variation in sensitivity levels due to genetic influences (Assary et al., 2020). The remaining 53% of the variance is due to environmental factors.

Some studies have identified the prevalence of this trait at around 15-20% of the population (Aron & Aron, 1997), while other researchers have determined the prevalence to be as great as 30%. One specific study found that the general population can be divided into three groups based on levels of SPS: low sensitivity, which Lionetti et al. (2018) dubbed as "dandelions" and making up approximately 30% of the population; medium sensitivity, dubbed "tulips" and making up approximately 40% of the population; and high sensitivity, named "orchids" and encompassing approximately 30% of the population. Dandelions possess low SPS, high levels of extraversion, low levels of neuroticism, and low levels of positive emotional reactivity. Orchids, on the other hand, score high in SPS, possess low levels of extraversion, high levels of neuroticism, and high levels of positive emotional reactivity (Lionetti et al., 2018).

SPS has been associated with higher levels of anxiety and depression, specifically the ease of excitation and low sensory threshold characteristics of this trait (Jakobson & Rigby, 2021; Liss et al., 2008). A study by Aron et al. (2005) found that experiencing an adverse environment throughout childhood impacts individuals with SPS to a greater extent than individuals without SPS, and that this adverse childhood plus the presence of the SPS trait more often leads to increased negative affectivity (including fearfulness, anxiety, and depression) in adulthood. Experiencing an adverse childhood environment, therefore, impacts the mental development of individuals with SPS, due to the deep emotional processing experienced by these individuals (Acevedo, 2020; Aron et al., 2005, 2012). A recently published study provides additional evidence of this theory, again finding positive correlations between SPS and childhood trauma, as well as SPS and increased negative affectivity such as depression, anxiety

and poor self-esteem (Karaca Dinç et al., 2021). Additionally, this study found that SPS mediated the positive relationship between childhood trauma and increased negative affectivity, in that childhood trauma positively predicted SPS, which positively predicted negative affectivity (Karaca Dinç et al., 2021).

Sensory Processing Sensitivity and Empathy Levels. Research investigating relationships between specific self-report or behavioural tests of empathy and levels of SPS has not yet been conducted; however, neuroimaging research into the associations between SPS and neural activity has shown increased activity in regions associated with empathy (e.g., inferior frontal gyrus and insula), self-other awareness (e.g., again, the inferior frontal gyrus and insula), and self-referential processing (e.g., temporoparietal junction) during the viewing of emotional pictures (Acevedo et al., 2018). SPS may, therefore, be positively associated with empathy, potentially as the trait is characterized by increased sensitivity to others' emotional states, introspection, and emotional awareness.

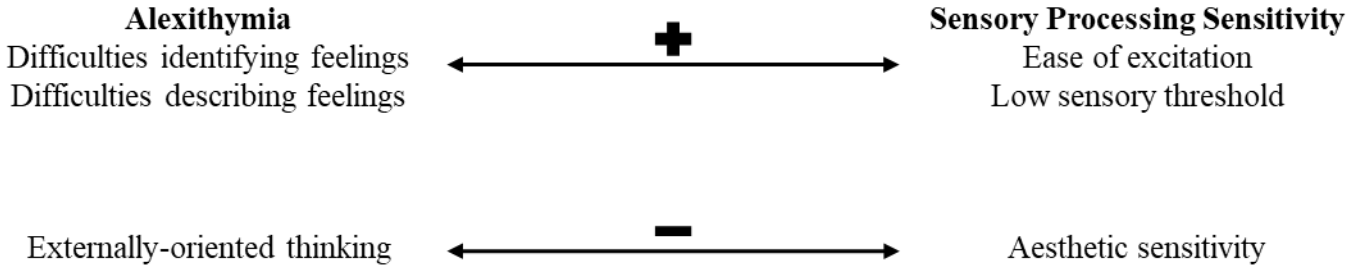
Relationship between Alexithymia and Sensory Processing Sensitivity

Although alexithymia and SPS appear to possess contradicting symptomologies, these two personality traits have been found to co-occur in a subset of the population (see Figure 1; Jakobson & Rigby, 2021; Karaca Dinç et al., 2021; Liss et al., 2008). Liss et al. (2008) reported that the alexithymic properties of difficulties identifying and describing feelings were positively related to the SPS properties of ease of excitation and low sensory threshold, thereby indicating that participants who were more easily aroused had greater difficulties identifying and describing their own emotions. Additionally, the aesthetic sensitivity factor of SPS was negatively related to the externally oriented thinking property of alexithymia. This indicates that individuals who are

more moved by aesthetic properties of the environment are more likely to look inward and evaluate themselves and are less concrete thinkers.

Figure 1

Relationships between Features of Alexithymia and SPS



A recent study replicated the relationships found by Liss et al. (2008) between traits associated with alexithymia and SPS (Jakobson & Rigby, 2021). These authors also identified five classes of individuals possessing differing levels of SPS and alexithymia — each characterized by a unique sensory processing style (Jakobson & Rigby, 2021). Building on the SPS classifications proposed by Lionetti et al. (2018), Class 1 were termed lexithymic orchids, with low levels of alexithymia and high levels of SPS; Class 2 were lexithymic dandelions, with low levels of alexithymia and low levels of SPS; Class 3 were the modal group, with mean levels of both traits; Class 4 were alexithymic tulips, with high levels of alexithymia and SPS and low interoceptive accuracy; and Class 5 were alexithymic orchids, with high levels of alexithymia and SPS but preserved interoceptive accuracy. Difficulties with environmental appraisal and emotional regulation were most evident in Classes 4 and 5 (the two classes possessing high levels of alexithymia).

Jakobson and Rigby (2021) also measured the sensory processing and self-regulatory styles characteristic of each subtype. These authors speculated that the unique sensory processing

and self-regulatory styles of particular classes might contribute to problems with empathy and related processes. Specifically, individuals in Class 2 (lexithymic dandelions) possessed a strong self-focus and hyposensitivity to external events. It was, therefore, speculated that these individuals may also possess limited empathy (Jakobson & Rigby, 2021). Class 4 individuals (alexithymic tulips) were also predicted to show empathic deficits; however, this was presumed to be linked to their interoceptive impairment and hypersensitivity to external stimulation. More specifically, the interoceptive impairment seen in this class was predicted to lead to poorly differentiated affective states and reduced emotional contagion, but also a blurring of the lines between self and other. This class's hypersensitivity to external stimulation was also expected to lead members to employ avoidance coping strategies in stressful situations. In addition to the above, members of the two orchid classes (i.e., higher SPS levels) and the modal group were predicted to be more aware of their own emotions, more reactive to others, and report stronger empathy (Jakobson & Rigby, 2021).

Few authors have investigated the co-occurring traits in the same study. With continued evidence supporting the interplay between these two traits and early adversity, future research would benefit from measuring both SPS and alexithymia in various populations and their links to a range of socioemotional processes, including those related to empathy.

Objectives and Hypotheses

The overarching goal of the current study was to examine links between the personality traits of alexithymia and SPS, early life experiences in the form of emotional abuse, self-reported levels of empathy and related constructs, and emotional contagion induced in a behavioural task. Five specific study objectives were: (1) to measure the associations between SPS, alexithymia, childhood emotional abuse, current mood, and empathy, assessed through self-report; (2) to

validate a novel emotional contagion behavioural task by confirming that the film types elicited different emotions; (3) to identify unique variance in performance on the behavioural task accounted for by SPS, alexithymia, and childhood abuse, while controlling for potential effects of current mood; (4) to determine how SPS, alexithymia, and childhood abuse relate to both self- and other-focused aspects of empathy (again, while controlling for current mood); and (5) to assess links between self-reported empathy and performance on the behavioural task.

It was hypothesized that alexithymia and SPS would both be associated with aspects of emotional contagion and empathy, but that these associations would differ. Specifically, it was predicted that SPS would positively predict emotional contagion and empathy, and that alexithymia would negatively predict emotional contagion, leading to a weaker contagion response and reduced empathy. Finally, it was predicted that performance on the behavioural task would relate to self-reported levels of both self- and other-focused aspects of empathy.

Chapter 2: Methods

Ethical approval was received from the Research Ethics Board at the University of Manitoba (Fort Garry campus). All participants provided informed, written consent prior to participation.

Participants

Adult participants were recruited from the Introduction to Psychology course at the University of Manitoba. Participants were Canadian citizens and reported English as their first language. Canadian citizenship was required to remove the impact of culture on emotional film clip responses, which was outside of the scope of this study. Participants were required to speak English as a first language, as the self-report measures were provided in English and reliability and validity have been established specifically for the English versions of these measures. Participants were also required to have no history of neurological disorders or significant head injuries, in order to remove the potential effects of cognitive impairments on the results, as well as focus on the developmental form of alexithymia, rather than acquired alexithymia common after head injury (Hogeveen & Grafman, 2021). Participants received course credit for participating in the study. After cleaning the data (see below) a final sample of $N = 305$ was left. The mean age of participants was 20.09 years (SD = 4.72; range = 17 – 44). The majority of participants reported their sex as female (81.3%); due to this fact, sex differences were not explored in the present study.

