Psychopathic Traits, Multimodal Emotion, and Empathy

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Abstract

Psychopathy is a disorder of personality characterized by a lack of conscience, with emotional (interpersonal and affective) and behavioural (lifestyle and antisocial) characteristics.

Psychopathy can also be scored along a continuum as a dimension of personality. Previous research has identified a link between psychopathy and reduced processing of emotional stimuli, as well as low empathy. Yet, one feature psychopathy is the ability to reproduce correct emotional responses despite reduced emotional and empathic experience, likely as a result of social learning. The present study evaluated perception of emotion and empathy relative to psychopathic traits in a sample of undergraduate students, and examined whether increasing the ambiguity of the stimuli would reveal deficits in emotion processing and empathy associated with psychopathy, which would provide further evidence of a learned response to emotional stimuli in individuals high in psychopathy. Rather than static images, the stimuli were dynamic video clips incorporating two types of emotion cues, facial expression and vocal affect, with varying levels of ambiguity in the expression of the emotion. These stimuli were used in four experiments in which emotion recognition and empathic response were measured in large samples of undergraduate participants. Across the four experiments, the predicted interaction between psychopathy and ambiguity of emotion cues was not observed. However, in all experiments, participants with higher levels of psychopathy had reduced emotion recognition accuracy and lower levels of empathy. The present study provides further evidence of an overall deficit in emotion processing in individuals high in psychopathy, and evidence of impaired empathic response using a novel objective measure of empathy.

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Psychopathic Traits, Multimodal Emotion, and Empathy

The ability to perceive emotion in others is argued to be the basis of empathy, the capacity to appreciate the affective state of others. Empathy is an important attribute of human interaction which facilitates social communication and attachment. Although the perception of emotion is believed to be a necessary prerequisite for empathy, it nonetheless remains unclear how empathy and the perception of emotion are linked. The goal of the present study is to examine the mechanism underlying the relationship between empathy and the ability to perceive emotion in others, focusing on individuals who have a deficit in the ability to perceive emotion and how this deficit affects their construction of empathy for others.

Impairments in perception of emotion and empathy have been observed in several types of individuals, including individuals with psychopathic characteristics, those on the autistic spectrum, as well as those with other significant psychiatric disorders, such as schizophrenia and depression. Unlike most of these individuals, however, those with psychopathic characteristics often function successfully in society despite their reduced capacity for empathy and emotion perception. Indeed, some (e.g., Cleckley, 1941; Hare, 1979) have argued that psychopathic individuals are often skilled manipulators who succeed in occupational and interpersonal situations at the expense of others; their diminished experience of empathy allows them to seek personal gain without concern for the well-being of those around them. In the present study, I asked individuals who vary in psychopathic characteristics to classify visual and/or auditory

depictions of emotions. Empathic response was also measured in addition to classification of these emotional stimuli.

In the following sections, I review the literature on emotion perception and empathy, including theories that attempt to explain the experience of emotion, the perception of emotional stimuli, and the relationship between emotion and empathy. I also discuss the definition and prevalence of psychopathy, as well as the theories proposed to underlie the disorder. I will also review previous studies which have explored the relationship between psychopathy, perception of emotional stimuli, and empathy. Although numerous studies have examined either deficits in the processing of emotional stimuli or decreased empathy in psychopathic individuals, few have bridged the gap between these two concepts with a testable hypothesis that includes both emotion perception and empathic responding.

I will then outline the four experiments conducted for this thesis project, which aimed to assess emotion recognition and empathy in individuals that vary in subclinical psychopathy. These studies used dynamic video stimuli containing both emotional prosody and facial expressions, designed to approximate the experience of another's emotional expression in social interactions in order to provide a more ecologically valid test of emotion recognition and empathic response. All four experiments were conducted with samples of undergraduate students varying in psychopathic characteristics, using an online paradigm to present emotional expression in short 12-second video clips with either isolated emotional prosody, facial emotion, or prosody and facial emotion combined. In all four experiments, the relationship between psychopathic traits and both emotion recognition and corresponding empathic response was explored: specifically, whether manipulating the ambiguity of the emotional stimuli would produce variations in emotion recognition and empathy as a function of level of psychopathy.

Emotion and Cognition

A crucial element of social interaction is the ability to read others' emotions (Lindquist, Barrett, Bliss-Moreau, & Russell, 2006). Emotion cognition is a term used to describe the regulation, application, and interpretation of emotions in social interactions which reflect interconnections between emotional and cognitive processes. A necessary aspect of emotion cognition is emotion-specific knowledge: children must develop knowledge of emotions and situations that may elicit these emotions in order to interpret social cues that indicate expressions of emotion (Ackerman & Izard, 2004).

While the ability to recognize basic emotions such as sadness and happiness is thought to be more or less innate and is fully developed by the age of 3 years, the ability to understand more complex social emotions such as shame and guilt is not fully acquired until later in childhood (Ackerman & Izard, 2004). This suggests that aspects of emotional understanding are fundamental to all humans, whereas others that are modulated by cognitive processes.

The relationship between emotion and cognition or indeed whether they are distinct processes is a contentious topic (Fugate & O'Hare, 2014). A pervasive issue in this debate is the disagreement over definitions of both the terms emotion and cognition (Cunningham & Kirkland, 2012). However, numerous studies have provided evidence for a reciprocal relationship between cognition and emotion: emotional stimuli can bias attention towards valenced stimuli (Grider & Malmberg, 2008; Mathews & MacLeod, 2002; Wadlinger & Isaacowitz, 2008), and certain cognitive processes such as reappraisal can modulate emotional responses (Foti & Hajcak, 2008; Grecucci, Georgetta, van't Wout, Bonini, & Sanfey, 2013; Williams, Bargh, Nocera, & Gray, 2009;). Manipulation of individuals' emotional states results

in facilitation of responses to emotion words congruent with the induced emotional state in word-naming or judgment tasks, providing further support for the complex relationship between cognition and emotion (Niedenthal, Halberstadt, & Setterlund, 1997; Niedenthal & Setterlund, 1994; Scott & Robins, 1988).

Lazarus (1991) states that cognition and emotion have a reciprocal relationship: while emotion is always a response to meaning, it can influence thoughts and later emotions. In his cognitive-motivational-relational theory of emotion, Lazarus outlines two stages of appraisal that shape emotion response, both of which have cognitive underpinnings: primary appraisal pertains to the stakes one has in the outcome of a situation, primarily concerning congruence with one's present or future goals; while secondary appraisal deals with options for coping such as blaming or defining of future expectations. Müller et al.'s (2008) resource allocation model is another theory which views emotion and cognition as inseparable: this model predicts that negative emotions influence cognition by depleting cognitive resources and thus worsening performance on complex cognitive tasks.

One source of evidence for the relationship between cognition and emotion comes from studies of brain imaging. The amygdala, a structure in the limbic system of the brain, is implicated in emotional response and behaviour. Emotion is believed to be a more fundamental phenomenon than higher order cognitive processes and consequently, emotional response has been demonstrated to occur prior to more complex cognitive appraisal (Phelps, 2006). Studies have shown that activation in the prefrontal cortex is associated with conscious regulation of emotional response that occurs in the amygdala (Salzman & Fusi, 2010). However, other studies have determined that these connections may occur via other structures such as the dorsal anterior cingulate, and that emotion-regulating processes may be as influential on cognition as the other

way round (Ray & Zald, 2012). Emotion recognition and affective Theory of Mind (mentalizing and making attributions about another's emotional states, typically thought of as a cognitive process; e.g., Baron-Cohen, 2011) have been observed to involve overlapping activation in areas of the brain (Mier et al., 2010). The more recent view of Pessoa and McMenamin (2017) suggests that the relationship between brain function and emotional content is dynamic: emotionally-laden stimuli influence the structure of neural networks, with different brain regions participating in some networks of emotion-processing more so than others and at differing times. Thus, it is not simple to tease out the boundaries between what has classically been labelled as "cognition" vs. "emotion". What is clear from these potentially contradictory findings is that cognition and emotion have a complex interconnection and that these are not merely separate and parallel processes.

Evidence also exists suggesting that recognition of emotional information involves initial judgment of the stimulus as belonging to a discrete category of emotion (e.g., "happiness") with later appraisals determining characteristics of the emotion such as the intensity. Thus, this may involve an automatic process that leads to basic recognition which is followed up by cognitively moderated appraisal processes (Briesemeister, Kuchinke, & Jacobs, 2014).

Research on Perception of Emotional Stimuli

Emotion is conveyed via the content of language (semantic emotion) as well as nonverbal cues such as the emotional quality of speech (also known as vocal affect, i.e., prosody) and facial expressions. Many studies have explored patterns of perception for different types of emotional stimuli in both healthy individuals and patients with varying psychiatric disorders.

Emotional deficits have been documented in a number of disorders, including autism (Bal et al., 2010; Kuusikko, 2009; Samson, Huber, & Gross, 2012), schizophrenia (Brüne, 2005; Edwards, Jackson, & Pattison, 2002; Namiki et al., 2007) and psychopathy (Blair et al., 2002; Casey, Rogers, Burns, & Yiend, 2013; Wilson, Juodis, & Porter, 2011). Autism and psychopathy, in particular, have been described as having similar emotional symptoms of emotional detachment and reduced concern for others' welfare. However, the proposed distinction between the emotional impairments corresponding to these two disorders is that while psychopathy is associated with decreased affect in general, autism is associated with a reduced ability to perceive and respond to the emotions of others rather than reduced emotional experience (Blair, 2008).

Facial expression of emotion. The ability to recognize facial expressions of emotions in others is a necessary skill for communication. Facial expression of emotion is thought to be innate, expressed and interpreted similarly across cultures. People are not able to recognize all facial expressions equally well: they are best at identifying happy expressions, less able to identify sad and angry expressions, and poorest at identifying fearful and disgusted expressions (Martinez & Du, 2012).

There is some disagreement over whether classification of facial expression should be considered discrete and separate categories (categorical approach), or as having overlapping, “fuzzy” edges among categories (continuous approach) (Martinez & Du, 2012). People tend to rate individual expressions as existing on a gradient and belonging to more than one emotion category, rather than identifying them as belonging to separately defined categories (Russell & Bullock, 1986). Therefore, it can be worthwhile to use ratings of emotion intensity to ensure that the intended emotion categories are represented in tasks requiring individuals to distinguish and

categorize emotion. Cross-cultural studies have shown that varying intensities of facial emotion are perceived differently depending on cultural backgrounds of the viewer, suggesting that differences in culturally-based cognitive styles influence innate abilities to perceive emotional faces (Engelmann & Pogosyan, 2013).

Individuals also differ in their ability to perceive facial expressions. Neal and Chartrand (2011) found that when facial muscles were restricted so that viewers could not as effectively mimic the expression they were observing, processing of facial expressions was reduced. Conversely, when facial feedback was enhanced so was processing of facial expressions. One conclusion that may be drawn from this finding is that people are better at perceiving emotion in others' facial expressions when they can have an empathic response to the emotion and experience it for themselves.

Context also appears to be important in making judgments of emotional expression. Incorporation of contextual cues such as voices and words into processing of facial expression occurs with relative automaticity and can influence how the expression is perceived (Barrett, Mesquita, & Gendron, 2011).

Semantic emotion. Two types of cues for emotion exist in language: semantic and prosodic emotion. Prosodic emotion refers to vocal affect and is therefore only present in spoken language. Semantic emotion refers to word meaning plus the collective meaning of individual words due to syntax. Semantic emotion can be presented both visually (affective visual words) and aurally (spoken words with emotional meaning).

Words with emotional meaning have been demonstrated in memory tasks to be more salient and easier to recall than neutral words (Bock & Klinger, 1986; Siddiqui & Unsworth, 2011) and emotion words are also more easily falsely recalled (Bauer, Olheiser, Altarriba, &

Landi, 2009). This increased saliency and memory bias for emotion words can disrupt recall of associated neutral words (Murray & Kensinger, 2012) and exaggerate “attentional blink”, the decreased attention to a second (neutral) word that follows an earlier (emotion-laden) word (Mathewson, Arnell, & Mansfield, 2008). When primed with an emotion word, response to a target emotion word that differs in valence from the prime can produce interference; Hermans, De Houwer, and Eelens (1994) observed interference from emotional primes on respondents’ reproduction (pronunciation) of target words that were incongruent with the emotional prime.

Much of the research on semantic emotion content utilizes cognitive tasks such as the lexical decision task (making a judgment about whether a letter string is a word or a pseudoword, with response times for this judgment being the primary dependent variable). Thus, studies using this type of task tend to focus on cognitive processes related to emotion processing. Affective words produce faster response times than neutral words in lexical decision (Scott, O’Donnell, Leuthold, & Sereno, 2009; Scott, O’Donnell, & Sereno, 2014; Yap & Seow, 2014).

The emotion Stroop task, a variation of the Stroop task (Stroop, 1935), is a cognitive task in which individuals must identify the colour of affectively negative, positive, or neutral words printed in various colours. Affectively negative words produce slower response times in this task than positive or neutral words (Mama, Ben-Haim, & Algom, 2013; van Hooff, Dietz, Sharma, & Bowman, 2008; Williams & Nulty, 1986). This task has been used extensively to assess cognitive-emotional deficits in individuals with various types of psychopathology (Bailey, Paret, Battista, & Xue, 2012; Caparos & Blanchette, 2014; Wikström, Lundh & Westerlund, 2003; Williams, Mathews, & MacLeod, 1996). Research using cognition-based tasks with semantic emotion, particularly those which are assessed based on response times, reveal an effect on

processing of semantic emotional content, which likely involves both cognitive and emotional processes.

Vocal affect. Prosodic emotion (vocal affect) encompasses the perceptual qualities of speech such as pitch, rhythm, and intonation (Banzinger & Scherer, 2005). Individual differences of the speaker must always be considered, as it has been suggested that the idiosyncratic style of the speaker can influence perception of vocal affect recognition (Wallbott & Scherer, 1986).

Emotional prosody that is congruent with the emotional semantic content of words has been found to facilitate processing of the words, resulting in faster response times for identification of words (Levens & Phelps, 2008; Nygaard & Queen, 2008). Deficits in identification of prosodic emotion have been found in individuals with disorders such as Asperger's syndrome (Lindner & Rosen, 2006) and schizophrenia (Bach, Buxtorf, Grandjean, & Strik, 2009; Edwards, Jackson, & Pattison, 2002). Individuals suffering from major depressive disorder have also been found to have a tendency to bias emotional prosody towards more negative emotions (Peron et al., 2011). Several studies have also identified impairments in processing of vocal affect by individuals high in psychopathy (Bagley, Abramowitz, & Kosson; Blair et al., 2002; Blair et al., 2005; Mackenzie & Logan, 2014b), a topic that will be discussed in greater detail below.

In a recent ERP (Event Related Potential) study, Iredale, Rushby, McDonald, Dimoska-Di Marco, and Swift (2013) examined neural correlates associated with the perception of prosody when individuals were asked to identify whether words paired together representing either happy, angry, or neutral prosody were spoken with the same or different emotion tones (e.g., angry paired with angry or angry paired with happy). Results showed that processing

occurred in three stages: the initial stage involved greatest activation in the parietal regions, indicative of emotion feature detection; the second stage showed differential activation in the left versus right hemispheres specific to the particular emotion (left hemisphere activation for happy, right hemisphere for angry); and the third stage involved activation in the prefrontal cortex, indicative of cognitive processing of the stimuli. Iredale et al.'s results provide evidence for an emotional reaction precipitating cognitive processing of emotional stimuli; however, the results also provide further support for the view that both emotional and cognitive processes are involved in the perception of emotional stimuli.

Cognitive decline occurring as a result of aging is associated with a reduced ability to perceive prosodic affect. Older adults are especially poor at identifying prosodic emotions with negative valence (Mitchell, Kingston, & Barbosa Boucas, 2011). Impairments in vocal affect recognition have also been found in individuals with right hemisphere damage, highlighting the importance of the potential role of the right hemisphere in identifying emotional prosody (Adolphs, Damasio, & Tranel, 2002; Harciarek, Heilman, & Jodzio, 2006).