Measures

Toronto Alexithymia Scale – 20 Items

The Toronto Alexithymia Scale (TAS-20) is a 20-item self-report measure of alexithymia (Bagby et al., 1994). Items are answered using a five-option Likert scale ranging from 1

(*strongly disagree*) to 5 (*strongly agree*). The TAS-20 includes three subscales that assess three separate facets of alexithymia: difficulties identifying feelings (DIF), difficulties describing feelings (DDF), and externally oriented thinking (EOT). Chi-square tests of goodness of fit have verified this three-factor model of alexithymia as a better fit of the trait than one-factor and two-factor models ($p < 0.001$; Parker et al., 2003).

The DIF subscale addresses the ability to identify one's feelings and how they differ from other bodily sensations. There are seven questions in the DIF subscale. The DDF subscale includes five questions related to difficulties with describing one's emotions to others. The last subscale, EOT, includes eight items and addresses questions that relate to having a concrete thinking style and engaging in minimal introspection. Item scores are summed to produce the total and subscale scores. Only the total scores were used in the present investigation.

The TAS-20 has an acceptable internal consistency, with Cronbach's alpha values between 0.66 and 0.81 for the total and subscale scores (Bagby et al., 1994). In this study, the TAS-20 possessed high reliability, with Cronbach's $\alpha = 0.86$. Test-retest reliability of this measure is 0.77 ($p < 0.01$), indicating significant test-retest reliability (Bagby et al., 1994). The TAS-20 also possesses strong convergent validity when compared to questionnaires of cognition styles (Bagby, Taylor, et al., 1994). Additionally, the TAS-20 shows significant concurrent validity when compared to professional ratings of alexithymia in a clinical population (Bagby, Taylor, et al., 1994).

Highly Sensitive Person Scale

The Highly Sensitive Person Scale (HSPS) is a 27-item self-report measure of SPS (Aron & Aron, 1997). Each item is rated on a seven-option Likert scale from 1 (*not at all)* to 7

(*extremely*). There are no reverse-scored items, and the measure is scored by calculating the mean (Aron & Aron, 1997).

The HSPS possesses strong internal consistency, with an average Cronbach's $\alpha = 0.87$ (Smith et al., 2019). The current study replicated this strong reliability, with Cronbach's $\alpha = 0.89$. The HSPS has been compared to measures of similar constructs, such as positive affect, neuroticism, and introversion with medium-to-large correlation effect sizes, indicating some concurrent validity between these measures, but also indicating that SPS is a separate construct (Aron & Aron, 1997; Smith et al., 2019).

The HSPS was designed to represent a single factor of SPS; however, researchers have identified strong evidence for two- or three-factors making up one specific higher-order construct of SPS (Ershova et al., 2018; Lionetti et al., 2018; Smith et al., 2019; Smolewska et al., 2006). The three-factor model of SPS appears to have the most supportive evidence, with the three factors identified as ease of excitation (EOE), including items that address the level of external stimuli at which one becomes overwhelmed; low sensory threshold (LST), which relates to unpleasant sensory arousal; and aesthetic sensitivity (AES), which identifies the effect of a pleasant aesthetic on the individual (Smith et al., 2019; Smolewska et al., 2006). These three factors correlate with the HSPS total scale with coefficient values between 0.50 to 0.90, and intra-scale correlation coefficients are 0.40 for EOE and AES, 0.45 for LST and AES, and 0.73 for EOE and LST. Therefore, there is a stronger relationship between the EOE and LST subscales; however, each subscale relates to the others (Smolewska et al., 2006). Only the total scores were used in the present investigation.

Adult Temperament Questionnaire – Orienting Sensitivity Subscale

It has been recommended that the Orienting Sensitivity subscale of the Adult Temperament Questionnaire (OS-ATQ) be administered along with the HSPS to assess the full range of features associated with SPS (Aron et al., 2012). Total scores on the OS-ATQ and the HSPS are strongly correlated ($r = 0.63$; Evans & Rothbart, 2008). This implies that orienting sensitivity is a construct closely related to SPS.

The OS-ATQ is a 15-item self-report measure that assesses one's level of emotional and cognitive awareness of internal and external stimuli (Evans & Rothbart, 2007). It taps into three aspects of sensitivity: neutral perceptual sensitivity (five items), measuring one's level of awareness of low-intensity environmental stimuli; affective perceptual sensitivity (five items), measuring how one's emotions are affected by low-intensity stimuli; and associative sensitivity (five items), measuring spontaneous cognitions not related to external stimuli. The affective perceptual sensitivity subscale is similar to the AES subscale of the HSPS, as both measure the effect of environmental stimuli, or the aesthetic, on an individual. The associative sensitivity subscale, on the other hand, taps into an individual's depth of processing and the "richness" of their inner life (for example, imagery) – qualities characteristic of SPS but not specifically assessed by the HSPS (Aron et al., 2012). Each item is rated on a seven-point Likert scale, from 1 (*extremely untrue*) to 7 (*extremely true*) or using an X (*not applicable*) option. Only the total scores were used in the present investigation.

The OS-ATQ is correlated with measures of intellect ($r = 0.62$) and openness ($r = 0.45$; Evans & Rothbart, 2007; Laverdière et al., 2010). The internal consistency of this subscale has been calculated with Cronbach's $\alpha = 0.85$ (Laverdière et al., 2010). Internal consistency in the current study for this measure was reasonably strong, with Cronbach's $\alpha = 0.73$.

Interpersonal Reactivity Index and Empathy Index

The combined Interpersonal Reactivity Index and Empathy Index (IRI/EI) is a 41-item self-report measure, including the following subscales: perspective-taking (PT), measuring the ability of an individual to adopt the point of view of another; fantasy (FS), the ability of an individual to imagine the feelings of fictitious characters; empathic concern (EC), the ability to feel sympathy and concern for people in need; personal distress (PD), the tendency of an individual to feel unease while in uncomfortable interpersonal interactions; empathy (EMP), which identifies an individual's ability to feel the same feelings as those around them; and behavioural contagion (BC), which addresses an individual's tendency to mimic the actions of those around them (Davis, 1983; Jordan et al., 2016). Each item is rated on a five-option Likert scale, from 0 (*does not describe me well*) to 4 (*describes me very well*). The reliability of this measure has been confirmed with Cronbach's $\alpha \geq 0.71$ for each subscale (Jordan et al., 2016). In the current study, Cronbach's $\alpha = 0.86$ for the total measure, again indicating strong internal consistency. Reliability analyses for each subscale in this current study produced Cronbach's $\alpha \geq 0.60$, except for the BC subscale. Removing two items from the BC subscale improved Cronbach's $\alpha \geq 0.60$. Therefore, in the current analyses, the BC subscale included five items, whereas each of the other subscales included seven items.

Childhood Trauma Questionnaire (CTQ) Short Form – Emotional Abuse Subscale

This self-report measure assesses the level of emotional abuse one experienced throughout childhood (Bernstein et al., 2003). Emotional abuse is defined as "verbal assaults on a child's sense of worth or well-being or any humiliating or demeaning behaviour directed toward a child by an adult or older person" (Bernstein et al., 2003, p. 175). Individuals are asked to think about their experiences as a child and teenager, and to rate their agreement with each

item on a five-option Likert scale, from 1 (*never true*) to 5 (*very often true*). Five items are included in this subscale. Item scores are summed to produce a total emotional abuse subscale score.

The emotional abuse measure has strong criterion-related validity when compared to therapist ratings of abuse (Bernstein et al., 2003). The items of this subscale load strongly onto the same factor, with factor coefficients between 0.72 and 0.84. Additionally, Cronbach's alpha coefficients are between 0.84 and 0.89 (depending on the population), which indicates strong internal consistency (Bernstein et al., 2003). In the current study, the emotional abuse subscale possessed strong internal reliability, with Cronbach's $\alpha = 0.91$.

Patient Health Questionnaire – 9 Items

The Patient Health Questionnaire-9 (PHQ-9) is a nine-item self-report depression screening measure (Kroenke et al., 2001). This measure asks individuals to rate the frequency of their experience of different symptoms of depression over the past two weeks from 0 (*not at all*) to 3 (*nearly every day*). The items are summed.

The PHQ-9 has strong internal consistency, with Cronbach's alpha coefficients of between 0.86 and 0.89, and strong test-retest reliability (Kroenke et al., 2001). In this study, the PHQ-9 possessed strong internal reliability, with Cronbach's $\alpha = 0.88$. Others have reported that, when compared to diagnoses by trained mental health professionals, criterion-related validity is good, with a correlation coefficient of 0.84 (Kroenke et al., 2001).

General Procedure

Participants registered for the study through an online research sign-up system and received a link to a survey administered through Qualtrics Online Survey Software. Participants provided informed consent, answered demographic questions regarding their gender and age,

completed a behavioural task that was designed to elicit emotional contagion, and then answered the previously described self-report measures of alexithymia, SPS, empathy and its related constructs, childhood emotional abuse, and current depressive symptoms.

For the behavioural task, participants watched positive, negative, mixed-valence, and neutral film clips. After viewing each clip, participants answered questions regarding the emotion(s) they experienced during viewing. Emotional and neutral film clips were chosen from a collection compiled by Samson et al. (2016) that have been shown to reliably induce different levels of positive (amusement, pride, and love), negative (repulsion, fear, sadness, and anger), and/or mixed emotions. Each clip was approximately 30 seconds in length and did not include audio. The clips were natural and realistic and had not been professionally created or edited. In total, ten clips were presented to participants: two positive clips ("positive"), two mixed-valenced clips that show someone in an embarrassing situation that others might find amusing ("embarrassing/cute"), two mixed-valence clips that show someone in an embarrassing situation that others might find mortifying ("embarrassing/humiliating"), two negative clips ("negative"), and two neutral clips ("neutral"). To illustrate the content of the clips, one of the positive clips showed a toddler dancing; one embarrassing/cute clip showed a wedding photographer falling into a fountain; one embarrassing/humiliating clip showed a man trying to photocopy his buttocks and breaking the glass; one negative clip showed a bull throwing and trampling a torero; and one neutral clip showed a boy drinking tea. One clip of each type showcased a single individual, and the other featured an individual who was part of a large group. A list of the chosen film clips and their characteristics is included in Appendix A.

Before watching each clip, participants were instructed to "direct [their] whole attention to the film, let the film sink in and try to feel with the person in the film." After watching the

clip, participants then were instructed to "indicate what effect the film had on [them] *personally*." Participants then rated how much they *personally* felt each of the emotions amusement, pride, love, repulsion, fear, sadness, anger, boredom and embarrassment on a six-option Likert scale from 1 (*do not agree at all*) to 6 (*very strongly agree*). Participants were explicitly asked to use a rating of 1 (*do not agree at all*) if they did not experience a given emotion. This instruction was included to address the increased tendency for participants with alexithymia to report not experiencing any emotion (Aaron et al., 2018). Finally, participants were asked to rate how closely they thought their "feelings while watching the film clip matched those experienced by the main person in the clip" on a six-option Likert scale from 1 (*very different*) to 6 (*very similar*). This question was asked to tap into the other-focused aspect of empathy by requiring the participant to identify what the featured individual in each film clip was feeling, and then self-reflect on how closely their own emotions matched. Ratings in the behavioural task were averaged across the two videos shown for each film type (individual vs. group context).

After viewing each video clip and responding to the associated questions, participants completed two items chosen from the Edinburgh Handedness Inventory (Oldfield, 1971) before proceeding to the next video. The purpose of this was to allow for a short break between each clip involving a task that was low in cognitive and emotional demands. Answers to these items were not analyzed. The film clips were presented alternating between a positive or neutral clip and a negative or embarrassing clip and ending with two positive and/or neutral clips. This was done to minimize mood induction effects and to allow participants to end the task by experiencing positive emotions.

Chapter 3: Results

Data Cleaning and Imputation of Missing Data

A total of 340 participants completed the online study. Prior to inferential testing, data were cleaned by removing duplicate responses, checking for proper coding of variables (including adjusting reverse coded responses), removing participants who did not complete at least one subscale of any questionnaire or did not complete ratings for one (or more) video(s) in the behavioural task, and removing participants who took less than five minutes or more than two hours to complete the study. Responses for participants who took less than five minutes to complete the study were removed as the accuracy of these responses could not be trusted due to the fact that watching all of the film clips would take approximately five minutes in itself. Responses for participants who took more than two hours to complete the study were removed due to the possibility that the participants' emotional state could have significantly changed (due to external influences) over that length of time. Thirty-five participants were removed during data cleaning, leaving a final sample of $N = 305$.

After cleaning the data, Little's Missing Completely at Random (MCAR) test was run and confirmed that missing data were MCAR. Less than 0.005% of values were missing. Missing values were then imputed using an Estimation-Maximization algorithm. The data were also checked for outliers (which were corrected by Winsorizing), dependent variables were checked for normality, and linearity between independent and dependent variables were identified. These analyses, and the descriptive and inferential statistical analyses described below, were conducted using SPSS 28 (*IBM SPSS Statistics for Windows*, 2021). Unless otherwise indicated, an alpha of 0.05 was assumed as the basis for statistical significance.

Objective 1: Assessing Relationships between Study Measures

Correlation coefficients were calculated and tested for significance to examine relationships between the TAS-20, HSPS, OS-ATQ, CTQ, PHQ-9, and IRI/EI total and subscale scores. The Benjamini-Hochberg procedure was used with a False Discovery Rate (FDR) of 0.05 to control for the increased probability of Type 1 errors when testing multiple hypotheses.

As seen in Table 1, HSPS scores were positively correlated with both the TAS-20 scores and the OS-ATQ scores, with small and medium effect sizes respectively. TAS-20 and OS-ATQ scores were not significantly correlated. All three personality variables were positively correlated with both the CTQ and PHQ-9 scores with small to medium effect sizes, which were also positively correlated with one another with a medium effect size. As correlations between the variables listed above were in the small-to-moderate range, these associations were not strong enough to create problems related to multi-collinearity in the analyses described below.

The IRI/EI subscales correlated with each other, with the exception of the PT and PD subscales and the FS and PD subscales. The HSPS and OS-ATQ total scores were positively correlated with the IRI/EI subscales, supporting the view that those with SPS tend to believe themselves to be generally empathic. In contrast, those scoring higher on alexithymia reported experiencing some degree of awareness of how others affect them *personally* (positive correlations with PD and EMP), but a weakness in understanding what the *other person* is feeling (negative correlations with EC and PT); in other words, they report being more self-focused than other-focused. CTQ scores positively correlated with the PD and BC subscales, and PHQ-9 scores positively correlated with the PD, EMP and BC subscales, suggesting that both of these variables are more closely related to self-focused contagion than to other-focused empathy processes. The relationships between the variables listed above suggest that it would be wise to

control for past emotional abuse and current mood when assessing links between the personality variables, performance on our behavioural task, and empathy-related constructs.

Table 1

Pearson Correlation Coefficients Measuring the Relationships between the Study Measures

	TAS-20	HSPS	OS-ATQ	EC	PT	FS	PD	EMP	BC	CTQ
TAS-20	--									
HSPS	0.27**	--								
OS-ATQ	-0.02	0.46**	--							
EC	-0.13*	0.29**	0.34**	--						
PT	-0.24**	0.17**	0.26**	0.43**	--					
FS	-0.03	0.37**	0.39**	0.31**	0.19**	--				
PD	0.44**	0.46**	0.05	0.18**	-0.03	0.05	--			
EMP	0.14*	0.53**	0.40**	0.48**	0.27**	0.37**	0.38**	--		
BC	0.08	0.38**	0.29**	0.31**	0.13*	0.37**	0.20**	0.54**	--	
CTQ	0.24**	0.25**	0.14*	-0.05	0.03	0.07	0.17**	0.08	0.12*	--
PHQ-9	0.49**	0.42**	0.21**	-0.03	-0.06	0.12	0.29**	0.19**	0.18**	0.43**

Note. Yellow, orange, and red colouring indicate small, medium, and large effect sizes, respectively. TAS-20 = Toronto Alexithymia Scale; HSPS = Highly Sensitive Person Scale; OS-ATQ = Orienting Sensitivity subscale from the Adult Temperament Questionnaire; CTQ = Emotional Abuse subscale of the Childhood Trauma Questionnaire; PHQ-9 = Patient Health Questionnaire. Subscales of the Interpersonal Reactivity Index/Empathy Index: EC = Empathic Concern; PT = Perspective Taking; FS = Fantasy; PD = Personal Distress; EMP = Empathy; BC = Behavior Contagion.

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Objective 2: Validating the Behavioural Task

Ratings for the nine measured emotions (i.e., amusement, love, pride, repulsion, fear, anger, sadness, boredom and embarrassment) collected during the behavioural task were

compared in a 5 (Film Type) X 9 (Rating) repeated-measures analyses of variance (ANOVA) to determine which emotion ratings differed across film types.