Integration of multimodal emotional stimuli. A consistent finding regarding multimodal presentation of stimuli is that when information is presented via both visual and auditory domains, visual information usually takes precedence (Bertelson & Aschersleben, 1998), including perceptual processes considered to be primarily auditory, such as the perception of music (Tsay, 2012) and speech (McGurk & MacDonald, 1976). This is particularly true when divergent or conflicting information is presented simultaneously via both domains (Collignon et al., 2008; Vroomen, van Linden, Keetels, de Gelder, & Bertelson, 2004), although in some cases conflicting auditory information can interfere with visual processing (Joassin, Maurage, Bruyer, Crommelink, & Campanella, 2004). Interference from contradictory multimodal information can

influence processing of person identity or expressed affect (Campanella & Belin, 2007). When consistent information is presented via both modalities, visual and auditory processing are complementary (Lewis, Beauchamp, & DeYoe, 2000).

Processing of simultaneous visual and auditory information often involves specific pathways for integration relating to processing of sensory inputs, attention, and memory in order to perceive the information (de Gelder, Böcker, Tuomainen, Hensen, & Vroomen, 1999; Joassin et al., 2011). In fact, bimodal information produces a facilitation effect on processing (faster, more efficient responding) compared with unimodal (one modality only) presentation (Collignon et al., 2008) and this facilitation is considered to be evidence of successful integration of stimuli from multiple domains (Calvert et al., 2001). Conversely, a lack of facilitation may indicate a failure to integrate multimodal stimuli, which may reveal a different processing deficit compared to what would be observed with unimodal stimuli alone. This highlights the value of assessing emotion cues in both integrated and isolated contexts when exploring the influence of different channels for emotion on emotion perception.

Semantic emotion (either visual or auditory) has been demonstrated to be the most salient of emotion cues. With respect to processing of different emotion cues within speech only, semantically presented emotion is well attended even in the presence of contradictory emotional information from prosodic emotion cues (Wurm & Vakoch, 1996). Within the same modality (vision), satiation of semantic words (excessive priming leading to a decrease in accessibility of the word being presented) can produce interference in recognition of facial affect relating to the same emotion (e.g., satiation of the word “anger” can lead to slower categorization of angry facial expressions or behaviours) (Lindquist et al., 2006; Gendron, Lindquist, Barsalou, & Barrett, 2012). Semantic context can facilitate facial expression recognition or produce

interference when the context is negative or discordant from the facial expression (Rainis, 2001). Patients who have suffered traumatic brain injuries have difficulty categorizing facial expressions but demonstrate improvements when provided with semantic context to aid in recognition (Croker & McDonald, 2005).

Most studies that use emotional stimuli employ static images or word-length stimuli. Although such studies attempt to extrapolate perceptual findings to real-life perception of emotion cues, Regenbogen et al. (2012a) argue that studies with these types of stimuli have little ecological validity. Cues for emotion perception rarely occur in such restricted contexts: social interactions most often provide multiple sources of cues for emotion, and these cues are dynamic and integrated rather than static and isolated.

In an attempt to rectify this shortcoming in the literature, Regenbogen et al. (2012a) investigated the effects of integrating semantic, prosodic, and facial emotion cues in the form of brief video clips. Participants observed a brief emotional story told by a single individual and were exposed to four conditions: all three emotion channels available simultaneously, and three conditions wherein each of the three channels was made neutral (i.e., no semantic emotion, no prosodic emotion, or no facial emotion cues). They found that participants were not only better at identifying the emotion conveyed in the stimulus when all emotion channels were presented simultaneously, but participants were also more likely to experience an empathic response to the stimulus in the all-channel condition compared with the conditions where one of the channels was made neutral. This underscores the importance of combined (multimodal) cues for emotion that provide context which aid in emotion perception during everyday social interactions.

Cross-cultural perception of emotion. Expressions of basic emotions are believed to be universally recognizable across cultures and therefore be largely resistant to cultural influence, in

keeping with Darwin's (1872) theory that the same basic emotions are experienced and expressed across all mammalian species. Although emotional information is generally perceived similarly across cultures and more similarities than differences are present in intercultural emotion perception, culture-specific patterns of emotional behaviour do exist which appear to provide an in-group advantage for individuals within that culture (Scherer, Clark-Polner, & Mortillaro, 2011). Slight differences exist in the perception of emotion stimuli across cultures, particularly with respect to ratings of intensity of the emotion. These differences have primarily been observed between individualist (e.g., Western) and collectivist (e.g., non-Western) cultures, rather than among Western cultures (Engelmann & Pogosyan, 2013). However, perception of emotional expressions via media such as soap opera scenes appears to be cross-cultural, with similar patterns of recognition observed in both Eastern and Western samples (Krauss, Curran, & Ferleger, 1983).

Summary and Criticisms of Research in Emotion Perception

Results from many studies demonstrate that there are a number of different types of cues for emotion which, when presented simultaneously, can either enhance or interfere with processing of particular emotion cues. Certain cues, such as visually presented emotion, can bias recognition of other types of emotion cues. It is also next to impossible to divorce the influence of cognition from emotion perception, particularly when it comes to integration of emotion cues from different sources as it is unclear what falls under innate emotion-processing and what is influenced by higher-order top-down processing. The limited application of most emotion perception tasks to real-world situations of emotional understanding has been stressed by Regenbogen et al. (2012a). They used a strategy in which multiple types of emotion cues were presented both simultaneously and separately in a dynamically unfolding form. This not only

addresses the issue of limited ecological validity of emotion tasks in laboratory settings, but also the concern of the relative influence of different types of emotion cues and how these cues might interfere with one another. As such, I believe adopting the multimodal approach used by Regenbogen et al. to be a potentially useful methodology for assessing individual differences in emotion perception.

Thin Slices of Behaviour

Studies of “thin slices of behaviour” have found that people can identify much about an individual, including personality characteristics, level of intelligence, and presence of personality disorders, by viewing brief video clips of their behaviour and speech (Ambady & Rosenthal, 1993; Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004; Oltmanns, Friedmann, Fiedler, & Turkheimer, 2004). Viewers can even detect the presence of psychopathic traits from brief video excerpts of behaviour (5, 10, and 20 seconds in length) (Fowler, Lilienfeld, & Patrick, 2009). These studies indicate how quickly and accurately first impressions are formed, and that these impressions can effectively be formed within even a few seconds of observation of an individual’s behaviour.

The ability of viewers to detect intended qualities in “thin slices” underscores the value of employing this type of stimuli for perceptual tasks involving portrayal of emotions. If people can accurately identify multifaceted aspects of personality, such as personality disorders, via short video clips, it should also be an effective way to convey brief expressions of emotion that are likely easier to identify than static images depicting emotion.

Empathy

Singer (2006) argues that empathy is the likely motivation for much altruistic behaviour and what inhibits individuals from inflicting harm on others, as well as enabling social coherence

and communication. Empathy is important for moral development; in addition to allowing for a general understanding of the emotions of others, lower empathy in early adolescence has been correlated with violent behaviour in early adulthood (Galán, Choe, Forbes, & Shaw, 2017). Criminal offenders who demonstrate a reduced ability to “mentalize” and share the emotions of others are more likely to commit crimes against another person (Mariano, Pina, Peretti, Valenti, & Mazza, 2017). The nature and definition of empathy has been the subject of much debate. Singer et al. (2004) broadly define empathy as the ability to understand what another is feeling, and this feeling may refer to an affective or sensory state. Singer et al. found that observing pain in a loved one activates areas of the brain involved in the personal experience of pain, indicating that affective empathy evokes sensory experience in the person experiencing it, also known as “emotion contagion”.

De Vignemont and Singer (2006) propose a definition of empathy that specifies the following requirements: it is an affective state which is isomorphic to the affective state of another. This state is induced through observation or imagination of the affective state experienced by another, and the individual must be conscious that the source of this affective state is another individual. These qualifications allow for a distinction between empathy and similar constructs such as sympathy and cognitive perspective-taking. Singer (2006) makes a distinction between the supposed cognitive and affective components of empathy, stating that these processes involve different neural circuitry. The cognitive aspect of empathy that is associated with Theory of Mind allows individuals to mentalize and interpret others’ “propositional attitudes”, but does not require an affective response. Singer’s proposal suggests that a true empathic response involves an affective state. Therefore, the experience of empathy cannot be attributed to cognitive processes alone.

Empathy is not automatic. Evidence suggests that an empathic response can be modulated by a number of factors including characteristics of the individual, intrinsic qualities of the emotion (intensity, saliency, and valence), and contextual elements. Singer et al. (2006) found that participants in an economic game showed activation in brain areas associated with empathy when they believed a confederate in the game experienced pain, but this empathic reaction was moderated (decreased) when this pain was inflicted upon a confederate who cheated.

A distinction has also been made between trait and state empathy. A recent meta-analysis observed a relationship between state feelings of “being moved” (proposed as a broader emotion related to state empathy, called *kama muta*) and trait empathy (Zickfeld, Schubert, Seibt, & Fiske, 2017). Van der Graaff et al. (2016) found that state and trait empathy were modestly correlated, but there was little relationship between state and trait empathy for happiness. This suggests that empathic processes may not be equivalent for all emotions.

Dadds et al. (2012) state that a necessary condition for human empathy is the proclivity to attend to the emotions of others. The development of empathy is critical when considering the aetiology of psychopathy. Two routes have been identified for normal socialization and development of a “conscience” associated with the ability to experience empathy. While the first route has a physiological basis, the second involves self-regulatory processes. The first route to the development of conscience is a highly reactive amygdala which allows children to identify distress in others, thereby engendering an empathic response. The second route involves internalization of morals based on expected norms for social behaviour, often imposed through parental discipline. Children must use effortful control to self-regulate their own responses, over time producing appropriate empathic responses (Posner & Rothbart, 2007; Rothbart, Ahadi, &

Hershey, 1994). Both processes for socialization are important as one or both routes may be implicated in the development of psychopathy.

Alternatively, Baron-Cohen (2011) asserts that the pathway to empathy involves 10 key areas of the brain. He argues that if certain areas involved in this empathy circuitry, such as the frontal cortex, amygdala, and the anterior cingulate cortex, fail to develop appropriately, the result is the reduced capacity for empathic response seen in psychopathic individuals. In summary, both malfunctioning cortical and/or limbic regions of the brain and associated poor socialization are implicated in the failure of psychopathic individuals to develop normal levels of empathy.

Gender differences in empathy. Women have higher levels of empathy than men, including women in incarcerated populations (DeWolfe, Jackson, & Winterberger, 1988). The difference in empathy between women and men may also affect the perception of emotion (Rogstad & Rogers, 2008). Regenbogen et al. (2012a) observed that females were more likely than males to rate their own emotional state after exposure to an emotional conversation excerpt as being the same emotion as they identified in the conversation, and were more likely to rate the intensity of their own related emotional state as more intense. However, when galvanic skin response was used in the same study to objectively measure empathic responding, males actually showed greater skin conductance, indicating a stronger physiological response to the stimuli. Regenbogen et al. posited that males may experience empathy in a different way than females, potentially having a less outwardly expressed outlet for an empathic response as a result of socially prescribed gender roles that tend to restrict men's overt expression of emotion.

Social cognition

Empathy (both affective and cognitive), Theory of Mind, and emotion understanding are said to combine to form a construct known as social cognition (Ornaghi, Brockmeier, & Grazzani, 2014). Note that while some empathy researchers equate Theory of Mind with the cognitive form of empathy, researchers in social cognition differentiate these two constructs. Studies have shown that children demonstrate improvements in social cognition after training, including approaches such as conversational training to improve understanding of emotions, and the effects of training remain stable after a 6 month follow-up (Ornaghi et al., 2014).

Neurocognitive Accounts of Empathy

In consideration of the various theories and definitions of empathy, there is increasing agreement amongst researchers that empathy is the result of three neurophysiological processes: 1) an emotional simulation process that mirrors the emotion of another's experience, with neural activation in areas such as the limbic system; 2) a conceptual, perspective-taking process, associated with cortical areas such as the prefrontal cortex; and 3) an emotion-regulation process that serves to soothe personal distress at the pain or discomfort of the other individual, which initiates compassion and helping behaviour in the person experiencing the empathic response. This latter response is based in areas of the orbitofrontal and right parietal cortex (Elliot, Bohart, Watson, & Greenberg, 2011). The first two processes are representative of the affective and cognitive components of empathy, and neural accounts suggest that these are two separate but overlapping physiological processes. The present study attempts to address the emotional component of empathy in the context of an emotion deficit theory of psychopathy, bearing in mind the caveat that it may not be possible to fully separate the cognitive and emotional processes involved in empathic responding.

Criticisms of Empathy Research

The primary concern when evaluating theories of empathy is the overlap among constructs relating to empathy. In particular, similarity in definitions and common usage of the constructs of sympathy and empathy are sources of confusion. In order to apply a theory of empathy, one must select a particular definition of empathy and work within the parameters of that definition. Additionally, the overlap between the constructs of empathy and social cognition makes it difficult to delineate distinctions in findings between these two concepts. Ornaghi et al. (2014) suggest that social cognition is a more comprehensive construct which subsumes empathy, with the implication that cognitive empathy and Theory of mind are separate constructs. The duality of cognition and emotion in the experience of emotion is evident, despite controversies about the details of the relevant concepts. While acknowledging these controversies, the emphasis in the present study will be on the emotional component of empathy. This is arguably the most crucial element of an empathic response, because in order to experience empathy, one must first identify emotion in another individual and then experience a resulting emotion themselves (Dadds et al., 2012; which may or may not be consistent with the observed emotion, depending on the definition of empathy).

The broadest definition of empathy can potentially include several types of emotional responses. A particular situation or an emotional state present in another person may elicit any number of emotional responses in an individual that are not necessarily consistent with the emotion experienced by the other person. For example, one may observe another individual being treated unjustly and experience anger; while this emotional reaction may reflect sympathy or perspective-taking, it would not necessarily be considered true empathy if the emotion experienced by the observer is not the same as the emotion of the individual being poorly treated.

For example, Marsh (2012) defines empathy as “a general term for an emotional response to another’s emotional state”, wherein such emotional response may either be congruent with (e.g., observing fear, experiencing fear) or complementary (e.g., observing pain and experiencing anxiety). This encompasses a much broader range of emotional responses for empathy compared to restricting empathy to refer to a vicarious emotional response. For the purposes of the present project, the more concise and constrained definition of empathy will be used, namely, that empathy will be specified as elicitation of an emotion consistent with (i.e., a similar emotion to) the emotion of another.

In addition to controversy over the definition of the construct of empathy, empathy measures often have questionable validity. The Empathy Scale (Hogan, 1969), which was one of the first measures used widely as a measure of cognitive empathy, demonstrated poor test-retest reliability and internal consistency, with limited replication of the originally hypothesized factors (social self-confidence, even-temperedness, sensitivity, and non-conformity; Baron-Cohen & Wheelwright, 2004; Spreng, McKinnon, Mar, & Levine, 2009). The Questionnaire Measure of Emotional Empathy (QMEE; Mehrabian & Epstein, 1972), was developed to tap into emotional or affective empathy in particular; however, the scale was found to reflect general emotional arousal more than empathy per se (Mehrabian, Young, & Sato, 1988). The Interpersonal Reactivity Index (IRI; Davis, 1983) was designed to measure both cognitive and affective empathy; however, this measure seems to be more a measure of imagination and emotional self-control than these two facets of empathy (Baron-Cohen & Wheelwright, 2004). Thus, not only has empathy been challenging to define, but corresponding measurement of this construct has proven difficult. This is one of the reasons that a more “objective” measure of empathy was selected for the present study than a self-report measure: participants will be asked to report on

their emotional state following exposure to a stimulus rather than being asked to make a judgment or respond to a statement, and this perceived state will be compared to the emotion in the stimulus to which they are responding. This will hopefully reduce some concerns about using self-report measures of empathy, including the difficulty teasing apart cognitive from affective empathy.