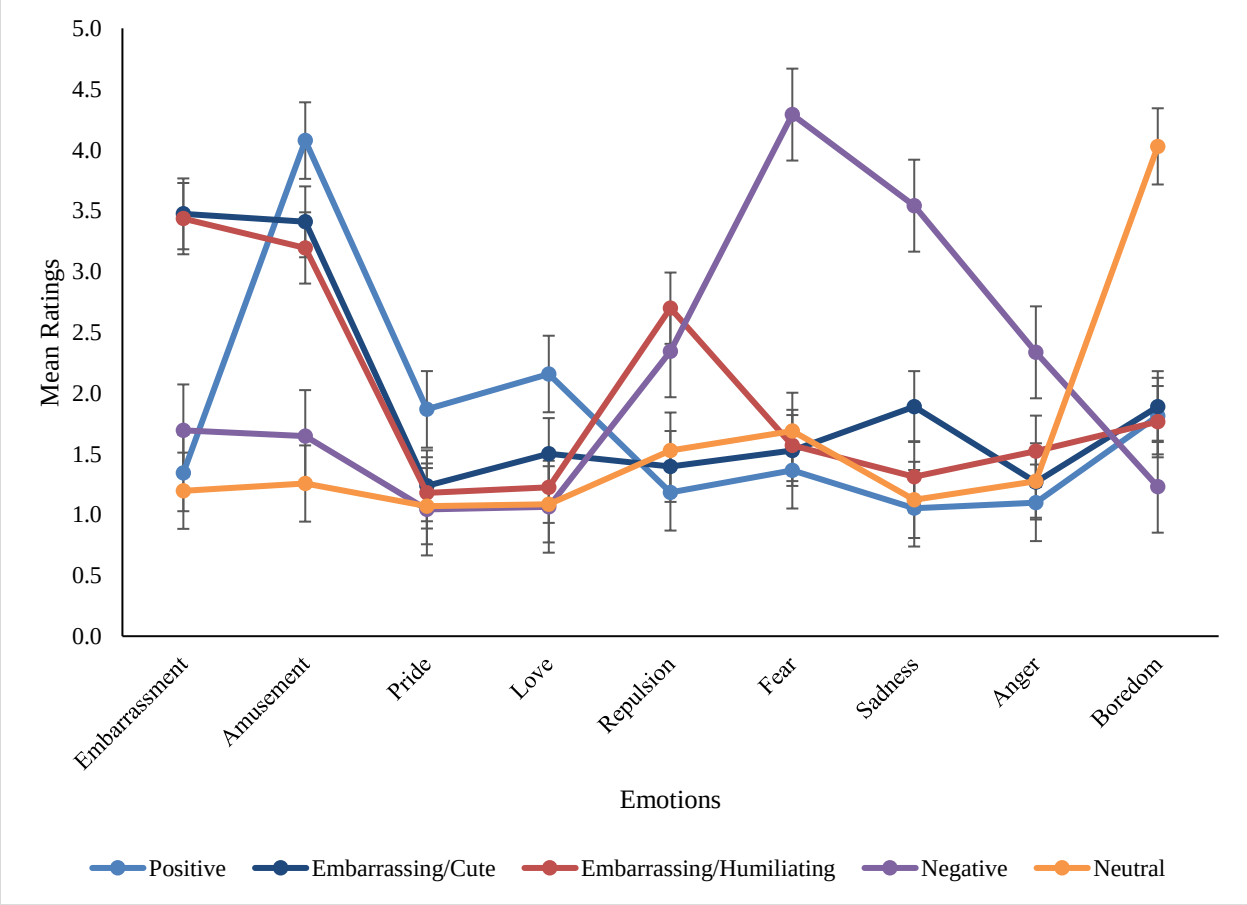
Mauchly's test indicated that the assumption of sphericity had been violated for film type, $\chi^2(9) = 119.45$, $p < 0.01$, rating, $\chi^2(35) = 763.29$, $p < 0.01$, and the film type by rating interaction, $\chi^2(527) = 6295.43$, $p < 0.01$. Therefore, Greenhouse-Geisser corrections were applied for tests of within-subject effects. Emotion ratings significantly differed both across film types, $F(3.32, 1008.35) = 203.94$, $p < .01$, $\eta_p^2 = .40$, and across emotions, $F(5.08, 1544.42) = 265.31$, $p < .01$, $\eta_p^2 = .47$. There was also a significant interaction effect between film type and emotion ratings, $F(12.97, 3941.54) = 440.52$, $p < .01$, $\eta_p^2 = .59$.

Follow-up tests of simple main effects with Bonferroni corrections were completed to identify the specific emotion ratings that differed within each film type, and the specific film types that differed for each emotion rating. As seen in Figure 2, the positive film type elicited the highest ratings of amusement, pride and love (the positive emotions), and the lowest ratings of repulsion, fear, sadness, and anger. Amusement was the strongest emotion elicited by the positive films. Embarrassing/cute and embarrassing/humiliating films produced similar ratings to one another in terms of pride, fear, boredom, and embarrassment ($p > .05$). However, whereas the embarrassing/cute films elicited higher levels of amusement, love, and sadness than the embarrassing/humiliating films, the embarrassing/humiliating films elicited higher levels of repulsion and anger. The strongest emotions elicited by both of these films were amusement and embarrassment. Negative films produced the highest ratings of fear, sadness, and anger, and the lowest ratings of boredom across all film types. Fear was the strongest emotion elicited by this film type. Finally, neutral films produced the lowest levels of amusement and embarrassment

and the highest ratings of boredom of all film types. The strongest emotion the neutral films elicited was boredom.

Figure 2

Mean Emotion Ratings for each of the Measured Emotions across Film Types



Objective 3: Assessing Unique Variance in Emotional Contagion Accounted for by SPS, Alexithymia, and Childhood Emotional Abuse

Predictors of the Primary Emotion Elicited by each Film Type in the Behavioural Task

As noted above, the strongest or "primary" emotions elicited by the positive, negative, and neutral film types were amusement, fear, and boredom, respectively. For the

embarrassing/cute and embarrassing/humiliating film types, amusement and embarrassment "tied" as the most strongly rated emotions. Therefore, to find the primary emotion score for these two film types, the averages of the amusement and embarrassment ratings (i.e., "amusement-embarrassment") were calculated. The mean primary emotion ratings for the full sample are found in Table 2.

Table 2

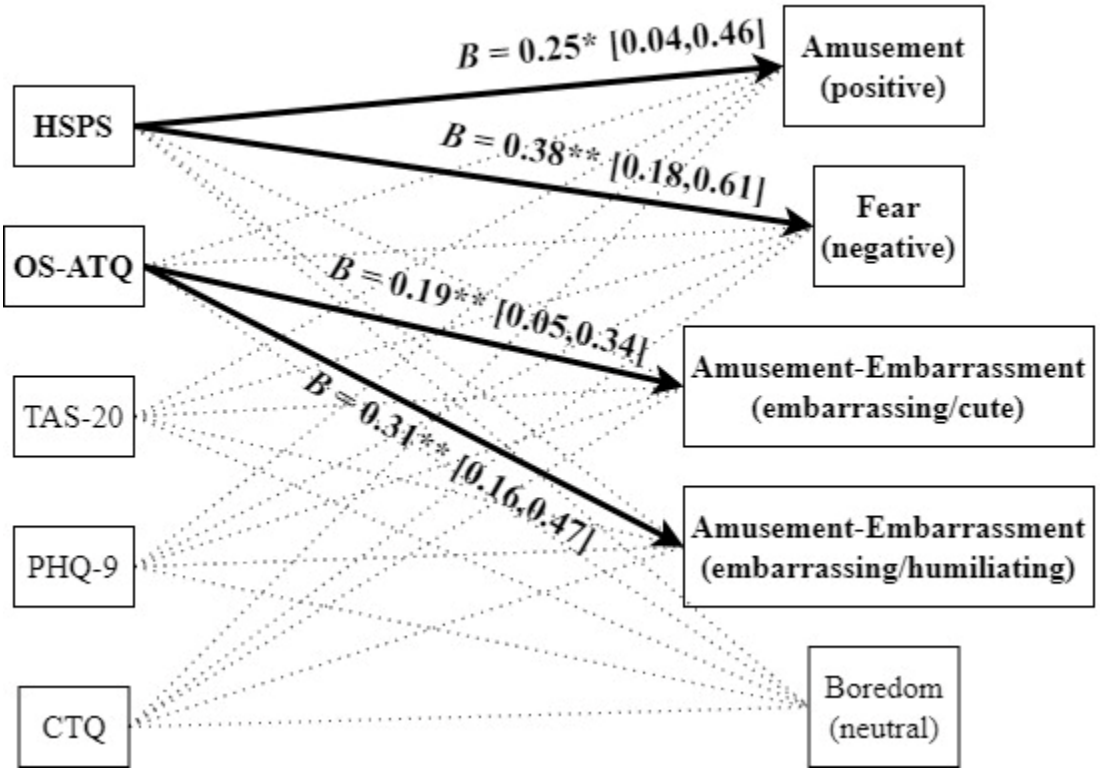
Mean Ratings for the Primary Emotion(s) Elicited by each Emotional Film Type

Film Type	Primary Emotion	*M*	*SD*
Positive	Amusement	4.08	1.27
Embarrassing/cute	Amusement-embarrassment	3.47	0.95
Embarrassing/humiliating	Amusement-embarrassment	3.34	1.02
Negative	Fear	4.29	1.44
Neutral	Boredom	4.03	1.43

The relationships between the TAS-20, HSPS, OS-ATQ, PHQ-9 and CTQ scores and the primary emotion for each film type were assessed using a multiple multivariate regression (MMR) model, with the total scores for the five questionnaires entered as predictor variables, and the rating for the primary emotion for each of the five film types entered as outcome variables. Therefore, this model measured the extent to which the personality variables explained variation in how fully individuals experienced the emotion (or blend) that was most strongly endorsed for each film type in the full sample. CTQ and PHQ-9 scores were included in the current and subsequent MMR analyses to control for past emotional abuse and current mood. For this and all subsequent MMR models, bias-corrected accelerated 95% confidence intervals were calculated using 1000 bootstrapped samples.