Empathy and Perception of Emotion

Dampening participants' facial feedback when viewing facial expressions – a procedure derived from work on “embodied” perception – impairs people's ability to read other's facial emotion (Neal & Chartrand, 2011). In other words, when people are not able to mirror the facial expressions of others, also known as motor empathy, their emotion perception abilities are reduced.

A recent meta-analysis by Olderbak and Wilhelm (2017) reviewed the results of four studies that explored the relationship between emotion perception and empathy. These studies included a range of sample characteristics and methodologies. Results showed that across the four studies, emotion perception (across different emotions) was weakly related to both cognitive and affective empathy. This relationship was no stronger when an emotion-specific model, i.e., the relationship between empathy and perception of individual emotions, was used. The authors suggest that the lack of strength observed in the relationship between emotion perception and empathy may be due to weaknesses in measurement of both constructs. These findings indicate that there is a relationship between emotion perception and empathy, although it may not have been sufficiently explored to date.

Psychopathy

Individuals with psychopathic characteristics have difficulty accurately perceiving emotional information that is associated with a deficit in empathy. In this section I describe more fully the characteristics of psychopathy, the theories that have been proposed to account for psychopathy, plus how psychopathy is measured.

Defining Psychopathy

The psychopathic personality is characterized by behavioural features that include impulsivity and deviant behaviour and emotional features that include shallow affect and callousness. A psychopath is said to have no conscience: psychopathic individuals are highly driven by reward motivation and demonstrate a clear disregard for potential negative consequences of their actions or the welfare of others, particularly if such consideration thwarts their personal objectives. Psychopathic individuals also lack empathy, making them willing to engage in behaviour or crime that the average individual would find aversive because of the resulting harm or distress that might be inflicted upon others. The emotional and behavioural features of psychopathy are at their extreme in individuals diagnosed with psychopathy but vestiges of these features can be found in individuals who fall below the clinical cutoff for a diagnosis of psychopathy. In short, although psychopathy is a disorder of personality, it also exists as a continuous personality trait present to varying degrees in the general population.

The mechanisms underlying psychopathy are not fully understood. However, a growing body of research suggests that deficits in processing emotion information are typically associated with increasing levels of psychopathy, a relationship that may account, at least in part, for the reduced empathy associated with psychopathy. For example, recent research by Mackenzie and Logan (2014b) has shown that individuals who have higher levels of psychopathic characteristics

can accurately identify the emotion conveyed in spoken sentences but not in spoken words, whereas individuals with fewer psychopathic characteristics are equally accurate at identifying emotion in both types of utterances. The critical difference is the duration of the prosodic cues that convey the emotion (e.g., happiness, sadness, anger, fearfulness) is reduced in isolated words compared to sentence-length stimuli, implying that individuals with higher levels of psychopathy require more information to identify emotions. In light of results such as this, the present investigation is designed to explore combinations of emotion expression, where, in addition to prosodic cues to emotion being presented, visual cues to emotion are also presented. Examining the effect of prosodic and visual cues, both individually and together, will provide a more complete picture of the differences between highly psychopathic and less psychopathic individuals in processing various types of emotional cues.

The psychopathic personality was originally identified by Cleckley (1941) in his work, *The Mask of Sanity*. Cleckley was the first to characterize a type of individual who conveys the outward appearance of normalcy, yet inwardly lacks a conscience or concern for the welfare of others. Cleckley's original description of psychopathy included 16 criteria within three dimensions of impaired functioning: interpersonal, behavioural, and affective. Features within these three dimensions include unresponsiveness in general interpersonal relationships, inadequately motivated antisocial behaviour, and lack of remorse or shame. The shallow affect psychopaths possess prevents them from experiencing normal emotions and in turn, they fail to appreciate the consequences their actions will have for others. Yet, their ability to portray socially acceptable behaviours and appropriate emotional reactions belies their true qualities of shallow affect and callousness. Cleckley's work provided the foundation for modern conceptions of psychopathy. It is from this foundation that Hare developed the Psychopathy Checklist (PCL;

1991) for the assessment of psychopathy. The PCL (and its current version, the PCL-R [Psychopathy Checklist-Revised]) and other tools for measurement of psychopathy that are based largely on the work of Cleckley and Hare will be discussed in greater detail below.

Although they comprise less than 1% of the population (Coid, Yang, Ullrich, Roberts, & Hare, 2009; Forth, Brown, Hart, & Hare, 1996), assessments of psychopathy in community samples have estimated that as many as 3.6% of the population may be characterized with “probable psychopathy” (Coid & Yang, 2008) which increases their risk of having the emotional and behavioural characteristics associated with psychopathy (note that the term “probable psychopathy” is used by Coid and Yang to define the group of individuals scoring high on the range of psychopathic traits, but below the cutoff for clinical psychopathy). As a result of their impulsive and antisocial behaviour, individuals who meet the criteria for clinical psychopathy are highly overrepresented in incarcerated samples with estimates for incidence rates in this population of between 8 and 20% (Coid et al., 2009; Assadi, Noroozian, Pakravannejad, Yahyazadeh, & Aghayan, 2006), although rates of psychopathic females are as low as 2% due to lower prevalence of the disorder in females than males (Coid et al., 2009). Convicted psychopaths are more likely to engage in violent crime (Coid, 2002) and recidivate when released from prison (Hemphill & Hare, 1995; Singh, Grann, & Fazel, 2011) than nonpsychopathic criminals.

Psychopathy has not been recognized in the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-IV; American Psychiatric Association, 1994) as a distinct psychiatric disorder. It has often been subsumed under disorders such as sociopathy and Antisocial Personality Disorder (APD) which have considerable overlap with psychopathy yet

are distinct pathologies (Vitale & Newman, 2008). The latest version of the DSM, the DSM-5 (American Psychiatric Association, 2013), combines the features of APD and psychopathy into a single personality disorder: Antisocial/Psychopathic. Although the construct of psychopathy should not be defined by the tool used to assess it, it is often inseparable from measures such as the PCL-R because of its lack of recognition by the DSM as a distinct disorder.

The etiology of psychopathy is unknown. However, evidence suggests there is a genetic component to psychopathy. For example, Viding et al. (2005) identified a high heritability index for callous-unemotional traits in children based on the results of a twin study. Moreover, most experts agree that psychopathy is related to biologically determined factors like temperament, which discriminates psychopathy from sociopathy, as the latter is more often associated with a faulty belief system attributed to environmental factors such as poor parenting or lack of socialization (Lykken, 1995; Perez, 2012). Unlike psychopaths, who often act as though they do not possess a conscience and therefore a sense of morality, sociopaths do have a conscience and a moral compass but the direction of this compass is skewed from what most individuals would deem socially acceptable (Pement, 2013). In summary, whereas either disorder can lead to antisocial behaviour, the etiology and conscious (or unconscious) processes that lead to inappropriate behaviour differ between the two.

Evidence also exists that mistreatment in early childhood can modify the neurobiology of the brain, in particular the amygdala, resulting in the diminished stress responses and emotion observed in psychopathic individuals. For these individuals the propensity to engage in antisocial behaviour would be dependent upon the opportunities available to use instrumental aggression in pursuit of personal goals, with successful aggression reinforcing this behaviour (Daversa, 2010). Dargis and Koenigs (2017) found that witnessing domestic violence during childhood was

associated with higher levels of psychopathy overall, and this relationship was particularly strong for the interpersonal/affective characteristics of psychopathy. Thus, while psychopathy is viewed as primarily of biological rather than environmental origin, early trauma may modulate neural structures implicated in the development of psychopathy.

Although the most common stereotype of a psychopath is that of a violent offender, the reality is that the majority of individuals who meet the criteria for psychopathy manage to avoid the criminal justice system. Whether this is because they do not engage in crime at all or are able to skillfully elude punishment is not clear; however, the distinction between incarcerated psychopaths and these individuals has earned the latter the title of “successful psychopaths”. The etiology of the “successful psychopath” may be similar to that of the incarcerated psychopath but the developmental outcomes may differ due to different environmental influences. Babiak, Neumann, and Hare (2010) found a higher incidence of psychopathy in a corporate sample compared to a community sample. Therefore, even though not all psychopathic individuals will commit violent crimes that lead to punitive consequences, their superficial charm and callous manipulation allow them to succeed in corporate settings via underhanded tactics that are interpersonally destructive to those around them.

The expression “They know the words but not the music” (Johns and Quay, as cited in Blair et al., 2006) has been used to describe the paradoxical ability of psychopaths to convey an appropriate emotional response even though they do not experience emotion like an average person. Lack of empathy and remorse are primary characteristics of psychopathy, yet psychopathic individuals are often able to skillfully replicate the outward expression of these feelings. This is the “mask of sanity” originally described by Cleckley (1941). One explanation is that psychopaths are able to learn appropriate responses via an understanding of social feedback

so as to project the expected reaction in a given situation. Psychopathic individuals demonstrate a normal capacity to judge complex social emotions based on information from the eye region alone (Richell et al., 2003) and accurately judge the trustworthiness of an individual using facial cues alone (Richell et al., 2005). These results are surprising, given that the amygdala is implicated in successful completion of both tasks. However, both tasks may rely more on acquired social skills than genuine emotional understanding. The true capacity of the psychopathic individual to perceive and interpret emotion is revealed, however, in studies examining psychopathic traits relative to emotional stimulus-processing, a topic that will be discussed in a later section.

Several accounts of psychopathy distinguish between two theoretically distinct categories of psychopathy: primary and secondary psychopathy. Primary psychopathy characterizes core emotion deficits such as callousness, shallow affect and interpersonal manipulation, whereas secondary psychopathy places an emphasis on antisocial behaviour (Ross et al., 2007). An important difference between primary and secondary psychopathy is the presence or absence of anxiety: primary psychopaths are identified as having low anxiety and fearlessness, while secondary psychopathy is associated with higher anxiety and neuroticism, putting these individuals at risk of mood disorders (Hughes, Moore, Morris, & Corr, 2012). The distinction between primary and secondary psychopathy is not a focus of the present project.

Measurement of Psychopathy

The most widely used diagnostic instrument for psychopathy is the Psychopathy Checklist Revised (PCL-R; Hare, 1991; 2003). It was created as a way to assess the emotional and behavioural symptoms of psychopathy originally identified by Cleckley (1941). As noted previously, the PCL-R should not be considered synonymous with psychopathy; it is merely a

tool for assessment of the disorder. However, it is the most commonly used diagnostic measures and many other psychopathy measures are based on it.

The PCL-R is scored using a semi-structured interview and file information about past behaviour. It is designed to be administered in forensic settings by a trained expert. The PCL-R has a four-factor structure with Lifestyle and Antisocial and Affective and Interpersonal components (Neumann, Hare, & Newman, 2007) that reflect the emotional and behavioural elements of the disorder. Psychopathy can be assessed using the total PCL-R score or it may be split up into its distinct components based on the four factor structure. It is commonly collapsed into a two-factor structure for analysis: the Interpersonal and Affective factors can be combined into a single factor representing the emotional features of the disorder, with the Lifestyle and Antisocial factors being combined into a single factor that represents the behavioural features. The PCL-R has 20 items, each scored on a 3-point scale: an item score of 0 indicates the characteristic is definitely not present, whereas an item score of 2 indicates the characteristic is definitely present. This yields a total possible score of 40, with a score of 30 or above generally identified as the cutoff criterion for psychopathy. The fact that a cutoff score is specified might suggest that the theoretical approach underlying the development of the PCL-R views psychopathy as a taxon (either present or absent). However, because the measure is scored continuously from 0 to 40 also suggests that a PCL-R-based approach to assessment of psychopathy is amenable to the view of psychopathy as a dimensional trait. A factor analysis and set of taxometric procedures performed by Walters, Duncan, and Mitchell-Perez (2007) provided support for a dimensional interpretation of the PCL-R. A youth version of the PCL-R, the PCL:YV (Forth, Kosson, & Hare, 2003), has also been developed, with a factor structure similar to that of the PCL-R (Kosson et al., 2013). The combined two-factor structure of the PCL-R has

been corroborated by evidence from neuroimaging studies: Anderson et al. (2017) found that during implicit emotion processing, the interpersonal/affective (Factor 1) scores of the PCL-R were related to reduced emotion-dependent influence on visual processing areas, while antisocial-lifestyle (Factor 2) scores were related to increased activation of the amygdala and related regions relating to stimuli saliency.

While the PCL-R should not be considered synonymous with the definition of psychopathy itself, it can be used as a tool to help understand the nature of psychopathy. Using a latent-profile analysis, Hare (2016) identified three profiles of offenders who score highly on the PCL-R: manipulative psychopaths, aggressive psychopaths, and sociopaths. Manipulative psychopaths and aggressive psychopaths are viewed as variants of psychopathy, whereas sociopaths are a subtype of offender.

A number of measures have been created to assess dimensional psychopathic traits in the general population, a construct that could be labeled “subclinical psychopathy”. These include the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996), the Levinson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995), the Triarchic Model of Psychopathy (Patrick, Fowles, & Krueger, 2009) and the Self-Report Psychopathy Scale (SRP; Williams, Paulhus & Hare, 2007). Measures developed for assessment of psychopathic traits in the general population have demonstrated concurrent validity with the primary forensic psychopathy measure (the PCL-R) in their ability to recognize these traits in both forensic and non-forensic (community) samples (Malterer, Lilienfeld, Neumann, & Newman, 2010; Tonnaer, Cima, Sijtsma, Uzieblo, & Lilienfeld, 2013). Psychopathy measures developed for use in the general population, such as the Psychopathic Personality Inventory (PPI), have been used to predict subjective judgments such as moral reasoning in populations such as business people

(MBA students) where one might expect to see higher than average psychopathic traits (Heinze, Allen, Magai, & Ritzier, 2010).

The Self-Report Psychopathy scale was used in the present study. The SRP-III (Paulhus, Neumann & Hare, in press) short version is frequently used to assess psychopathic traits in non-incarcerated samples. The first version of the SRP was developed by Hare and colleagues as a measure of continuous psychopathic traits based on the same underlying factor structure as the PCL-R. The first version of the SRP was developed in 1985, and has since been revised twice and validated through considerable use in both forensic and community samples (Williams & Paulhus, 2004). The SRP was selected as the measure of psychopathy in the present study for several reasons. First, the structure of the SRP maps onto that of the PCL-R, making it easier to draw conclusions about the relationship between psychopathy as a construct within the general population and in forensic settings where rates of “clinical psychopathy” are higher. Second, the SRP has been validated in many studies, including both forensic and community samples, providing further evidence that it is measuring a construct that can be described in terms of both of these populations. Third, the factor structure of the LSRP and the PPI have received some criticism: the LSRP Factor 1 is related more to secondary psychopathy and antisocial behaviour than the core affective/interpersonal characteristics associated with psychopathy, and the PPI has a different personality profile from measures such as the PCL-R (factor analysis reveals that the PPI subscales of Machiavellian Egocentricity and Coldheartedness are consistent with Factor 1 of the LSRP and SRP, yet these subscales are not part of the PPI Factor 1). Despite these issues, it is important to appreciate that all of these self-report measures have high validity as measures of psychopathy, and generally comparable factor structures (Seibart, Miller, Few, Zeichner, & Lynam, 2010). One study did report that while scores on the SRP were correlated with those on

the PCL-R, they were not as highly correlated with the PCL-R as scores on another forensic measure of psychopathy: the Comprehensive Assessment of Psychopathic Personality: Institutional Rating Scale (CAPP-IRS; Cooke, Hart, & Logan, 2004). Thus, despite the advantages to using the SRP and its similarity in construction to the PCL-R, it is possible that the SRP may not capture the full range of psychopathic traits as effectively as a forensic measure of psychopathy, and thus one must use caution when extrapolating results on the SRP to forensic populations with clinical psychopathy.

The SRP has four facets (Criminal Tendencies, Erratic Lifestyle, Callous Affect, and Interpersonal Manipulation) that can be further collapsed into two broader factors, behavioural and emotional components. The application of a subclinical measure that is structured similarly to the PCL-R allows for extrapolation from a sample of individuals varying in subclinical psychopathy to similar behaviours in individuals with “clinical” psychopathy.

Theories of Psychopathy

Although its cause and etiology are not fully understood, a number of theories have been proposed that attempt to explain the mechanisms underlying psychopathy. These include neurocognitive theories such as the violence inhibition mechanism and the fear dysfunction hypothesis, cognitive theories such as the response modulation hypothesis, as well as neural accounts such as left hemisphere lateralization, amygdala dysfunction, hemisphere lateralization hypothesis, and frontal lobe dysfunction.

Most individuals find the experience of distress in others to be aversive, thereby inhibiting actions that would cause such distress in order to avoid the negative experience of another’s suffering. The violence inhibition mechanism (VIM) hypothesis asserts that this

experience is impaired in psychopaths; that is, highly psychopathic individuals do not experience the same aversion to others' distress as normal individuals. Even animals like rats demonstrate this aversion to causing torment in another rat (Rice & Gainer, 1962), highlighting that this experience is biologically-based and not species-specific. Consistent with the VIM, a number of studies have found that psychopathic individuals have reduced physiological response to the observation of distress in others (Blair, Jones, Clark, & Smith, 1997; Blair, 1999). However, the VIM fails to account for findings in support of other hypotheses such as fear dysfunction and response modulation. It is also unable to explain results of studies that point to the combined influence of temperament and environmental factors on the development of morality.

The fear dysfunction hypothesis states that psychopaths do not experience fear in the way healthy individuals do, thereby diminishing the normal tendency to avoid punishment or negative consequences. This theory posits that moral development occurs as a result of fear of punishment. As this process is believed to be deficient in psychopaths, these individuals fail to develop the moral guide known as a conscience. While non psychopathic individuals will avoid carrying out actions with socially-imposed sanctions out of fear of punishment, psychopaths do not possess this aversion to punishment and therefore do not feel averse to committing social transgressions. Non psychopathic individuals will avoid engaging in behaviour for which they have previously been punished in order to prevent future punishment. Psychopaths do not develop the foresight to avoid engaging in behaviour for which they will be punished, as their lack of aversion to punishment offers them no disincentive to engage in this behaviour if they are motivated to do so. Studies of aversive and fear conditioning (Hare, Frazelle, & Cox, 1978; Birbaumer et al., 2005), passive avoidance learning (Newman & Kosson, 1986; Mitchell et al., 2004) and response reversal (Mitchell, Colledge, Leonard, & Blair, 2002; Blair et al., 2005)

provide support for this hypothesis. Additionally, psychopathic individuals have demonstrated reduced physiological and subjective responses to fear-inducing situations (Marsh et al., 2011). However, the fear dysfunction hypothesis leaves some issues unresolved. According to Blair et al. (2005) the theory is unable to predict antisocial behaviour, it suggests that moral development occurs as a result of fear of punishment alone with no consideration of the role of empathy, and it proposes that there is a single system involved in fear response. A recent review (Hoppenbrouwers, Bulten, & Brazil, 2016) observed inconsistencies within the literature on dysfunctional fear and psychopathy in terms of how “fear” is defined and measured. The authors suggest that psychopathy may not be related to fearlessness in general, but more specifically to threat detection and responsivity which have been included under the umbrella term of “fear”. This may at least partially account for mixed findings relative to the association between dysfunction fear and psychopathy.

The VIM and fear dysfunction hypothesis can be broadly grouped as a set of theories which propose an underlying deficit in emotion-processing as the antecedent for the symptoms of psychopathy. These two theories are criticized, however, because each fails to explain the results supporting the other. An additional theory, the Integrated Emotions System (IES) can resolve the discrepancies between findings supporting the VIM and those supporting the fear dysfunction hypothesis (Blair et al., 2005). The IES posits that rather than a general impairment in amygdala functioning, psychopathic individuals possess a deficit in representation of affect that occurs via the amygdala. The implications of this impairment are that psychopathic individuals do not make normal affective associations with conditioned stimuli, thereby failing to develop normal fear reactions and aversion to others’ distress.

According to the dysfunctional amygdala hypothesis (R. Blair et al., 2006), the proposed mechanism underlying the lack of fear experienced by psychopathic individuals is a dysfunctional amygdala and limbic system. The amygdala plays an important role in fear response and orienting attention toward threatening stimuli. The fear dysfunction hypothesis suggests that the amygdala of a psychopathic individual is underactive, restricting the response they would have toward stimuli that would induce a fear reaction in a non psychopathic person. Psychopathy has been correlated with reduced amygdala activity in response to emotion regulation tasks in neural imaging studies (Harenski, Kim, & Hamann, 2009).

However, the proposed fear dysfunction and associated dysfunctional amygdala theories may come with a caveat. A recent study by Schultz et al. (2016) found that when psychopathic individuals were differentiated by primary vs. secondary psychopathy, primary psychopaths actually showed increased activity in the dorsal amygdala and the anterior cingulate in response to classical fear conditioning. This is contradictory to the relationship proposed by the low fear/dysfunctional amygdala hypotheses. Secondary psychopaths showed the opposite effect, with the decreased amygdala activity in response to fear conditioning that one would expect to be associated with psychopathy. Thus, there may be differences in amygdala activation in psychopathic individuals based on other related characteristics, such as level of anxiety.

Marsh (2016) identifies several accounts that have been proposed to explain how the amygdala is implicated in identification of fearful expressions. These include 1) increased vigilance in response to potential danger, 2) focusing attention to the eye area of faces, 3) response to an unconditioned aversive stimulus, or 4) the generation of an empathic fear response. Of these proposed explanations, the only one that can explain impaired fear recognition across modalities is empathic fear. Compared to altruistic individuals who have

enhanced amygdala function in response to fear, reduced amygdala activation in psychopathic individuals does provide evidence to suggest that impaired processing of fearful expressions is dependent on a link between fundamental empathic processes and amygdala responses to fear.

Several neurophysiological theories of psychopathy have been proposed. These include the left hemisphere activation hypothesis, the somatic marker hypothesis, and deficits associated with dysfunction of the frontal lobe. The left hemisphere activation (LHA) hypothesis (Kosson, 1998) is a neurophysiological theory suggesting that cognitive impairments in psychopathic individuals become evident under conditions involving increased processing demands on the left hemisphere. Under conditions where processing demands in the left hemisphere are equal or less than those in the right hemisphere, psychopathic individuals should demonstrate no deficits in cognitive processing compared to normal individuals (Kosson, 1996). Mayer and Kosson (2000) observed an underdominance of right handed users in a sample of psychopathic inmates compared to nonpsychopathic inmates and prevalence of right-handedness in the general population. This prevalence of left-handedness could not be accounted for by other factors. Mayer and Kosson concluded that it was therefore likely that functioning was lateralized primarily in the right hemisphere for this group of psychopaths compared to a group of nonpsychopaths, consistent with the LHA.

As predicted by the LHA, psychopaths demonstrate atypical lateralization of language function resulting in below-average language processing (Hare & McPherson, 1984). Jutai, Hare, and Connolly (1987) observed unusual lateralization of ERP responses to a word-processing task in psychopaths under conditions of distraction, concluding that psychopathic individuals have limited left hemispheric resources for processing lexical stimuli which is particularly pronounced when increasing attentional demands are placed on these resources.

However, not all studies support the theory of hemisphere lateralization in psychopaths (Hare, 1979). More recently, an interaction between the LHA and executive weakness (EW) has been proposed as the mechanism underlying psychopathy that could account for previously mixed findings testing the LHA alone. Suchy and Kosson (2006) identified deficits in cognitive processing by psychopathic individuals but only in verbal tasks with high executive demands, consistent with the LHA by EW interaction explanation.

Studies of individuals with acquired frontal lobe damage and those who demonstrate aggressive or antisocial behaviour that is associated with decreased frontal lobe activity implicate deficiency in the frontal lobe in psychopathy (Hecaen & Albert, 1978). However, this hypothesis does not distinguish between reactive (unplanned aggression initiated by heightened emotional states such as anger) and instrumental aggression (intentional aggression employed to achieve a specific goal), which are believed to be distinct constructs. As it is instrumental aggression that is specifically associated with psychopathy, it is important that this distinction be made as it is not clear whether frontal lobe dysfunction is associated with both types of aggression. The frontal lobe dysfunction hypothesis is also criticized for its lack of specificity regarding which areas of the frontal cortex may be involved in psychopathy, and its failure to identify why damage to this region would result in an increase in aggressive behaviour (Blair et al., 2005).

Other studies have connected more specific areas of the frontal lobe with the executive functioning impairments and antisocial behaviour associated with psychopathy. Psychopaths demonstrate deficits in behavioural inhibition comparable to patients with orbitofrontal lesions (Pham, Vanderstucken, Philippot, & Vanderlinden, 2003). Psychopaths also fail to display normal punishment learning, as identified in studies using card games such as the Iowa Gambling Task (Bechara, Damasio, Damasio, & Anderson, 1994). In this task, whether

participants receive reward or punishment depends on which deck of cards they choose to draw from: two decks are high risk, high reward resulting in overall loss; two decks are low risk, low reward resulting in overall gain. Participants should be able to recognize the advantage of playing from the low risk deck rather than the high risk deck; however, patients with ventromedial lesions and psychopathic patients both demonstrate a failure to develop this strategy, instead persistently drawing from the high reward deck and suffering an overall net loss.

Another area of the frontal cortex that has been implicated in psychopathy is the orbitofrontal cortex. K. Blair et al. (2006) identified processing deficits in the orbitofrontal cortex in psychopathic individuals using an object alternation task. Both developmental and acquired (i.e., resulting from brain lesions) forms of psychopathy have been linked to impairment in the orbitofrontal cortex (Mitchell, Avny, & Blair, 2006). An explanation for the connection between psychopathy and specified frontal lobe dysfunction can be provided by the somatic marker hypothesis.

The somatic marker hypothesis (Damasio, 1998) posits that the ventromedial cortex (which includes both the medial and orbitofrontal cortices) governs a set of regulatory physical states designed to provide feedback for behaviour so as to either encourage or discourage the behaviour from perpetuating. These feedback loops, identified as “somatic markers”, signify the behaviour as either negative or positive and provide corresponding physiological feedback that influences the likelihood of the behaviour being repeated. Thus, the somatic marker hypothesis may contribute a cognitive framework for the underlying physiological dysfunction of ventromedial and orbitofrontal cortices involved in psychopathy.

The response modulation hypothesis (RMH) (Lorenz & Newman, 2003; Patterson & Newman, 1993) is a cognitive theory that offers a different account of psychopathy from emotion-based theories of psychopathy. The RMH posits that symptoms of psychopathy are not the result of a deficit in emotion-processing but rather a deficiency in the ability of highly psychopathic individuals to allocate attentional resources. Psychopaths are highly goal-oriented. According to the RMH, when psychopathic individuals are engaged in goal-directed behaviour, their narrowed focus prevents them from attending to any peripheral stimuli outside their dominant response set. Healthy individuals may be interrupted in pursuit of a goal by the recognition of negative consequences to themselves or others that may ensue as a result of their goal-directed behaviour. The RMH argues that psychopathic individuals lack the capacity to appreciate consequences of their actions due to their restricted goal focus, which often has negative implications for themselves or others around them (Newman & Kosson, 1986; Newman & Wallace, 1993). This theory does not suggest that psychopathic individuals are incapable of self-regulating, but rather that they find self-regulation more difficult than normal individuals because the attentional processes needed for self-regulating ability are deficient in psychopaths.

A recent meta-analysis of 94 studies found a small to medium relationship between psychopathy and response modulation deficits (Smith & Lilienfeld, 2015). Response modulation deficits were observed for both affectively neutral and affectively laden tasks; however, results from the meta-analysis suggest that response modulation is likely not sufficient to provide a complete etiological account of psychopathy.

While studies supporting the RMH have been able to account for reduced processing of emotional stimuli in an attention task, it is unclear how this theory can explain deficits in emotion-processing demonstrated in simple emotion tasks with no divided attention. For

example, the theory does not seem to be able to account for studies in which psychopaths show a reduced ability to process emotional stimuli in a single task of emotion identification such as categorization of spoken emotion words (Blair et al., 2002) or facial expressions (Stevens & Blair, 2001) where the emotion-processing requirement serves as the primary task. In summary, a number of theories attempt to explain the underlying mechanism of psychopathy, all of which have varying degrees of empirical support. However, none are able to account for all aspects of the disorder. Some cognitive theories have the potential to overlap, such as the violence inhibition mechanism and the low fear hypothesis, and these may describe the same neurophysiological cause, such as amygdala dysfunction.

Although there are competing theories that are unable to account for deficits across multiple areas of functioning (e.g., attention vs. emotion), recent evidence suggests that emotion-based and attention-based mechanisms may occur in tandem (Moul, Kilcross, & Dadds, 2012). Baskin-Sommers and Newman (2014) developed a modified theory of the relationship between attention and emotion relative to psychopathy. Using a gaze detection task, they observed that psychopathy was associated with a bottleneck in early attention that limits the ability to process contextual information. When contextual information required to regulate goal-directed behaviour was minimized in the gaze detection task, psychopathy was associated with better task performance. Thus, individuals high in psychopathy may have a disruption in cognitive control resulting from overallocation of processing resources to information that is motivationally salient.

A more recent conceptualization of an integrated model of attention and emotion in psychopathy comes from Hamilton, Hiatt Racer, and Newman (2015). The authors proposed the Impaired Integration (II) model, which proposes that psychopathic individuals have a reduced

ability to bind sensory features of stimuli into an initial cognitive representation, leading to an information bottleneck that affects their ability to process information in the environment. This processing style has a reciprocal effect on neural networks involved in learning and information processing, resulting in underdeveloped pathways for these processes. This further perpetuates the narrowly focused, goal directed behaviour and limited processing of secondary stimuli, resulting in antisocial behaviour.

Because the identification of emotion is an essential component of the present study, predictions about results in the present study will be made in the context of a general emotion deficit theory of psychopathy (potentially encompassing the violence inhibition mechanism, fear dysfunction hypothesis, integrated emotion systems theory and underlying pathology consistent with a dysfunctional amygdala). Therefore, in the absence of a task involving varied demands on attention or hemispheric laterality, application of this group of theories (emotion deficit theory) is most relevant. Specifically, predictions will be made based on a general emotion deficit hypothesis about the relationship between emotion and cognition in relation to psychopathy: that is, that individuals high in psychopathy require more effortful processing in order to produce the same response (emotion categorization or empathy) to emotional stimuli than do individuals low in psychopathy. While the relationship between cognition and emotion is unclear, particularly as it relates to emotion processing in psychopathy, if individuals high in psychopathy are able to portray a “mask of sanity” as a result of a learned response to emotional stimuli that affords them the ability to generate normative emotional and empathic responses, then presumably this learned response reflects greater effort (i.e., cognitive control) on the part of the individual in order to produce a response equivalent to that of someone low in psychopathy for whom emotional and empathic responses are more automatic. Thus, evidence of this increased demand

on cognitive resources required for to produce such a normative response to emotional stimuli should be reflected in poorer categorization and ability to empathize with the emotion presented.

In addition, results will be analyzed not only in terms of total psychopathy score but will also be broken down by the two broad factors of psychopathy: emotional and behavioural. Previous research suggests that deficits in emotion-processing should be associated with Factor 1 (emotional). Thus, I predicted that emotion recognition and empathic responding will be inversely related to Factor 1 of the SRP in particular, indicating that lower accuracy for emotion perception and empathy are associated with shallow affect and reduced emotional experience. In contrast, I predicted that the behavioural factor would not be related to emotion perception and empathy.

Gender Differences in Psychopathy

Most studies of psychopathy have included only male participants. However, differences exist between males and females regarding psychopathy. Psychopathy is generally less prevalent in women than men. One study found 31% of violent male offenders met the cut-off score for psychopathy compared to only 11% of violent female offenders (Grann, 2000, as cited in Rogstad & Rogers, 2008).