Figure 3

Relationships between Predictor Variables and Primary Emotion Ratings



Note. TAS-20 = Toronto Alexithymia Scale; HSPS = Highly Sensitive Person Scale; OS-ATQ = Orienting Sensitivity subscale from the Adult Temperament Questionnaire; PHQ-9 = Patient Health Questionnaire; CTQ = Emotional Abuse subscale of the Childhood Trauma Questionnaire. Sold bold paths represent significant positive associations. Non-bold dashed paths are not significant. *B* represents the regression coefficient.

* *B* is significant at the 0.05 level; 95% confidence interval shown in square brackets.

** *B* is significant at the 0.01 level; 95% confidence interval shown in square brackets.

As shown in Figure 3, mean scores on the HSPS significantly predicted Amusement ratings for the positive film type and Fear ratings for the negative films, when holding all other

predictors constant. Mean scores on the OS-ATQ significantly predicted the Amusement-Embarrassment averaged ratings for the embarrassing/cute and embarrassing/humiliating films. TAS-20, CTQ and PHQ-9 scores did not significantly predict primary emotion ratings.

Predictors of Dispersion in the Emotions Elicited by each Film Type in the Behavioural Task

For each participant, a "dispersion" score was computed for each film type by counting the number of emotions that received a mean rating across the two exemplars that were higher than 1 (*do not agree at all*). This count could range from zero (neither film of a given type elicited a rating > 1 for any emotion) to nine (at least one film of a given type elicited a rating > 1 for every emotion). This score indicated how varied the emotions elicited by each film type were, with a higher dispersion score indicating more emotions being felt.

Table 3

Mean Dispersion Scores for each Film Type

Film Type	*M*	*SD*
Embarrassing/humiliating	4.87	2.04
Embarrassing/cute	4.80	2.19
Negative	4.54	1.74
Positive	3.95	2.01
Neutral	2.97	2.03

Table 3 shows the mean dispersion score for each film type. Dispersion scores for the five film types were compared using a repeated-measures ANOVA. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(9) = 51.13$, $p < 0.01$. Therefore, a Greenhouse-Geisser adjustment to the degrees of freedom was used. There was a significant difference in dispersion scores across film types, $F(3.66, 1112.67) = 112.66$, $p < 0.01$, $\eta_p^2 = .270$. Post-hoc pairwise comparisons with Bonferroni corrections indicated that the only contrasts that were *not*

significantly different (at the $p < .01$ level) were those between the negative and embarrassing/cute films, and between the embarrassing/cute and embarrassing/humiliating films. Thus, neutral films had the lowest dispersion scores and the two types of embarrassing films had the highest dispersion scores, with negative and positive films falling in between.

Table 4

Bootstrapped Parameter Estimates for Significant Relationships between Predictor Variables and Dispersion Scores

			95% Confidence Interval	
Predictor	Film Type	*B*	Lower	Upper
	Positive	0.36*	0.08	0.65
	Embarrassing/cute	0.34*	0.03	0.70
HSPS	Embarrassing/humiliating	0.33*	0.07	0.62
	Positive	0.02*	0.00	0.04
	Negative	0.03**	0.01	0.05
	Embarrassing/cute	0.04**	0.02	0.06
	Embarrassing/humiliating	0.04**	0.07	0.62
TAS-20	Neutral	0.03*	0.01	0.05
	Embarrassing/cute	-0.05*	-0.10	-0.00
PHQ-9	Embarrassing/humiliating	-0.05*	-0.09	-0.00

Note. HSPS = Highly Sensitive Person Scale; TAS-20 = Toronto Alexithymia Scale; PHQ-9 = Patient Health Questionnaire. *B* represents the regression coefficient.

* *B* is significant at the 0.05 level.

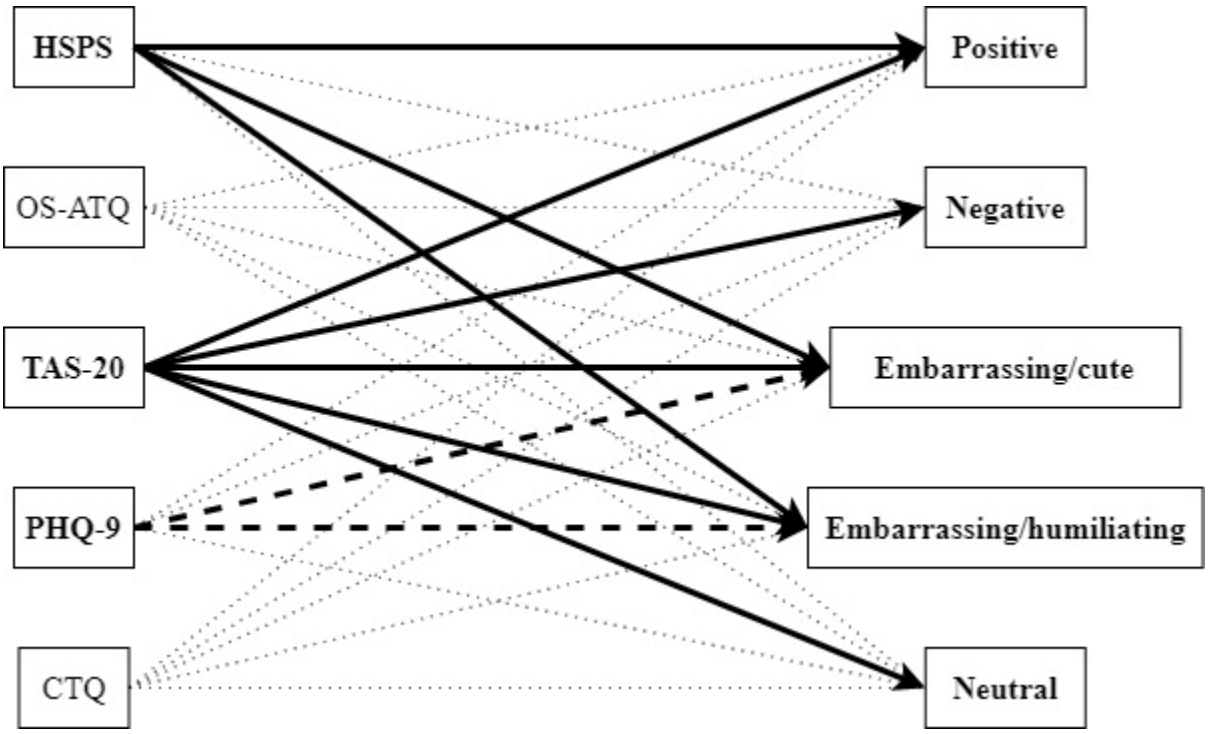
** *B* is significant at the 0.01 level.

The relationships between the TAS-20, HSPS, OS-ATQ, CTQ and PHQ-9 scores and the dispersion score for each film type were assessed using a MMR model, with the questionnaire scores entered as predictor variables and the dispersion scores for each film type entered as

outcome variables. Therefore, this model measured the extent to which the personality variables predicted emotional reactions to each film type.

Figure 4

Relationships between Predictor Variables and Emotion Dispersion Ratings for each Film Type



Note. HSPS = Highly Sensitive Person Scale; OS-ATQ = Orienting Sensitivity subscale from the Adult Temperament Questionnaire; TAS-20 = Toronto Alexithymia Scale; CTQ = Emotional Abuse subscale of the Childhood Trauma Questionnaire; PHQ-9 = Patient Health Questionnaire. Solid bold paths represent significant positive associations and dashed bold paths represent significant negative associations. Non-bold dashed paths are not significant.

Comparing the relationships between self-reported personality variables and dispersion scores identified the TAS-20 total score as a significant predictor of dispersion scores for all film types when holding all other predictors constant (see Table 4 and Figure 5). Mean scores for the

HSPS significantly predicted dispersion scores for the positive, embarrassing/cute and embarrassing/humiliating film types. Mean scores on the PHQ-9 negatively predicted dispersion scores for the embarrassing/cute and embarrassing/humiliating films. OS-ATQ and CTQ scores did not significantly predict dispersion scores.