Studies of psychopathy in women have found higher rates of criminality in female psychopaths than average females (Salekin, Rogers, Ustad, & Sewell, 1998; Crawley & Martin, 2006). Psychopathic women have also demonstrated antisocial behaviour and emotional deficiency (Vitale, Smith, Brinkley, & Newman, 2002) and physiological reactions like decreased startle-blink response to disturbing images (Sutton, Vitale, & Newman, 2002) similar to psychopathic men. However, psychopathic women fail to demonstrate certain behaviours

consistently observed in psychopathic men such as response perseveration (Vitale & Newman, 2001) and impoverished passive avoidance learning (Vitale, Newman, Bates, Goodnight, Dodge, & Petit, 2005; Vitale, Maccoon, & Newman, 2011). Therefore, there are concerns about generalizing characteristics of psychopathy across both males and females.

With respect to emotion recognition, a recent study found gender differences relative to psychopathic traits in men versus women (Delk, Bobadilla, & Lima, 2017). Among women, higher social dominance and lower anxiety were associated with reduced recognition of fear and anger; high rebelliousness and impulsiveness were associated with increased recognition of disgust and anger. Among men, traits of ruthlessness and lack of fear were associated with decreased recognition of angry stimuli. These gender differences in psychopathy suggest that it may be informative to examine participants' emotion recognition and empathy performance as a function of gender.

Psychopathy and Reduced Emotional Experience

Impaired emotional response in psychopathic individuals when viewing or imagining emotion-inducing stimuli has been well documented. When asked to “get into the feeling” of the emotion portrayed in a negative image, individuals scoring highly on Factor 1 of psychopathy (emotional factor, associated with callousness and shallow affect) show decreased responsiveness on a measure of heart rate (Casey, Rogers, Burns, & Yiend, 2013).

During an emotion regulation task, individuals high on psychopathy demonstrate reduced amygdala activity in response to negative images compared with controls (Harenski, Kim, & Hamann, 2009). This type of finding is consistent with the theory that the emotional deficit of psychopathy is linked to amygdala dysfunction. Failure to regulate emotion has been implicated

in the aggressive behaviour associated with psychopathy: a recent study found that poor emotion regulation (measured by the Difficulties with Emotion Regulation Scale) was more strongly associated with aggressive behaviour than were either the Fearless Dominance or Coldheartedness scales of the Psychopathic Personality Inventory (PPI; Long, Felton, Lilienfeld, & Lejuez, 2014). The PPI focuses on emotional and behavioural symptoms of psychopathy with limited emphasis on criminal behaviour. Fearless Dominance includes subscales of Social Potency, Stress Immunity, and Fearlessness, believed to be caused by a deficit in emotional reactivity. Coldheartedness is a separate component of the PPI that encompasses callous, unemotional traits thought to be integral to psychopathy (Marcus, Fulton, & Edens, 2013). An electroencephalogram (EEG) study found a reduced response (late-positive potential) in individuals scoring highly on the PPI-R compared to low scorers (Medina, Kirilko, & Grose-Fifer, 2016). This was particularly true for responses to images that were less emotionally arousing, suggesting that high scorers are more responsive to more intense emotional stimuli and less responsive to stimuli that are more ambiguous.

Difficulties in interpreting and expressing emotion are consistent with the clinical construct of alexithymia. Alexithymia is a disorder affecting the ability to regulate affect, associated with impaired emotion-processing. Alexithymic individuals have difficulty recognizing and communicating their emotions and identifying emotions of others. Presence of this disorder can lead to difficulties in interpersonal relationships, coping with stressful situations, and other maladaptive behaviours (Kojima, 2012). Alexithymia is an important construct to consider when assessing emotion perception. Measures of alexithymia are often used to screen out individuals who have poorer than average abilities to understand and produce emotion.

Prevalence estimates of alexithymia in the general population vary around approximately 10% (Mason, Tyson, Jones, & Potts, 2005). A number of studies have explored the link between psychopathy and alexithymia, as it seems likely that individuals with impaired emotionality would also have difficulty identifying and describing their own emotions. Several studies have established a link between alexithymia and psychopathy (Gori et al., 2014). More specifically, alexithymia has been found to be correlated with secondary (low-anxious) psychopathy (Lander, Lutz-Zois, Rye, & Goodnight, 2012).

Other studies exploring the relationship between these two constructs have found mixed results. Louth, Hare, and Linden (1998) found no significant correlation between alexithymia and psychopathy in a sample of female offenders. Although 30% of participants were identified as psychopathic and 32% as alexithymic, only 3 participants (out of 37, ~8%) met the criteria for both psychopathy and alexithymia. Lockwood, Bird, Bridge, and Viding (2013) found that psychopathy and alexithymia both predicted deficits in affective processes involved in empathy but that these constructs predicted such processes independently from one another. A recent study in an Italian sample (Schimmenti et al., 2017) found that Dark Triad traits (including psychopathy) were associated with alexithymia but these traits were negatively correlated with empathy. Kroner and Forth (1995) demonstrated a link between psychopathy and alexithymia; however, the relationship was not as predicted: Factor 2 (antisocial/lifestyle) of psychopathy was correlated with the Importance of Emotions scale of the Toronto Alexithymia Scale (TAS-20), whereas Factor 1 (affective/interpersonal) of psychopathy and total psychopathy score were negatively correlated with the Emotional Understanding scale and overall TAS-20 scores. The latter is particularly surprising, given the evidence for an emotion deficit associated with Factor 1 of psychopathy. However, the nature of the questions of this scale (e.g., “I am often confused

about what emotion I am feeling”) infers a certain vulnerability and lack of awareness on the part of respondents; it is possible that characteristics such as deceitfulness and grandiosity preclude psychopathic individuals from answering such a questionnaire honestly.

There is also evidence that the link between secondary psychopathy and alexithymia may be mediated by deficits in emotion processing with a separate psychiatric condition, such as Borderline Personality Disorder (Ridings & Lutz-Zois, 2014). However, the finding that both alexithymia and psychopathy predict similar impairments in empathic responding (Jonason & Krause, 2013) suggests that alexithymia should be considered in the context of research in emotion and psychopathy. A measure of alexithymia could prove useful when examining individual differences in emotion perception relating to a construct such as psychopathy. In order to attribute differences in emotion perception to variability in psychopathic traits, it is important to consider the potential relationship with alexithymia as both constructs implicate difficulties in emotional understanding.

Psychopathy, Emotion, and Cognition

Theories of psychopathy generally have been divided on whether they view psychopathy as an impairment in cognitive or attentional processing (e.g., prefrontal dysfunction or response modulation) versus a deficit in emotion-processing (dysfunctional amygdala, fear dysfunction, violence inhibition). Several of the attention-based theories attempt to account for the observable impairments in emotion processing by suggesting that they occur as a result of specific deficits in information-processing or attention rather than emotionality itself. To date, the Integrated Emotion Systems (IES) is the only theory of psychopathy integrating cognition and emotion that has proposed the existence of an impairment in psychopathic individuals in both these overlapping domains.

Whether or not psychopathic individuals possess specific (separate) deficits in cognitive- and/or emotion-processing, they seem to have difficulty integrating cognitive and emotional information. Müller et al. (2008) obtained results indicative of this non-normative integration. They found that nonpsychopathic individuals demonstrated interference from negative emotion cues (consistent with the resource allocation model) in a word recall task, an effect that was not observed in psychopaths. Thus, it is important to explore differences in emotion perception among individuals varying in psychopathic traits in the context of not just a pure emotion deficit in high scoring individuals but also a combined cognitive-emotion processing impairment that might be responsible for the perceptual limitations observed in highly psychopathic individuals who are faced with emotional stimuli.

Psychopathy, Emotion, and Empathy

If attention to others' emotions is a necessary requirement for the experience of empathy, the substantial body of evidence pointing to impoverished emotion-processing by psychopathic individuals would be consistent with their decreased capacity for empathic responding. Several studies have demonstrated that empathy is negatively associated with psychopathy (Brouns, de Wied, Keijsers, Branje, & van Goozen, 2013; Giammarco & Vernon, 2014; Holmqvist, 2008; Ali & Chamorro-Premuzic, 2010; Jones, Happé, Gilbert, Burnett, & Viding, 2010; Schimmenti et al., 2017).

Given that psychopathy is characterized by a lack of conscience, it is not surprising that psychopaths have consistently been found to demonstrate impoverished levels of empathy. Ali, Amorim, and Chamorro-Premuzic (2009) found that individuals with primary psychopathy (low anxious psychopaths, associated more with impoverished emotion, distinct from secondary psychopathy in which individuals with higher anxiety tend to score more highly on the

behavioural component of psychopathy) experienced positive affect in response to sad stimuli, opposite to the experience of individuals high on trait emotional intelligence and inconsistent with an empathic response. Increased time spent in treatment is associated with increased empathy towards victims in offenders, but this increased empathy is moderated by psychopathy; psychopathic offenders do not demonstrate this increased empathy towards victims (Roche, Shoss, Pincus, & Menard, 2011). When viewing images of others experiencing pain, psychopaths have reduced activity compared with nonpsychopathic individuals in the orbitofrontal cortex and ventromedial prefrontal cortex, areas involved in empathic response (Decety, Skelly, & Kiehl, 2013). Khvatskaya and Lenzenweger (2016) found that when people viewed negative images, and their own facial expressions in response were objectively measured (using an automated program), individuals high in psychopathic traits were significantly less likely to display congruence between their own emotions and the emotions portrayed in the images, suggesting reduced affective empathy.

Mullins-Nelson, Salekin, and Leistico (2006) observed a negative correlation (using the Psychopathic Personality Inventory – short form) between psychopathy and the emotional component of empathy but not the cognitive component. Similarly, Oliver et al. (2016) found that increased coldhearted psychopathic traits were associated with reduced affective sharing and empathic concern in response to affective images, and yet these traits were unrelated to performance based on cognitive empathy. This perhaps points to the fact that cognitive aspects of empathic responding are easier to “learn” than emotional empathic responding, thereby permitting psychopathic individuals to produce adequate responses for the former while highlighting their inability to truly experience the latter. Other studies have identified a similar divergence between the presence of cognitive empathy and absence of emotional empathy in

psychopathic individuals (Lockwood et al., 2013; Robinson & Rogers, 2015; Seara-Cardoso, Neumann, Roiser, McCrory, & Viding, 2012; Vyas, Jameel, & Channon, 2016).

A recent study (De Ridder, Pihet, Suter, & Caldara, 2016) investigated the relationship between empathy and emotion perception relative to psychopathic traits in adolescents. Results showed that in real life situations, cognitive empathy skills possessed by adolescents high in callous-unemotional traits may allow them to compensate for an impairment in recognition of others' distress. However, this compensatory process may result in perception of emotions as excessively negative.

Pfabigan (2015) found that violent offenders with both high and low psychopathic traits showed reduced skin conductance in response to painful expressions. However, only inmates high in psychopathic traits demonstrated subjective empathy ratings comparable to controls. Thus, those high in psychopathy are able to know, yet not feel, the experiences that others feel. Robinson and Rogers (2015) also found that psychopathic offenders showed this pattern of cognitive empathy with a lack of affective empathy, and yet these offenders were able to simulate empathy under conditions prompting impression management. This points to the shortcomings of empathy measures: if individuals high in psychopathy know what is expected of them they may be able to produce a convincing empathic response and effectively fake on a measure of empathy if they are sufficiently motivated.

Interestingly, Nentjes et al. (2016) found that even individuals scoring highly on psychopathy found inhibition of emotion to be an effortful process. After viewing affectively-laden films, all participants (regardless of psychopathic traits) were able to significantly reduce their own facial expressions under instructions of inhibition. Psychopathic individuals were not

better at adopting a “poker face” than non-psychopathic individuals, as one might expect given the assumption of the psychopath’s “mask of sanity”. Psychopathic offenders did show content-appropriate facial expressions during the films just like non-psychopathic offenders, and the inhibition of emotion was related to cardiovascular changes, not psychopathy.

In a study investigating empathy relative to psychopathy factor scores, Lishner et al. (2015) found that the factor of callous affect was negatively related to affective empathy, and this relationship was consistent across three studies. This study also found that the interpersonal/lifestyle facets of psychopathy was associated with decreased empathy for positive emotions, whereas affective/antisocial facets were associated with decreased empathy for negative emotions. Across studies of psychopathy and empathy, individuals high in psychopathy appear to demonstrate impoverished emotional empathy; however, this may differ by psychopathy factor, reinforcing the importance of investigating empathy in the context of psychopathy in relation to the factor scores and not only to the overall psychopathy score.

Studies of moral reasoning indicate that psychopaths are capable of correctly solving moral dilemmas involving socially-sanctioned rules. That is, psychopathic individuals can distinguish right from wrong according to conduct established by social convention. Where these individuals fall short is in their ability to distinguish moral from conventional (sanction-based) dilemmas when performing moral judgments (Blair, 1995, 1997). When offered hypothetical scenarios from which socially-applied sanctions have been removed, psychopathic individuals do not differentiate between moral transgressions (classified based on implications for the rights and welfare of others) and conventional transgressions (those which have consequences for the social order). Most people would judge moral transgressions as being more severe, particularly in the

absence of an imposed law against the behaviour. Psychopaths, on the other hand, lack the ability to make this distinction, indicative of their inability to experience the normal degree of emotional empathy on which to base these judgments.

In a task requiring participants to identify behaviours that would elicit fear in others (emotional consequences) and how morally acceptable these actions are, Marsh and Cardinale (2012) found that highly psychopathic individuals (defined by the Psychopathic Personality Inventory) were both less accurate at identifying fear-inducing behaviours and more likely to deem these morally acceptable. Psychopathy was not significantly related to inaccuracy of judgments relating to anger-, happy-, or sadness-inducing behaviours. Findings like these are consistent with both the VIM and fear dysfunction hypothesis, suggesting that a deficit in emotion-processing is implicated in the lack of empathy displayed by psychopathic individuals.

Although the results of many studies have demonstrated a relationship between lack of empathy and psychopathy, overall, the literature linking psychopathy and empathy has been mixed. Fernandez and Marshall (2003) found that psychopathy did not significantly predict empathy for victims in a sample of rapists and nonsexual offenders, while another study found a reversal, with individuals high on psychopathy paradoxically demonstrating higher empathy scores (Lishner, Vitacca, Mosley, & Miska, 2012).

Psychopathy and social cognition. Little research has explored the link between the specific construct of social cognition and psychopathy. This is not surprising considering that psychopathic individuals demonstrate reduced emotional understanding and arguably poor empathy (although results are mixed), yet display a normal capacity for Theory of Mind. For this reason, it may not be useful to examine psychopathy in relation to social cognition as a whole.

The aspects of social cognition that seem to be impaired in psychopathic individuals are those that rely on emotion (emotional understanding and affective empathy); therefore, it is important to employ a study design that explores these two facets of social cognition separately and acting together.

Psychopathy and Perception of Emotion

In this section I outline in more detail research investigating the perception of emotion by individuals with psychopathic characteristics. Individuals with high levels of psychopathy possess deficits processing various types of emotional stimuli, consistent with an emotion deficit theory of psychopathy. Psychopaths have demonstrated reduced processing of disturbing images compared with controls. Patrick, Cuthbert, and Lang (1994) found reduced physiological response (cardiac, electrodermal, and facial muscle responses) to fearful imagery in psychopathic inmates compared with controls. Psychopathic individuals have also demonstrated reduced startle-blink response to unpleasant images (from the International Affective Picture System; Lang, Bradley, & Cuthbert, 2008) compared to nonpsychopathic controls (Sutton, Vitale, & Newman, 2002).

Identifying cues for emotion in others has been investigated using (static) facial expressions, words with semantic emotion cues and, to a lesser extent, with vocal affect. Not only are individuals high in psychopathy poorer at processing emotional stimuli, they are also poorer at predicting emotional reactions of others. As noted above, Marsh and Cardinale (2012) found that individuals high in psychopathic traits have greater difficulty identifying behaviours that would elicit fear in others and are more likely to judge such situations as morally acceptable.

Many studies examining the relationship between emotion and psychopathy measure reactivity to emotional stimuli using physiological measures or accuracy of judgments of emotion categories. Further studies, primarily those involving semantic emotion presented in the form of visual words via cognitive tasks, record response latencies as the primary dependent variable. Response time data from perceptual tasks can reveal underlying individual differences in cognitive functioning that may not be obvious if only accuracy judgments are used. Therefore, wherever possible, it is beneficial to obtain both accuracy ratings or judgments as well as response times to provide a more complete picture of perceptual processing.

Facial expression of emotion and psychopathy. Psychopathic individuals have demonstrated reduced processing of emotional facial expressions compared to nonpsychopathic individuals. Blair et al. (2004) observed that psychopaths have a decreased ability to process emotional language and facial expressions, particularly the expression of fear. Additional studies have identified a general impairment for psychopaths in the processing of emotional facial expressions, especially sad and fearful expressions, as well as impairments in identifying less intense expressions of emotion (Book, Quinsey, & Langford, 2006; Deeley, Daly, Surguladze, Tunstall, & Mezey, 2006; Dywan, Harris, McKee, Unsal, et al., 2007; Jusyte, Stein, & Schonenberg, 2017; Munro, Demetriooff, Porter, & Baker, 2017; Pera-Guardiola, 2016; Pham & Philippot, 2010; Prado, Treeby & Crowe, 2015). Children with psychopathic tendencies show similar impairments in processing of sad and, especially, fearful faces (Blair, Colledge, Murray, & Mitchell, 2001). In a recent study (Prado, Treeby, Rice, & Crowe, 2017), psychopathic traits were found to mediate the relationship between recognition of facial emotion and guilt-proneness, suggesting that psychopathic traits disrupt both normal affective processing and pro-social moral emotions.

Eisenbarth, Alpers, Segre, Calogero, and Angrilli (2008) compared categorization of facial expressions by psychopathic and nonpsychopathic females, both inmates and healthy controls. They found that psychopathic women demonstrated reduced accuracy for sad expressions, reduced arousal for angry expressions, and reduced valence ratings for positive expressions. There were no differences based on psychopathy for fearful expressions, but this appeared to be because of a floor effect of performance, with all participants responding with poor accuracy to fearful stimuli. Vieira et al. (2017) observed reduced amygdala activation in individuals scoring highly on coldhearted psychopathic traits when viewing sad facial expressions, and that this reduced activation was correlated with aversion to expressions of negative emotion, a finding consistent with the dysfunctional amygdala hypothesis of emotion and empathy. Results from several studies suggest that the deficits in recognition of facial emotion are based on misdirected attention away from the eyes, preventing the viewer from processing appropriate emotion cues (Gillespie, Rotshtein, Wells, Beech, & Mitchell, 2015; Boll & Gamer, 2016).

Psychopathic individuals are poorer at identifying increasingly ambiguous emotional facial expressions. Hastings, Tangney, and Steuwig (2008) manipulated the intensity of facial expression in their stimuli (60% intensity compared with 100% intensity) and found that psychopaths have greater difficulty identifying facial expressions, particularly when the intensity of the expression is decreased. This deficit was demonstrated for facial affect in general but was more pronounced for sad and fearful expressions.

In a meta-analysis on emotional expression recognition, Wilson et al. (2011) concluded that across studies, modest correlations between psychopathy and deficits in facial affect recognition exist, with the strongest deficits exhibited for the emotional expressions of fear and

sadness. Thus psychopathic individuals tend to have impaired recognition for emotional facial expression in general across emotions, but these impairments are minimal for emotions other than fear and sadness. Wilson et al. further suggested that recognition of facial affect is moderated by verbal processing demands; that is, impairments in verbal processing were more evident in studies that required a verbal response for emotions processed in the left amygdala. This conclusion allows for amalgamation of both the IES theory of psychopathy (relating psychopathy to a dysfunctional amygdala) and the left hemisphere activation hypothesis (relating psychopathy to abnormally lateralized brain function). Kosson et al. (2002) observed that psychopathic individuals were poorer at identifying facial emotion specifically when relying on the right hemisphere, consistent with unequal lateralization of resources in the left hemisphere for psychopaths. Findings such as those by Wilson et al. and Kosson et al. provide further confirmation that the relationship between emotion and cognition as it relates to the symptoms of psychopathy is complex and that these processes are very much intertwined.

Similarly, Jusyte, Stein, and Schonenberg (2017) observed that violent offenders showed impaired recognition of facial expressions, particularly fearful expressions. However, the authors suggest that this impairment is related more to deficient processes in categorization linked to antisociality in general, rather than specifically relating to psychopathic traits.

Semantic emotion and psychopathy. A number of studies have examined psychopathic individuals' ability to perceive semantic cues to emotion as depicted in visually presented words and found reduced processing for emotion words compared to controls. Using both semantic and affective priming conditions in a word-task requiring a congruency judgment (e.g., cat-dog for semantic condition, love-song for affective condition), Blair et al. (2006) found that psychopaths' response time and accuracy was similar to controls when semantically primed, but

they had longer RTs and decreased accuracy when affectively primed. Blair et al. concluded that the decreased performance demonstrated by psychopaths compared to controls appears to be the result of a deficit in emotion-processing as opposed to a general lexical or semantic deficit.

Long and Titone (2007) found reduced processing for affective words by psychopaths in lexical decision and negative word tasks. Psychopathic individuals demonstrated lower accuracy than nonpsychopaths for negative words in the LDT, and poorer identification of affectively negative words in the negative word task. This finding is similar to Blair et al.'s (2006) finding that psychopaths demonstrate a deficiency in processing of semantically emotional words that is indicative of an emotion deficit rather than an overall lexical processing impairment.

Several studies have explored perception of affective words specific to the underlying factors of psychopathy. Reidy, Zeichner, Hunnicutt-Ferguson, and Lilienfeld (2008) found impaired processing of emotion words by psychopaths specific to the emotional and behavioural factors of psychopathy. They concluded that participants scoring high on Factor 1 (callous/unemotional) demonstrated a reduced experience of sadness (identified by a decreased sensitivity to sad stimuli), whereas participants scoring high on Factor 2 (impulsive-antisocial) demonstrated an increased experience of anger (indicated by an increased sensitivity to angry stimuli).

Consistent with the response modulation hypothesis, Sadeh et al. (2013) found that the psychopathic personality subscale of Fearless-Dominance (from the PPI) was associated with an impairment in attentional control for positive words in an emotion-word Stroop task (Stroop, 1935), whereas the subscale of impulsive-antisociality was related to reduced processing (interference) for both negative and positive words. Fearless-dominance and impulsive-antisociality are facets of the NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992).

Previous studies have demonstrated that psychopathic traits can be estimated from general personality traits (Benning et al. 2005; Ross et al., 2009). Thus, these subscales were included because the traits they measure correspond to the emotional and behavioural factors of psychopathy and can be assessed in the general population via a widely used personality measure.

Sadeh et al. (2013) also found selective attention deficits in sensitivity to emotional distraction in psychopaths, specifically relating to the two-factor model of psychopathy (Factor 1 = Interpersonal/Affective, Factor 2 = Antisocial/Lifestyle). The potential for differences in perception of emotional stimuli related to the emotional and behavioural factors highlights the importance of examining these factors separately in addition to consideration of total psychopathy score.

Most studies that explore the relationship between the processing of visually-presented words and related psychopathic traits do so using either an emotion deficit or an attention deficit (response modulation) framework. Verona, Sprague, and Sadeh (2012) used a go-no go task of inhibitory function using emotion words to explore the attenuation of emotional word processing via inhibitory control, thereby incorporating both attentional and emotional features of psychopathy. They found that requirements of inhibitory control modulated ERP (event-related potential) response to affectively negative words in controls as was required by the task, yet psychopathic individuals showed a reduced processing of emotion words regardless of inhibitory demands. This finding is consistent with an emotion deficit theory of psychopathy and inconsistent with the response modulation hypothesis. Interestingly, the reduced emotion-processing ability observed in psychopaths was in contrast with a group diagnosed with antisocial personality disorder (APD) which is often described as having considerable overlap

with psychopathy; individuals with APD showed heightened processing of negative words regardless of inhibitory demands, suggesting that psychopathy and APD possess distinct mechanisms underlying impairments in emotion-processing.

Vocal affect and psychopathy. Fewer studies have explored the ability of psychopathic individuals to perceive emotional prosody (affect) in speech. Blair et al. (2002) identified deficits in the identification of isolated words with vocal affect by psychopathic inmates compared to nonpsychopathic inmates, specifically for words with fearful affect. Blair, Budhani, and Colledge (2005) observed similar results in a sample of adolescent boys with psychopathic tendencies. Bagley, Abramowitz, and Kosson (2009) presented incarcerated listeners with spoken sentences that varied in semantic and prosodic cues to emotion. The sentences contained either emotional semantic content but were spoken with neutral prosody, or were spoken with varying prosodic emotions in an unfamiliar language (Bulgarian) for the sample of native English participants. In short, these latter sentences contained no meaningful emotional semantic content. Psychopathic individuals were poorer at identifying both types of emotional information but reduced accuracy was particularly pronounced for sentences with only prosodic cues present. Bagley et al. did not include fearful affect (sad, angry, and happy were the emotions represented) and therefore were unable to demonstrate whether a greater impairment in processing of fearful stimuli was present for psychopathic participants.

Mackenzie and Logan (2014a) found differences in emotion-processing based on variability in psychopathic traits in an undergraduate sample. Using isolated words, they found that not only were high scoring individuals poorer at accurately recognizing emotional prosody during an initial pre-test, but they also did not demonstrate the same capacity as low scorers to improve in their ability to recognize emotional prosody following a training task in which

feedback was provided after incorrect responses to help improve recognition. This indicates that perceptual disadvantages for identification of prosody are not only found in individuals with “clinical” levels of psychopathy but are also present to some extent in individuals scoring high on a psychopathy measure but who do not meet the criteria for clinical psychopathy.

As noted earlier, Mackenzie and Logan (2014b) observed that individuals scoring high on a measure of subclinical psychopathy were less accurate than low scorers at categorizing the emotion of isolated words varying in emotional prosody. However, when required to identify emotional prosody in sentence-length stimuli, high scoring participants performed comparably to low scorers. The longer duration and greater variability of prosody inherent in the sentence-length stimuli presumably provided additional cues for emotion compared with the brief duration of word-length stimuli. Therefore, it seems that, given sufficient cues for emotion, psychopathic individuals can make the appropriate emotion judgment. If cues are made increasingly ambiguous, however (e.g., by shortening the duration of stimuli), the reduced capacity psychopathic individuals possess for emotion-processing becomes more evident.

Integration of multimodal emotion and psychopathy. To date, no published research has explored the capacity of psychopathic individuals to integrate multimodal channels for emotion. This is a gap in the literature which the present study aims to address. Individuals high in psychopathy may display evidence of a deficit in emotion-processing that is more pronounced for certain types of emotion cues (e.g., prosodic cues compared with more salient facial expression), particularly when emotion cues are more ambiguous than the most obvious emotion cues associated with semantic emotion. Individuals high in psychopathy may also demonstrate difficulties integrating emotion cues from different input channels, either because of their reduced ability to process emotional stimuli in general or as a result of an attentional impairment.

Presenting psychopathic individuals information about emotion via both isolated channels (i.e., visual and auditory channels separately) and simultaneous channels (i.e., both channels together) may provide further insight into emotion perception as a function of psychopathy.

Psychopathy and thin slices of behaviour. As noted above, some evidence (e.g., Mackenzie & Logan, 2014b) suggests that given sufficient cues for emotion, individuals high in psychopathy are as successful at emotion perception as low scoring individuals but when emotion cues are increasingly ambiguous, high scoring individuals have greater difficulty identifying the emotions. One way to make a stimulus more ambiguous is to shorten its duration as in Mackenzie and Logan (2014b) who compared the perception of emotion conveyed by prosody in spoken words versus sentences. The short stimuli in their experiment (i.e., spoken words) could be viewed as similar to a “thin slice” (cf. Ambady & Rosenthal, 1993) in that participants were asked to make a judgment based on a brief duration stimulus. Results of this study indicate that modifying the duration of even an already brief stimulus can influence the ability of viewers or listeners to identify the intended emotion conveyed and may produce greater disparity between individuals with normal emotion recognition capabilities compared to those with impairments in emotion recognition and processing. Therefore, brief stimuli such as video clips conveying cues for emotion may deliver sufficient ambiguity in presentation to distinguish among psychopathy-related differences in emotion recognition and associated empathic response. (Interest in study of the relationship between psychopathic traits and deficits in perception of emotion in thin slices of behaviour is increasing: Demetriooff et al. (2017) found that SRP scores were negatively correlated with recognition accuracy for sad micro-expressions.)

Present Study

The experiments conducted for my dissertation were designed to explore the integration of visual and spoken cues to emotion and related empathic response by individuals scoring high and low on psychopathy. It is unclear whether features of psychopathy are the result of an emotional or cognitive deficit; however, it is likely that these two processes are inseparable and must be considered in tandem. Social cognition is an important context for consideration of psychopathic traits as it combines cognitive (Theory of Mind) and emotional (emotion perception and affective empathy) constructs. Thus, the present studies involved both an emotion recognition and empathic response task, measuring accuracy and intensity of judgments.¹

The present studies included more naturalistic stimuli than typically used in studies of emotion and psychopathy. They employed dynamic video clips which provided the opportunity to explore psychopathic traits relative to not only dynamic facial expressions and prosody separately, but also in combination. Beyond the fact that no previous psychopathy studies have included such ecologically valid stimuli in studies of emotion perception and psychopathy, a further advantage of this type of stimuli is that the different conditions (separating types and combinations of emotion cues) allowed for examination of not only basic emotion recognition but also integration of emotion cues and whether differences in these processes exist based on variability in psychopathic traits. Such findings have the potential to provide more insight into

¹ An additional experiment was conducted which is not included in the body of the text. This experiment used the same tasks as Experiments 1,2 and 3, but it was conducted in the lab rather than online. One of the objectives of this approach was to allow for inclusion of response times (RT) measures, as it was felt that these would supplement the self-report ratings and more objectively tap into cognitive emotion processing. Because online RT measures can be unreliable, it was felt that the in-lab format would provide more reliable RT data. However, due to technical issues with software and difficulty obtaining participants for the in-person study, the sample size was not sufficiently large to legitimately explore a continuous measure of personality like psychopathic traits (final participant total came to only 66) and no effects were revealed when these data were analyzed. It was determined that the lab format was not an adequate way to measure the relationship between this type of continuously varying trait and individual differences in perception due to the sample size limitations, and thus further studies were conducted online in order to obtain a larger sample.

the underlying mechanisms of psychopathy, and were intended to shed light on the cognition versus emotion debate relative to social cognition and functioning in individuals high in psychopathic traits.

Further to the critical task of emotion perception, a measure of empathic response was also included. While researchers have explored the relationship between psychopathy and empathy and the relationship between psychopathy and emotion perception separately, little work has integrated the two in order to directly explore the relationship between emotion perception and empathic response. The intention of this approach was to test the assumption that deficiencies in emotion perception and empathy response by psychopathic individuals are based on the same underlying processes.

Experiment 1 used thin slices of individuals having a self-referential conversation approximately 12 seconds in length, portraying varying prosodic and facial expressions of emotion. The task involved both an emotion recognition component and a self-rating of empathy (indicating whether they match the emotional state of the individual they are observing). Differences in emotion identification and empathy were compared to participants' scores on a measure of subclinical psychopathy. Experiment 1 was conducted online.