Predictors of the Perceived Compatibility between Emotions Elicited in Oneself and Those Experienced by the Person Featured in the Film

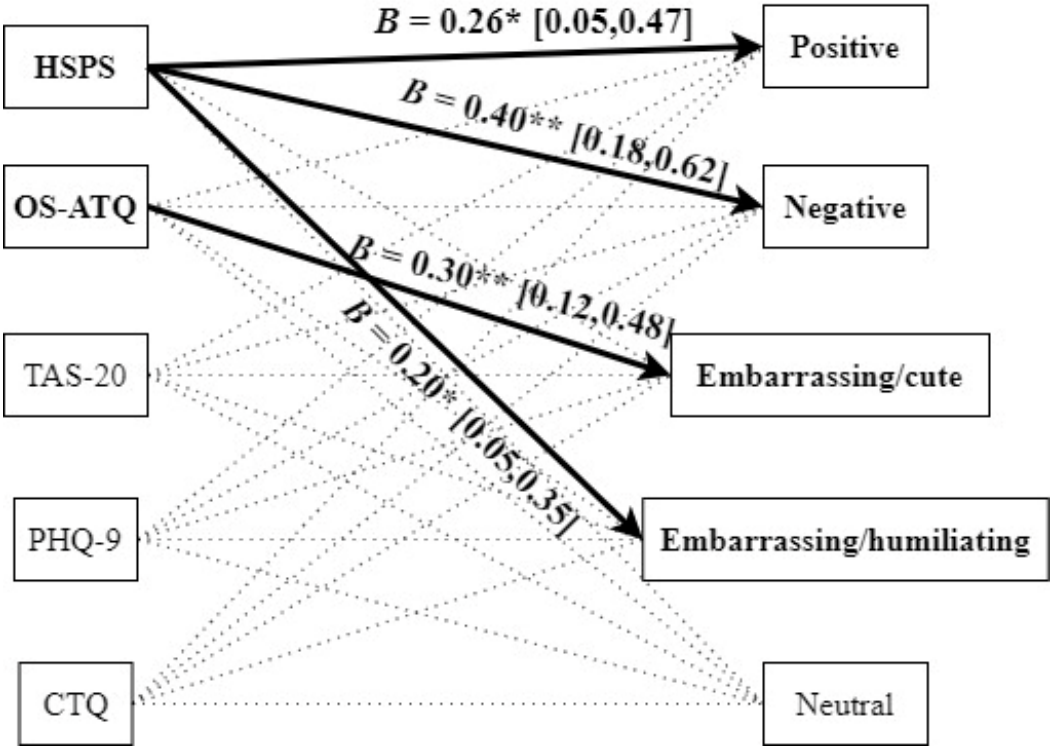
After rating how strongly they felt each emotion while watching a given film clip, participants rated how closely they felt that the emotions they experienced matched those experienced by the main person featured in the film clip. This question was intended to tap into the other-focused component of empathy. The "feelings match" ratings for each film type were entered as outcome variables into a MMR, with the TAS-20, HSPS, OS-ATQ, CTQ, and PHQ-9 scores entered as predictor variables.

As seen in Figure 5, HSPS mean scores significantly predicted "feelings match" ratings for positive, negative, and embarrassing/humiliating film types, when holding all other predictors constant, and OS-ATQ mean scores significantly predicted the "feelings match" ratings for the embarrassing/cute film types. The TAS-20, CTQ, and PHQ-9 scores did not significantly predict the "feelings match" ratings. This pattern of results closely parallels that seen for the relationship between the predictor measures and the primary emotions of each film type (Figure 3). Indeed, primary emotion scores were positively correlated with "feelings match" scores for the corresponding film types, with moderate-to-large effect sizes ($.29 \leq r(305) \leq .68$, $p < .001$). The exception was the correlation between boredom ratings for the neutral films and "feelings match" ratings for the neutral films which was somewhat weaker, but still significant ($r(305) \leq .17$, $p = .003$). Overall, these findings suggest that the more strongly an individual experiences

the primary emotion evoked by a given film in the full sample, the more likely they are to infer that they are truly empathizing with (i.e., *sharing the feelings of*) the main character.

Figure 5

Relationships between Predictor Variables and "Feelings Match" Ratings for each Film Type



Note. HSPS = Highly Sensitive Person Scale; OS-ATQ = Orienting Sensitivity subscale from the Adult Temperament Questionnaire; TAS-20 = Toronto Alexithymia Scale; CTQ = Emotional Abuse subscale of the Childhood Trauma Questionnaire; PHQ-9 = Patient Health Questionnaire. Sold bold paths represent significant positive associations. Non-bold dashed paths are not significant. *B* represents the regression coefficient.

* *B* is significant at the 0.05 level; 95% confidence interval shown in square brackets.

** *B* is significant at the 0.01 level; 95% confidence interval shown in square brackets.

Objective 4: Predictors of Self-Reported Empathy

An exploratory factor analysis (EFA) was completed with the IRI/EI subscales, utilizing a principal axis factoring extraction method and an oblique promax rotation method. These extraction and rotation criteria replicated the EFA completed by Jordan et al. (2016). As seen in Table 5, the EFA identified two factors, the PD, EMP and BC subscales loaded onto Factor 1 and the EC and PT subscales loaded onto Factor 2. The FS subscale loaded equally onto both factors. This replicates Jordan et al.'s (2016) factor structure. Factor 1, including the PD, EMP and BC subscales, was termed the "self-focused" factor, as items within these subscales ask about one's awareness of how certain situations and others' emotions and behaviours affect *oneself*. Factor 2, including the EC and PT subscales, was termed the "other-focused" factor, as these subscales address an individual's ability to adopt *another's* perspective and feel concern for them.

Table 5

Factor Loadings of the IRI/EI Subscales

Subscale	Factor 1 "Self-Focused"	Factor 2 "Other-Focused"
EMP	0.85	
BC	0.63	
PD	0.48	
PT		0.83
EC		0.50

Note. A cut off factor score of 0.40 was used. Subscales of the Interpersonal Reactivity Index/Empathy Index: EMP = Empathy; BC = Behavior Contagion; PD = Personal Distress; PT = Perspective Taking; EC = Empathic Concern.

An MMR model was created with TAS-20, HSPS, OS-ATQ, CTQ and PHQ-9 scores entered as predictors, and the two IRI/EI factor scores entered as outcome variables. This model

measured the extent to which the personality variables predicted individual differences in the strength of various constructs related to empathy, as reported by participants. As shown in Figure 6, the TAS-20 negatively predicted only the other-focused factor scores, when holding all other predictors constant. In contrast, the HSPS and the OS-ATQ positively predicted both the self-focused and other-focused factor scores. The CTQ and PHQ-9 did not significantly predict either factor.

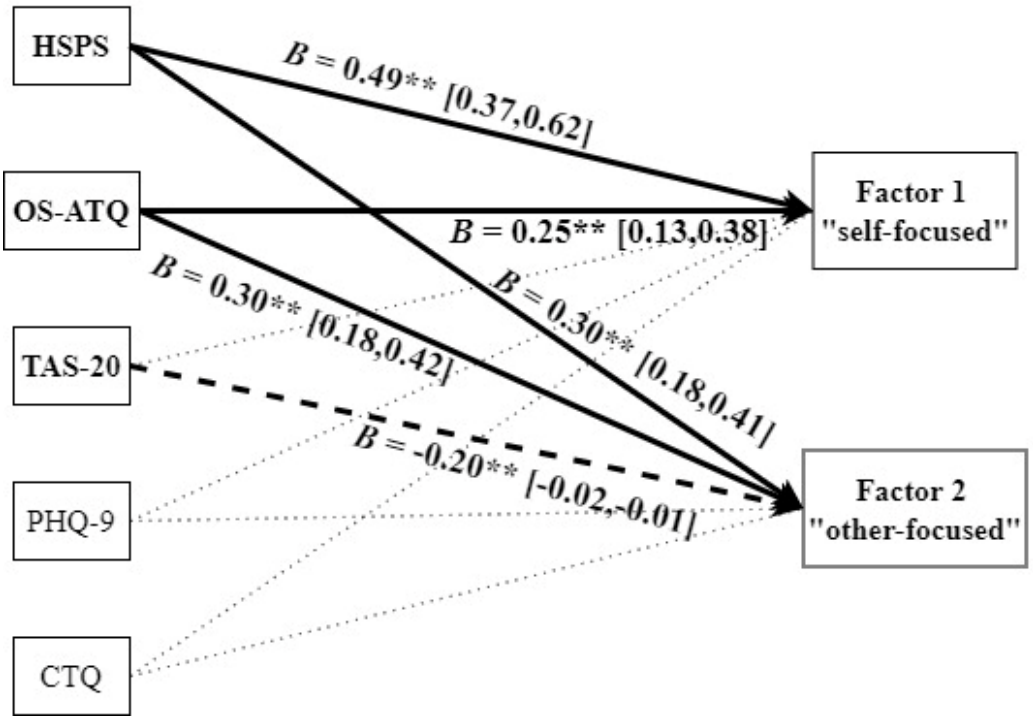
Objective 5: Associations between Self-Reported Empathy and Performance on the Behavioural Task

The primary emotions, dispersion scores, and "feelings match" ratings were averaged across all film types to produce a mean primary emotion rating, mean dispersion score, and mean "feelings match" rating. The previous analyses were then repeated utilizing these mean scores, and the results were replicated (results not shown). Thus, HSPS and OS-ATQ scores positively predicted the mean primary emotion rating; TAS-20 and HSPS scores positively predicted and PHQ-9 scores negatively predicted the mean dispersion score; and mean scores on the HSPS and OS-ATQ positively predicted the mean "feelings match" rating.