Experiment 2 included the same task as in Experiment 1. This version of the experiment was identical to the first, providing a direct replication, but with the addition of a measure of alexithymia (the TAS-20). Experiment 3 used the same tasks but limited response options for participants in the emotion recognition task, in order to ascertain whether responses would differ (i.e., if accuracy would be higher) if the category of "neutral" was removed as a response option when categorizing emotional expressions. Experiment 4 modified the methodology slightly, in

an attempt to assess potential psychopathy-dependent differences in emotion recognition and empathy; the most salient exemplars from Experiments 1-3 were presented, with the duration manipulated so that responses to short (more ambiguous) versus long (less ambiguous) stimuli could be compared.

Experiments 1, 2, 3, and 4 used a sample of undergraduate students varying in psychopathic traits. The fact that psychopathy can be measured as a continuous trait in the general population provides a potential complication to understanding the nature of the disorder; if the emotional deficit associated with psychopathy can be measured on a continuum, is this more indicative of a spectrum of functionality in emotion-processing as opposed to an innate, pervasive malfunction in true psychopaths that is not seen in individuals without the disorder? This is one of the considerations in this study as we explore the relationship between psychopathic traits in a relatively “low scoring” sample of undergraduates.

Experiment 1

The objective of Experiment 1 was to examine how individuals varying in psychopathic characteristics categorize video clips of different emotions and how much empathy they report when viewing these clips. The first objective was to determine whether individuals scoring high in psychopathic traits are as successful at recognizing emotional stimuli as low scoring individuals, and whether their ability to categorize emotional stimuli is dependent on the number of emotion cues present. A second objective was to identify whether high-scoring individuals experience the same empathic response as low-scoring individuals: do high scoring individuals 1) experience the same type of emotional response (e.g., true empathy vs. a different emotional

reaction to the observed emotion of another) as low-scoring individuals, and 2) do they experience as robust an empathic response as low-scoring individuals.

The method was based on Regenbogen et al. (2012a) who examined differences in the perception of multimodal emotion cues, either presented alone or in combination, in a German community sample. I used Regenbogen et al.'s stimuli and procedures but also examined participants' performance based on variability in psychopathic traits within the sample.

Regenbogen et al. used video clips delivering emotion cues via three emotion channels: semantic content, prosodic content, and facial expressions. They found that semantic cues for emotion were the most salient because removal of this channel result in the greatest reduction in emotion recognition and empathic response (empathy ratings and galvanic skin response) compared to removal of the prosodic or facial emotion information. This finding highlights the fact that semantic information provides the strongest cues for emotion in comparison with the other emotion channels.

Experiment 1 limited emotion cues to only prosody and facial expression; no semantic cues (i.e., sentence and word meaning) for emotion were included. There are several reasons for this. The first is that this allowed for isolation of emotion within the (separate) channels of prosodic and facial emotion. Previous studies have found that psychopathic individuals have difficulty processing facial emotion using static facial expressions (e.g., Stevens, Charman, & Blair, 2001). A key feature of Regenbogen et al.'s (2012a) stimuli is that they consist of dynamic facial expressions that develop over time (10-12 seconds), more closely approximating the expressions one would observe during social interactions and thus expanding on previous studies of psychopathy and facial affect in a more ecologically valid way.

The second reason for limiting the emotion cues to only prosody and facial expression was that although psychopathic individuals demonstrate reduced processing of the semantic content in emotion words in various cognitive tasks, they show greater deficits processing prosodic cues to emotion than semantic cues to emotion (e.g., Bagley et al., 2009). If individuals high in psychopathy were able to produce the appropriate response to emotional stimuli given sufficient emotion cues, the semantic content of stimuli with relatively lengthy duration (e.g., 10+ seconds containing semantic content) would render the emotion discernible enough that even individuals high in psychopathy would perform as successfully as those low in psychopathy. Therefore, including only the two less salient, more ambiguous channels (prosody and facial expression) was expected to highlight more distinctive differences between high and low scoring individuals in both recognition of emotion and associated empathic response.

Additionally, the facial and prosodic emotion condition were intended to expand on previous studies investigating the relationship between the perception of prosodic emotion cues and psychopathy (Blair et al., 2002; Bagley et al., 2009) by combining emotional prosody with an additional set of contextual cues in the form of facial expressions portraying emotions. Comparison between isolated emotion channels and the combined channel condition were expected to determine whether increasing stimulus ambiguity (one channel compared with two) in the absence of semantic information would result in exaggerated deficits in both emotion processing and empathy for individuals high in psychopathic traits.

Regenbogen et al. (2012a) obtained highly accurate ratings from a community sample of German participants, validating their stimuli as a test of emotion perception. Their stimuli have been further validated through their use in studies of healthy adults (Regenbogen et al., 2012b), depressed patients (Regenbogen et al., in press; Schneider, et al., 2012) and individuals with high

functioning autism (Schneider et al., 2013). Accuracy ratings of emotion recognition for the video clips are consistently above 80% across all studies, and above 70% for matching affective (empathic) response. Note that Regenbogen et al. manipulated the type and number of channels presented in the stimuli, but all because their studies also included semantic emotion as a type of emotion cue, stimuli in their studies included more channels than in the present studies. Thus, these accuracy ratings are based on stimuli either presenting all three channels at once (semantic emotion, facial expression, and vocal affect), or combinations of two out of three of these channels.

In order to obtain as large a sample as possible, Experiment 1 was conducted online. Similar to Regenbogen et al. (2012a), participants' ability to accurately identify the emotion of the stimulus, conveyed by either one or two channels, was examined, along with their empathic response to the stimuli measured using a questionnaire of self-identified emotional state. Regenbogen et al. also measured galvanic skin response (GSR) but due to issues in implementation and interpretation of this type of measure, it was not included in the present study.

The original Regenbogen et al. (2012) study employed the TAS-20 in order to screen out participants with deficits in emotionality. However, given the potential for overlap between the constructs of alexithymia and psychopathy in the context of emotion perception and empathy, and because the present study seeks to explore individual differences in emotionality, it seemed worthwhile to administer the TAS-20 and investigate the potential relationship between alexithymia and psychopathic traits. If alexithymia was correlated with the dependent variable(s) and had minimal overlap with psychopathy, it could be used as a covariate in determining the influence of individual differences on response (recognition and empathy) to emotional stimuli.

Results for Experiments 1-4 were predicted to vary slightly from those obtained by Regenbogen et al. (2012a) because the conditions presented in the present study (facial emotion only, prosodic emotion only, and facial with prosodic emotion) have been modified to exclude semantic emotion. Regenbogen et al. (2012b) used the same set of stimuli but included an additional condition with incomprehensible semantic content (spoken in a Slavic language) that would correspond to the role of the German language stimuli used in the present study when presented to English-speaking participants. They found that while the incomprehensible speech condition produced poorer emotion recognition and empathic response than when all types of emotion cues were present, presenting semantic content in another language resulted in higher emotion recognition and empathic response than when semantic content was made neutral. While it may seem like these two conditions should be comparable, Regenbogen et al. argued that processing of neutral semantic content demanded greater attentional resources that interfered with processing of other emotion cues, a phenomenon that was not experienced when semantic content was presented in an incomprehensible foreign language. This implies that emotion can be both perceived and yield an empathetic response when semantic cues are limited to a foreign language. In other words, the absence of semantic cues was not expected to interfere with the processing of facial and prosodic emotion cues.

The dual channel condition (facial and prosodic emotion) was expected to produce greater empathic response than the single channel conditions (prosodic or facial emotion alone). In addition, individuals scoring high on a subclinical measure of psychopathy (SRP-III) were expected to be less accurate at identifying the observed emotions and produce fewer empathic responses to the stimuli (in the form of matching one's own emotion to the observed emotion) than low scoring individuals.

Psychopathic individuals' characteristic ability to "know the words but not the music" suggests that an acquired knowledge of social expectations and sufficient cues for the expected response could make it possible for psychopathic individuals to produce appropriate responses. The video clips expressing dynamic emotion used in the experiments in the present study were predicted to be sufficiently long in duration (approximately 12 s) and provide sufficient cues to the participants that individuals with a high level of psychopathy could identify the emotion conveyed as accurately as low scoring individuals. If this were to be true, an individual's psychopathy score may not predict emotion recognition in the multi-channel condition. In contrast, because the single channel conditions provide fewer cues for emotion, it was expected that differences in emotion recognition based on psychopathy score would be more likely to emerge under the single channel conditions.

If the expected results were observed, it could provide some insight into the relationship between emotion and cognition in relation to psychopathic traits. Reduced accuracy demonstrated by individuals high in psychopathy, particularly as the ambiguity of the stimuli increased, may indicate that emotion recognition and empathic response require more effortful processing for individuals higher in psychopathy. In other words, as psychopathy increases, response to emotional stimuli - both for categorization and empathy judgements – becomes less automatic and increasingly requires conscious cognitive control, reflected in lower accuracy rates.

Even if high scoring individuals demonstrated performance in the emotion recognition element of the task that is comparable to that of low scorers, I predicted that these individuals would be unlikely to demonstrate the same degree of empathy that was expected of low scorers.

If individuals high on psychopathic traits showed normal levels of emotion recognition without the associated emotion self-response, this would be consistent with the portrayal of psychopaths as “knowing the words but not the music”; while they may be able to accurately recognize and name the emotion represented, their failure to identify with the emotional state of the subject in the video would signal their lack of deeper emotional understanding that would allow them to experience empathy.

The population of undergraduate students from which the sample was obtained for Experiment 1 is predominantly female. However, high SRP scores are represented disproportionately in males. Separating the effect of gender from the effect of psychopathy can potentially be difficult, as any potential psychopathy effects may be confounded by gender. More accurate emotion recognition associated with lower psychopathy scores may be confounded by participant gender (female). This confound also exists for empathy because females are generally higher in empathy than males. For these reasons, gender was considered as an additional variable in the present study.

No specific predictions were made for accuracy as a function of the individual emotions presented. An argument could be made for making predictions about fearful stimuli, and, to a lesser extent sad stimuli, since some evidence suggests reduced processing accuracy for these particular emotions. However, the predictions for this study do not focus in particular on the low fear/dysfunctional amygdala hypothesis of psychopathy, and the relationship between emotion type and psychopathic traits may be difficult to predict when ambiguity of the stimuli is manipulated. Thus, the effect of emotion type on accuracy, and the potential relationship between psychopathic traits and emotion type in relation to accuracy, were investigated with no a priori predictions.

Method

Participants. The sample for Experiment 1 was 391 undergraduate students recruited through Carleton University's online recruitment system (SONA). Removal of incomplete responses (>50%) resulted in a final sample of 347 participants. The only eligibility requirements were that participants had normal or corrected to normal vision and hearing. They were not required to be fluent English speakers as there was no relevant semantic content present in the study. Participants were awarded course credit in return for participation.

Measures. Participants were administered the Self-Report Psychopathy scale (SRP-III, short version; Paulhus et al., in press), a 29 item measure with items scored on a 5 point Likert scale (1 = strongly disagree, 5 = strongly agree). Items load onto four factors: Callous Affect (e.g., "People sometimes say that I'm coldhearted.") and Interpersonal Manipulation (e.g., "I rarely keep in touch with my family anymore."), which can be combined into Factor 1, characterizing an emotional component of psychopathy; and Erratic Lifestyle (e.g., "I have often done something dangerous just for the thrill of it.") and Criminal Tendencies (e.g., "I have tricked someone into giving me money."), which can be combined to form a behavioural component, Factor 2. One item (item 2: "I have never been involved in delinquent gang activity") is reversed scored to reduce response bias. Multiple studies indicate that the SRP is a reliable instrument, as well as having good construct and convergent validity in community samples (Mahmut, Menictas, Stevenson, & Homewood, 2011; Neumann & Pardini, 2014; Salekin, Trobst, & Krioukova, 2001).

Stimuli. Regenbogen et al.'s (2012) original stimuli consisted of 64 brief, standardized video clips (duration $M = 11.8$ s) with similar numbers of clips from male (5) and female (7) actors. Presentation of stimuli was randomized. The "all-emotion" condition involved each actor

telling a self-referent emotional story with emotional affect and an emotional facial expression. Whereas the original set of stimuli had four separate conditions based on the number of emotion channels present (all channels, no prosody, no facial emotion, no semantic emotion), the present study excluded the set of clips with neutral semantic content because the clips are in German, making the semantic content unavailable to English listeners. This reduced the original four conditions found in Regenbogen et al. to only three conditions in the present study. Emotion categories represented were happy, sad, fear, and disgust. Clips were designed such that the emotion (from any channel) was not evident in the first 3 seconds of the clip, but rather that the emotion emerged over the course of the story and reached its climax at the end in order to provide a dynamic and naturalistic type of emotional stimulus. For the neutral prosody condition, clips with the same semantic content and facial expression were recorded twice: once with emotional prosody and once with neutral prosody. For the neutral face condition, clips with the same semantic content and prosody were recorded twice: once with an emotional facial expression and once with the subject speaking with a neutral expression. In summary, participants were presented a total of 48 distinct stimuli: four different clips (i.e., four separate talkers) per emotion category by four emotion categories, with three conditions created for each clip (all emotion, no prosody, no facial emotion). These stimuli were each presented twice, for a total of 96 stimuli.

Procedure. Experiment 1 was conducted online using Qualtrics software, version Jan 2015 to April 2017 (Qualtrics, 2018). Participants filled out a consent form as well as provided demographic information (age and gender) once they were given the link to the study. They then received a set of general instructions for the experiment, including the order of questionnaire and task presentation to follow. Prior to the emotion/empathy task, participants completed the SRP-

III (identified to the participant only as a “personality questionnaire”). During the emotion perception task, video clips with German dialogue were presented from three conditions: all-emotion (prosodic and facial emotion), neutral prosody, and neutral facial emotion. Participants were instructed to imagine that the person they observed in each clip is a communication partner they are personally familiar with who is telling a brief story about themselves. After viewing each video clip, participants were asked to indicate their own emotional state from a forced-choice of four emotion categories (happy, sad, fear, or disgust) or a neutral category. They indicated this response by pressing a key (i.e., 1 = disgust, 2 = fear, 3 = happy, 4 = sad, 5 = neutral). Participants then rated the intensity of this emotion on a scale from 1-6.² After rating their own emotion, participants next identified which emotion the person in the video was experiencing, making their selection from the same set of emotion categories. Participants then also rated the intensity of the emotion they observed on the same scale from 1-6. Responses (categorization and intensity for self and other) did not include a response time measure. The procedure was self-paced, meaning that following the presentation of each video clip, participants had as much time as is necessary for each judgment and the task only moved on to the next judgment or video clip when the individual pressed a key to indicate each response was complete.

Self-ratings were given before participants identified the emotion of the clip (other rating) to minimize bias from the emotion recognition task in the self-rating of emotion. Participants were provided a short practice session in which they were presented with three video clips from

² Intensity ratings for emotion recognition and empathic response were collected (for all four experiments); however, due to time constraints and the volume of data and analyses already included in the project, analysis of these intensity ratings was not undertaken in the present research project.

the dataset to familiarize them with the stimuli. Following the practice stimuli, the remainder of the video clips were presented.

Participant responses were examined according to the following protocol employed by Regenbogen et al. (2012): if participants accurately identified the emotion expressed in the video clip (by one or two emotion channels), this was categorized as “other-matching target”. If participants’ own emotional state matched the emotion they identified in the video clip and this denoted the correct emotion, which was identified as “self-matching target”. The frequency of “self-other-matching” (when the emotion in the video clip was accurately recognized and was congruent with the identified emotional state of the participant) was considered evidence for an empathic response. All participants were exposed to all manipulations in the study. Therefore, the entire design was within-subjects; the psychopathic trait score (and the covariate of alexithymia score) were treated as individual difference variables.