Correlational analyses were run examining relationships between the two self-reported empathy factors (i.e., the "self-focused" and "other-focused" factor scores) and the mean scores from the behavioural task (i.e., the mean primary emotion rating, mean dispersion score, and mean "feelings match" ratings). Again, the Benjamini-Hochberg procedure was applied with an FDR of 0.05 to control for the increased probability of Type 1 errors when conducting multiple hypotheses.

Figure 6

Relationships between Predictor Variables and Self-Reported Empathy Factor Scores



Note. TAS-20 = Toronto Alexithymia Scale; HSPS = Highly Sensitive Person Scale; OS-ATQ = Orienting Sensitivity subscale from the Adult Temperament Questionnaire; PHQ-9 = Patient Health Questionnaire; CTQ = Emotional Abuse subscale of the Childhood Trauma Questionnaire. Solid bold paths represent significant positive associations and dashed bold paths represent significant negative associations. Non-bold dashed paths are not significant. *B* represents the regression coefficient.

* *B* is significant at the 0.05 level; 95% confidence interval shown in square brackets.

** *B* is significant at the 0.01 level; 95% confidence interval shown in square brackets.

As seen in Table 6, each of the behavioural task variables (i.e., the primary emotion, dispersion, and “feelings match” scores) were significantly correlated with one another, with

small to large effect sizes. The two IRI/EI factors were also significantly correlated with one another with a large effect size. In addition, the self-focused factor (Factor 1) significantly correlated with each of the behavioural task variables with small effect sizes, whereas the other-focused factor (Factor 2) significantly correlated with both the averaged primary emotion ratings and the averaged "feelings match" scores with small effect sizes. These findings confirm the importance that experiencing a strong primary emotion and a strong sense that one's feelings match those of another play in empathy, as well as provide additional evidence that the variables extracted from the behavioural task (i.e., primary emotion, dispersion, and "feelings match" ratings) related to self-reported empathy.

Table 6

Pearson Correlation Coefficients Measuring the Relationships between the Behavioural Task Measures and the IRI/EI Factors

	Mean Primary Emotion	Mean Dispersion	Mean "Feelings Match"	Factor 1 "Self-Focused"	Factor 2 "Other-Focused"
Mean Primary Emotion	--				
Mean Dispersion	0.41**	--			
Mean "Feelings Match"	0.56**	0.23**	--		
Factor 1 "Self-Focused"	0.24**	0.23**	0.25**	--	
Factor 2 "Other-Focused"	0.22**	0.06	0.20**	0.66**	--

Note. Yellow, orange, and red colouring indicate small, medium, and large effect sizes, respectively.

** Correlation is significant at the 0.01 level (2-tailed).

Chapter 4: Discussion

This study examined the links between the personality traits of alexithymia and SPS, early life experiences in the form of emotional abuse, mood, self-reported levels of empathy and related constructs, and emotional contagion induced in a behavioural task. In the current study, SPS and alexithymia were positively associated. This aligns with the results from a recent study conducted by Karaca Dinç et al. (2021) measuring relationships between these traits, childhood trauma and psychopathology. Liss et al. (2008) initially identified this relationship and showed that: (a) the difficulties identifying and describing feelings properties of alexithymia positively relate to SPS properties of ease of excitation and low sensory threshold; and (b) the externally-oriented thinking feature of alexithymia negatively relates with the SPS property of aesthetic sensitivity. These relationships have been replicated in additional research (Jakobson & Rigby, 2021). The positive association between alexithymia and SPS found in the present work and across these other studies highlights the co-occurrence and interplay between these traits, as well as the importance of incorporating both of these traits in future research.

Alexithymia has been found to be associated with early adverse environments (e.g., Xie et al., 2021) and depression (e.g., Honkalampi et al., 2010). Correlations between alexithymia and both early emotional abuse and depression were also observed in the current study. It has been proposed that a lack of affect sharing and mirroring between caregiver and child leads to difficulties with identifying and describing affective states (i.e., characteristics of alexithymia) later in life (Xie et al., 2021). Moreover, Karaca Dinç et al. (2021) established a mediating role of alexithymia on the link between childhood trauma and psychopathology (e.g., depression, anxiety, negative self-identity, somatization, and hostility).

SPS was also positively associated with depression and childhood emotional abuse in the current study, replicating past research. Possessing the trait of SPS in addition to experiencing an adverse developmental environment increases one's risk of difficulties with mood, anxiety, and other psychopathologies (Aron et al., 2005, 2012; Aron & Aron, 1997; Karaca Dinç et al., 2021; Liss et al., 2008). Indeed, Karaca Dinç et al. (2021) found that SPS also mediated the relationship between childhood trauma and psychopathology. Aron et al. (2005) identified a strong causal effect of an adverse childhood environment on negative affectivity in adulthood *for individuals with SPS*. It has been proposed that the increased depth of processing that individuals with SPS engage in (specifically concerning their social and emotional experiences) leads these individuals to be especially affected by a negative childhood environment (Aron et al., 2005; Aron & Aron, 1997). However, individuals with SPS who did not experience an adverse environment throughout childhood have been found to be no more likely to experience negative affectivity than individuals without SPS (Aron et al., 2005; Aron & Aron, 1997).

Relationships between SPS and self-reported or behavioural measures of empathy have not been explicitly investigated before; however, based on the increased processing of self and other emotional states that are characteristic of those displaying this trait, as well as neuroimaging research identifying increased neural activity in individuals with SPS in regions associated with empathy, self-other awareness, and self-referential processing during emotional processing tasks (Acevedo et al., 2018; Aron et al., 2012), it might be expected that trait SPS would be associated with increased levels of empathy. This relationship was identified in the current study, with SPS positively predicting both the self- and other-focused empathy factors on the self-report empathy measure. The idea that individuals scoring higher in trait SPS are better able to identify and mirror the other person's mood is consistent with the results from the

behavioural task eliciting emotional contagion. In this task, SPS positively predicted how strongly participants felt the primary emotion elicited by each film clip, as well as how closely the participants believed their feelings matched those of the main character in the films. These two scores were also positively correlated with one another. Together, this indicates that individuals with SPS feel the elicited emotion more strongly and, by feeling this emotion strongly, are more confident that their emotional response matches that of the other individual. The confidence that those with SPS have in the "match" may be further bolstered by closely examining the secondary emotions they feel, as SPS positively predicted dispersion scores. Therefore, SPS leads individuals to feel multiple emotions but one emotion stands out enough that individuals with SPS are able to extract this primary emotion and apply it towards identifying the emotion the other person is feeling. Overall, the results of the current study support the view that individuals with SPS possess higher levels of empathy and that (as proposed by Aron et al., 2012) this could be because they engage in deeper processing of their emotional responses.

Although SPS positively predicted both self- and other-focused aspects of empathy, alexithymia negatively predicted the other-focused empathy factor, which taps into empathic concern and perspective-taking. Previous research has also identified a negative relationship between alexithymia and other-focused aspects of empathy in numerous studies (e.g., Di Tella et al., 2020). Despite the fact that positive correlations were seen between alexithymia and two of the self-focused subscales of the self-report empathy measure (i.e., personal distress and empathy subscales) in the current study, alexithymia did not significantly predict the self-focused empathy factor score when taking SPS, childhood emotional abuse, and current depressed mood into account. Alexithymia did, however, positively predict the number of discrete emotions elicited

by each film (i.e., dispersion). It may be that, whereas those scoring high on SPS extract a strong, primary emotion and carefully examine secondary emotional responses in order to generate a nuanced appreciation of their response, alexithymia (occurring alone or in combination with SPS) makes the latter process more difficult, leading to a diminished ability to pinpoint one's emotional reaction. Therefore, alexithymia leads individuals to feel a multitude of emotions; however, no single emotion sticks out and, as a result, individuals are confused as to which emotion they are feeling and therefore which emotion the other individual is feeling. This would explain why Aaron et al. (2018) found that alexithymia was associated with reduced *emotional granularity* (the ability to describe one's feelings precisely), particularly when viewing negatively valenced films. Those with alexithymia might know they feel "something" but not always succeed in associating their imprecise, self-focused response with how another person is feeling. This idea is similar to Bird and Viding's (2014) view that the (other-focused) empathy impairments seen in alexithymia arise because the alexithymic individual has difficulty identifying their own affective state through emotional contagion, and therefore finds it difficult to identify the target's affective state.

Jordan et al. (2016) identified the other-focused aspect of empathy to be a stronger predictor of altruistic actions than the self-focused aspect. The other-focused aspect of empathy was a positive predictor of donations to a hypothetical cause, and the self-focused aspect of empathy was actually a negative predictor of donations. The authors proposed that the self-focused empathy factor can actually be debilitating to altruistic actions, as individuals higher in self-focused empathy perceive a greater level of personal distress while being empathic. In the current study, alexithymia negatively predicted the other-focused aspect of empathy; thus, those scoring higher in alexithymia might be expected to behave in a less altruistic or prosocial

manner. This aligns with research by Patil and Silani (2014) which found that alexithymic individuals were more likely to make more lenient moral judgments related to situations where accidental harm had occurred. Additionally, Zhang et al. (2020) found that individuals with alexithymia were more likely to make utilitarian, over deontological, judgments (i.e., possess a mentality of "the ends justify the means"). Note that, as SPS positively predicted *both* the other- and self-focused empathy factors in the current study, how an individual with SPS may behave in altruistic or prosocial situations may depend on the relative amounts of self- versus other-focused empathy the individual possesses.

Depression symptom severity did not significantly predict how strongly participants experienced the primary emotion of the films, the sense that their feelings matched those of the person featured in the films, or scores on the self- and other-focused factors of self-reported empathy when controlling for other variables. Interestingly, however, depression symptom severity negatively predicted dispersion scores for embarrassing/cute and embarrassing/humiliating films, when taking all other variables into account. Therefore, individuals experiencing increased depression symptoms were less likely to feel a multitude of emotions after watching these films. This relationship could be related to the emotional suppression that occurs with depression. Individuals with depression have been found to experience decreased positive and negative emotions when viewing emotional stimuli (Rottenberg et al., 2002). While this emotional suppression may be a "coping mechanism" for dealing with a depressive episode, emotional suppression has been found to be ineffective in the long run. Specifically, emotional suppression while watching emotional film clips has been associated with a poorer recovery from depression (Rottenberg et al., 2002).

Interestingly, in the current study, scores on the childhood emotional abuse measure did not significantly predict performance on the behavioural task or factor scores on the empathy measure after controlling for levels of alexithymia, SPS and depression. In a recent article, Greenberg et al. (2018) argued that individuals who had experienced childhood trauma showed elevated levels of empathy as adults – particularly with regard to other-focused skills such as empathic concern. Importantly, however, Greenberg et al. (2018) did not measure SPS in their sample. Given that SPS positively predicted other-focused empathy in the current study, the relationship between abuse and increased other-focused empathy in Greenberg et al.'s (2018) study may have been related to SPS, rather than to childhood abuse. It is also possible that, as in the case of negative affectivity, links between childhood emotional abuse and empathy measures would be most apparent in the subgroup of individuals who score high on SPS.

Limitations and Future Directions

Due to the ongoing COVID-19 pandemic, this study was completed online and remotely. As such, the size and resolution of the emotional film clips could not be standardized across participants. In addition, most of the participants were female university students and, although the age range was fairly broad (17 to 44 years), the majority were around 20 years of age. Some studies have identified sex differences in relation to self-focused empathy (e.g., Goerlich-Dobre et al., 2015), and so further work should be undertaken to determine if the results of the current study apply across both sexes, or are relevant to females only.

This study was also somewhat limited in that it utilized a behavioural task to measure participants' conscious experience of their emotional reaction to affective film clips. As a result, the data required subjective assessments. It would be interesting in future research to extend this work by collecting neuroimaging and/or physiological measures in addition to behavioural and

self-report questionnaires. Empathy is associated with activity in specific neural regions and resting-state networks, and both alexithymia and SPS have been associated with altered activity in specific neural regions required for empathy (Acevedo et al., 2014, 2021; Bird et al., 2010; Goerlich-Dobre et al., 2015). Alexithymia has also been associated with differences in heart rate variability, skin conductance response, and electromyography during empathy tasks (Bogdanov et al., 2013; Cecchetto et al., 2018; Härtwig et al., 2020; Lischke et al., 2018; Sonnby-Borgström, 2009). Further research is required to expand the current breadth of knowledge regarding neural and physiological changes associated with these personality traits, and with individual differences in empathy and prosocial behaviour.

It has been proposed that SPS is related to increased activity of the behavioural inhibition system (BIS) and that this may explain why individuals scoring high in SPS are inclined to reflect and potentially avoid threatening and uncertain situations (Aron & Aron, 1997; Smolewska et al., 2006). In the current study, SPS significantly predicted both strong negative and strong positive emotional reactions to affective films. Due to this high level of reactivity, individuals with SPS may be more inclined to "pause and check" in novel situations. Individuals with high levels of co-occurring alexithymia and SPS may be especially affected by a push-pull between the BIS and the opposing behavioural activation system (BAS); indeed Jakobson and Rigby (2021) proposed that these individuals have high levels of anxiety and stress, which may lead them to seek out pleasurable situations and avoid negatively-valenced situations. Further research investigating co-occurring alexithymia and SPS, and activations of the BIS and BAS in situations that arouse emotional contagion, could be conducted to test this hypothesis.

The focus of the current study was on the developmental form of alexithymia seen in the general population; future researchers could extend this by investigating the effects of

alexithymia on emotional contagion in individuals with acquired forms of alexithymia, which occur at high rates in a range of neurological disorders including traumatic brain injury and Parkinson's disease (Hogeveen & Grafman, 2021). Also, additional analyses of the data presented in the present study are currently being conducted to determine whether subgroups of the general population can be identified on the basis of varying levels of alexithymia, SPS, childhood abuse and depression. Similar to past research (Jakobson & Rigby, 2021; Liss et al., 2008), it is expected that different subgroups will be identified and that these subgroups may show distinctive patterns of emotional contagion and empathy.

Theoretical and Clinical Implications

As far as this author is aware, this study is the first to directly measure and confirm relationships between SPS and levels of empathy by utilizing both self-report and behavioural measures of empathy. Additionally, this study provides new insights into the possible basis of empathy deficits found in alexithymic populations, and into other factors that contribute to individual variability in our emotional awareness and empathy.

Having both high and low levels of empathy can lead to socio-emotional difficulties (e.g., negative affectivity and interpersonal conflicts). Identifying specific traits that underlie these individual differences could improve our ability to diagnose and treat individuals struggling with socio-emotional issues (e.g., individuals with autism spectrum disorder, eating disorders, alcohol use, or certain personality disorders) and open up new lines of research designed to investigate empathy deficits in these populations.

Although there is currently no "gold-standard" treatment for alexithymia, a review of psychological interventions targeting alexithymia by Cameron et al. (2014) found that treatments successful at reducing alexithymia scores consistently utilized psychoeducation and skills

training with the goal of improving emotional awareness. It may be that an approach utilizing skills training and psychoeducation regarding affective and bodily states and self-other distinction would be beneficial to target alexithymia and improve empathy levels. Indeed, Saito and colleagues (2016) found that providing instruction that primed alexithymic participants to make a self-other distinction increased these participants' empathy-for-pain. Specifically, participants with alexithymia were better able to correctly estimate the pain another experienced in a particular body part after being instructed to identify the body part as belonging to that person (Saito et al., 2016).

Individuals with SPS, who possess high levels of self-focused empathy, run the risk of experiencing high levels of personal distress that overwhelm them emotionally (Acevedo, 2020). The current findings suggest that this is due to the intense emotional reactions they have to other people. Therefore, empathy-related psychological treatment for individuals with SPS should focus on building emotional regulation and distress tolerance skills (Acevedo, 2020). Research, like the current study, investigating the mechanisms leading to individual differences in empathy levels allows for continued growth in the understanding and creation of treatments for empathy differences and associated emotional regulation difficulties.

Conclusion

In summary, the current findings suggest that alexithymia and SPS are both linked to levels of empathy in the general population. Whereas alexithymia predicts deficits in other-focused aspects of empathy (such as perspective-taking and empathic concern), potentially due to poor interpretation of the individual's own arousal signal leading to poor emotional processing, SPS predicts stronger self- and other-focused empathy, potentially because it increases the strength and granularity of the emotional response felt by the individual. This study

is the first to explore links between empathy differences in the general population and the co-occurring personality traits of alexithymia and SPS. Additionally, this study is the first to measure, through self-report and behavioural measures, increased levels of empathy in individuals with SPS. The findings from this study provide new evidence for theories regarding the mechanisms supporting emotional awareness and empathy, which have implications for the treatment of individuals experiencing socio-emotional difficulties.

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Appendix A: Film Clips in Emotional Contagion Behavioural Task

Film clip	Film duration (s)	One sentence film description	Number of individuals	Valence
Baby dancing to RnB	29	Little boy is dancing to RnB music at a wedding.	Large group	Positive
Escalator spinning	27	Young man is spinning on an escalator.	Alone	Positive
Man crashes into glass door	23	Man misses exit and crashes into glass door.	Alone	Embarrassing/ Cute
Wedding photographer fails	29	Wedding photographer falls into fountain.	Large group	Embarrassing/ Cute
Bride loses teeth drinking	20	Bride loses her teeth during drinking.	Large group	Embarrassing/ Humiliating
Guy breaks glass copying butt	24	Man breaks glass of photocopier when he's copying his butt.	Alone	Embarrassing/ Humiliating
Boy gets hit by car	20	Boy sitting in car jumps out only to be hit by a car in the next lane mid jump.	Alone	Negative
Bull throw and trample	21	Bull throws and tramples torero.	Large group	Negative
Boy drinking tea	31	Boy drinking tea.	Alone	Neutral
NY street	29	Street in NYC.	Large group	Neutral

Samson et al., 2016