Results

Demographics

Table 1. Demographic variables for Experiment 1

Variable	<i>M (SD)</i>
SRP-III Score - Overall	55.73 (15.86)
SRP-III Score - Emotional Factor	26.15 (8.78)
SRP-III Score – Behavioural Factor	29.64 (8.05)
Age (years)	20.08 (3.08)

The mean score for psychopathic traits overall for the Experiment 1 sample, as scored on the SRP-III, was 55.73³ ($SD = 15.86$). The two factors of the SRP-III differed slightly, with the emotional factor ($M = 26.15$, $SD = 8.87$) slightly lower than the behavioural factor ($M = 29.64$,

³ For the purposes of reporting, values were rounded to two decimals. HLM software version 7 generates up to three decimal places for values in the output. Thus, p values with three decimal places were rounded to $p < 0.01$. The exception to this was for values listed in the HLM output as $p = 0.000$: to further distinguish differences in significance, these values were reported as $p < 0.001$.

$SD = 8.05$). The average age of participants in the sample was 20.08 years ($SD = 3.08$). The sample was made up of 73.2% female participants (26.8% male).

In order to check that any effects associated with psychopathy (specifically, lower accuracy associated with psychopathy) were not simply an artifact of participants high in psychopathy responding before the full presentation of stimuli (i.e., participants rapidly clicking through the stimuli to get to the end, and in doing so providing less systematic responses rather than taking the time to fully evaluate the stimuli and responding appropriately), the relationship between psychopathy (SRP-III) score and average response time to submit each page was examined. This correlation was significant and in a negative direction, $r = -0.14$, $p < 0.01$, indicating that the reverse was true: higher psychopathy was associated with a slower average response time for submission of the page (response to each stimulus). While response time measures were not explored further, this result indicates two things: 1) it alleviates the concern of potential effects of psychopathy on accuracy being the result of inappropriate response to the task by individuals high on psychopathy (clicking through the stimuli without providing the expected response), and 2) slower response times for individuals higher in psychopathy may be a further indication that psychopathy is associated with more effortful processing of emotional stimuli.

Analyses. A multi-level modeling approach was used to analyze the data from Experiment 1 (and all subsequent experiments). This type of analysis was required because of the nature of the data: the task was repeated-measures, with all participants being exposed to all stimuli. Thus, condition and emotion are essentially “nested” within individuals (participants). Psychopathy is a between-subjects factor, and it is of interest to determine the relationship between psychopathy and accuracy for emotion recognition and empathy, depending on the type

and combination of emotion cues present. As the objective is to examine this relationship along the continuum of psychopathy scores, an analysis of variance is not appropriate (in the absence of comparisons between group means). Regression is also not appropriate, as an assumption of regression is independence of data. Repeated-measures data (data that is “nested” within people) by definition violates the assumption of independence, and therefore multilevel modeling is the appropriate statistical technique to use (Raudenbush & Byrk, 2002; Singer & Willett, 2003). Note that multi-level modeling does not have an associated measure of effect size, as effect size calculations rely on the use of variability as the denominator. In a multi-level model, variability is already divided into two (or more) levels; thus, an effect size calculation is not appropriate.

The data for Experiment 1 used a two-level multi-level model. For both dependent variables of emotion recognition accuracy and empathic response, emotion cue condition (type/combination of emotion cues) and emotion were variables at Level 1 of the model. As self-report psychopathy score is a between-subjects factor, this was a variable at Level 2. Separate models were utilized for overall psychopathy (SRP-III) scores, emotional psychopathy factor scores, and behavioural psychopathy factor scores. Gender was also added into the model as a Level 2 variable. The software used to analyze the data was HLM, version 7. This software was used for analyses in all experiments. Each model included a single dependent variable. Analyses were conducted for two dependent variables: emotion recognition, and empathic response. Predictors were entered into the model in an additive fashion, with the initial null model representing a model with no predictors. Each subsequent model’s fit was compared to the previous model using χ^2 , wherein lower deviance indicated a better fit of the model (Singer & Willett, 2003).

Calculation of sample size for multi-level models is not as straightforward as in other types of statistical models because an appropriate sample size must be calculated for predictors at each level of the model. A rule of thumb for multi-level modeling is that a minimum of 30 participants are necessary for sufficient power to test a Level 2 predictor. In theory, the larger the sample size at the highest level of the model (in this case, Level 2) the better, because this allows for testing of random slope variances at this level (the level of the individual) and thereby results in greater power. The large number of observations from each individual (due to the within-subjects design) allowed for a test of the Level 2 variables with sufficient power. Additionally, because several Level 1 predictors were included, each with multiple conditions/categories, it was important to maintain a sufficiently large sample size (i.e., higher than the minimum sample size recommended) in order to ensure the tests of Level 1 predictors had sufficient power. A sample size would enable the exploration of differences in emotion recognition and empathy relative to the continuous measure of psychopathic traits. Because Experiment 1 was completed online, it was possible to obtain a much larger sample than would be realistic in a laboratory setting. Finally, based on previous online studies I have conducted, the sample needed to be large enough to retain sufficient participants after data screening (such as removing individuals who did not complete the entire experiment).

Psychopathy and Emotion Recognition. The dependent variable of emotion recognition was measured in terms of accuracy rates: when participants labeled the emotion expressed by the speaker in the video as an emotion other than the correct emotion type, this was coded as 0; when participants correctly identified the emotion expressed by the speaker in the video, this was coded as 1. As there were multiple stimuli per condition and emotion, accuracy rates were represented as means across trials for each variable. Variables added into the model included

psychopathy (SRP-III) score at Level 2 (entered grand mean centered), and Condition and Emotion at Level 1. Both Condition and Emotion were dummy coded to compare the levels of each variable within the model.

I predicted that there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating reduced accuracy for identification of emotional stimuli. The model with the addition of SRP score was significantly different from the null model, indicating that SRP score did have an effect on accuracy for emotion recognition, $\chi^2(1) = 7.21, p < 0.01$. The negative coefficient indicated that increased psychopathy (SRP) scores were associated with lower accuracy for emotion recognition, $b = -0.001, SE = 0.0004, p = 0.01$ (see Figure 1).

Figure 1. Effect of psychopathy (SRP-III) on accuracy for emotion recognition (Experiment 1)

When gender was added into the model, the comparison between the new model and the previous model with psychopathic traits only was significant, indicating that gender had an impact on accuracy for recognition, $\chi^2(1) = 5.89, p = 0.01$. A significant difference was observed between males and females, with females ($M = 0.53, SE = 0.01$) demonstrating higher accuracy than males ($M = 0.47, SE = 0.01$), $b = 0.038, SE = 0.0004, p = 0.02$. However, the slopes were not significant for either gender: females, $p = 0.12$; males, $p = 0.1$. Therefore, it was

determined that gender did not provide a meaningful contribution to the model and was removed from the model for further analyses.

To determine if the emotion cue conditions impacted accuracy rates, two dummy variables which represented the three emotion cue conditions (emotional facial expression/emotional prosody = EE; emotional facial expression/neutral prosody = EN; neutral facial expression/emotional prosody = NE) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits, providing a model with condition, accounting for psychopathic traits. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 2891.7, p < 0.001$. The regression coefficients indicated that all three conditions differed from one another ($p < .001$), with emotional facial expression plus vocal affect (EE) producing the greatest accuracy ($M = 0.75, SE = 0.01$), emotional facial expression with neutral voice (EN) producing the second highest accuracy ($M = 0.57, SE = 0.01$) and neutral facial expression with vocal affect (NE) producing the lowest accuracy rates for emotion recognition ($M = 0.22, SE = 0.01$) (see Figure 2).

Figure 2. Effect of emotion cue condition on accuracy for emotion recognition, accounting for psychopathic traits (Experiment 1). Error bars represent standard error.

To explore whether an interaction existed between psychopathic traits and emotion cue condition, a model with psychopathic traits inputted at each level of emotion condition, which represented the interaction between psychopathic traits and emotion cue condition, was compared to the previous model with condition accounting for psychopathic traits. The model fit statistic comparing the two models was not significant, indicating that there was no interaction between psychopathic traits and emotion condition, $\chi^2(4) = 2908.14, p > 0.5$.

To determine if type of emotion impacted accuracy rates, condition was removed from the model and then three dummy variables which represented the four emotions (disgust, fear, happy, sad) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotions differed from the others in accuracy for emotion recognition, $\chi^2(3) = 70.52, p < 0.001$. Accuracy for most emotions differed at $p < .05$, with accuracy highest for sad ($M = 0.54, SE = 0.01$), followed by happy ($M = 0.35, SE = 0.01$), then fear ($M = 0.26, SE = 0.01$), and lowest accuracy for disgust ($M = 0.24, SE = 0.01$). (The

only emotions that did not significantly differ from one another were fear and happy, $p = 0.07$; fear and sad, $p = 0.07$; fear and disgust, $p = 0.89$.) (see Figure 3).

Figure 3. Effect of emotion type on accuracy for emotion recognition (Experiment 1). Error bars represent standard error.

To determine if type of emotion impacted accuracy rates in relation to psychopathic traits, a model with psychopathic traits at each level of emotion was compared to the model with type of emotion, accounting for psychopathic traits. This model comparison was not significant, indicating that there was no interaction between psychopathic traits and emotion type on accuracy for emotion recognition, $\chi^2(3) = 5.83$, $p = 0.12$.

Psychopathy and Empathic Response. The dependent variable of empathic response was also measured in terms of an accuracy rate: when participants identified their own emotion as different from the emotion of the speaker in the video, this was coded as 0; when participants correctly categorized their own emotion as the same emotion as that of the speaker, this was coded as 1. As there were multiple stimuli per condition and emotion, accuracy rates were represented as means across trials for each variable. Variables in the model included psychopathy (SRP-III) score at Level 2 (entered grand mean centered), and Condition and

Emotion at Level 1. Both Condition and Emotion were dummy coded to compare the levels of each variable within the model.

I predicted that there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating a lower empathic response to emotional stimuli. The model with the addition of SRP score was significantly different from the null model, indicating that SRP score did have an effect on emotional response (i.e., produced a match between the participant's rating of their own emotion and the emotion expressed in the video), $\chi^2(1) = 10.11, p < 0.01$. The negative coefficient indicated that increased psychopathy (SRP) scores were associated with lower empathic response to emotional stimuli, $b = -0.002, SE = 0.0006, p < 0.01$ (See Figure 4).

Figure 4. Effect of psychopathy (SRP-III) score on accuracy for empathic response (Experiment 1)

When gender was added into the model, the new model was not significantly different from the previous model, $\chi^2(1) = 0.91, p > 0.5$. Therefore, the variable of gender was removed from this model for further analyses.

To determine if the emotion cue conditions impacted accuracy rates, as with the outcome variable of emotion recognition accuracy, two dummy variables which represented the three

emotion cue conditions (EE, EN, NE) were added into the model in a single step. This addition of condition into the model resulted in a significantly different model fit statistic from the previous model with psychopathic traits only, $\chi^2(2) = 1432.26, p < 0.001$. The relationship among emotion cue conditions and accuracy was the same as for emotion recognition, with all three emotion cue conditions differing significantly from one another ($p < .001$). Thus, the results for condition were consistent with the prediction that the most salient condition, EE, would produce the greatest empathic response ($M = 0.46, SE = 0.02$), followed by EN ($M = 0.3, SE = 0.01$), with the least salient condition, NE, producing the lowest empathic response to the emotional stimuli ($M = 0.12, SE = 0.01$).

To explore whether an interaction existed between psychopathic traits and emotion cue condition, a model with psychopathic traits inputted at each level of emotion condition, representing the interaction between psychopathic traits and condition, was compared to the previous model with emotion cue condition accounting for psychopathic traits. The model fit statistic comparing the two models was significant, indicating that there was an interaction (on empathic response) between psychopathic traits and emotion condition, $\chi^2(6) = 34.06, p < 0.001$. All three conditions significantly differed from one another ($p < 0.01$), indicating that this relationship between psychopathic traits and condition extended to all emotion cue variations for empathic response (see Figure 5).

Figure 5. Interaction between psychopathy (SRP-III) score and emotion condition on empathic response (Experiment 1)

To determine if type of emotion impacted empathic response, condition was removed from the model and then three dummy variables which represented the four emotions (disgust, fear, happy, sad) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotions differed from the others in accuracy for empathic response, $\chi^2(2) = 100.41, p < 0.001$. All emotion categories significantly differed from one another in the associated empathic response, $p < .001$. Happy stimuli produced the highest empathic response ($M = 0.35, SE = 0.01$), followed by sad ($M = 0.32, SE = 0.01$), then disgust ($M = 0.26, SE = 0.01$), with fearful stimuli producing the lowest empathic response ($M = 0.24, SE = 0.01$) (see Figure 6).

Figure 6. Effect of emotion type on accuracy for empathic response, accounting for psychopathic traits (Experiment 1). Error bars represent standard error.

To determine if type of emotion impacted accuracy rates in relation to psychopathic traits, a model with psychopathic traits at each level of emotion, representing the interaction between psychopathic traits and emotion, was compared to the model with type of emotion accounting for psychopathic traits. This model comparison was significant, indicating that the slope of at least one emotion type in relation to psychopathic traits differed from the others, $\chi^2(8) = 53.01, p < 0.001$. Most slopes for emotion types in relation to psychopathic traits differed from one another, $p < 0.05$; although some did not: fear and sad ($p = 0.07$), disgust and happy ($p = 0.89$), and fear and happy ($p = 0.09$) did not differ significantly. Sad stimuli appeared to have the strongest relationship with psychopathic traits, followed by fear: as psychopathy increased, accuracy for sad stimuli decreased to a greater extent than was true for fearful stimuli, and this relationship existed to a lesser extent with other emotion types (see Figure 7).

Figure 7. Interaction between psychopathy (SRP-III) score and emotion type on empathic response (Experiment 1)

Psychopathy Factor Scores and Emotion Recognition. Accuracy for emotion recognition was further analyzed by participants' SRP-III scores separately by factor. This involved collapsing the four factors of the SRP-III into a more global two-factor structure, capturing the emotional and behavioural components of psychopathy independently.

When a model including the emotional factor score of psychopathy was compared against the null model using a model fit statistic, the difference between these two models was not significant, $\chi^2(1) = 2.73, p = 0.09$. Therefore, analyses for the emotional component of psychopathy did not proceed.

Comparing a model with behavioural psychopathy factor scores to the null model, these models were significantly different, $\chi^2(1) = 12.25, p < 0.01$. The slope of behavioural psychopathic traits was significant, and was in the same direction as overall psychopathic traits, indicating that an increase in psychopathic traits on the behavioural factor of psychopathy predicted reduced accuracy for emotion recognition, $b = -0.003, SE = 0.0009, p < 0.001$ (see Figure 8).

Figure 8. Effect of psychopathy (SRP-III) behavioural factor on accuracy for emotion recognition (Experiment 1)

There was a main effect of emotion cue condition, in which a model controlling for psychopathic behavioural factor traits was compared against the previous model with psychopathic behavioural factor traits only. The significance of this model statistic indicated that one or more conditions differed from the others, $\chi^2(2) = 2891.7, p < 0.001$. The coefficients revealed that all three conditions differed significantly from one another, $p < 0.001$. As was the case for the model accounting for overall psychopathic traits, EE produced the highest accuracy ($M = 0.75, SE = 0.01$), followed by EN ($M = 0.57, SE = 0.01$), with NE producing the lowest accuracy for emotion recognition ($M = 0.22, SE = 0.01$).

A model examining the interaction between psychopathy behavioural factor scores and emotion cue condition, compared against the model with emotion cue condition only (controlling for psychopathic emotion factor traits), was found to be significant, $\chi^2(6) = 85.47, p < 0.001$. The two most salient conditions, EE and EN produced the highest accuracy ($M = 0.75, SE = 0.01$; and $M = 0.57, SE = 0.01$, respectively), but did not significantly differ from one another, $p = 0.5$. These two conditions differed significantly from the least salient condition, NE, $p < 0.001$. Accuracy was very low for this last condition, $M = 0.22, SE = 0.01$ (see Figure 9).

Figure 9. Interaction between psychopathy (SRP-III) behavioural factor score and emotion condition on accuracy for emotion recognition (Experiment 1)

A model with emotion type, accounting for behavioural psychopathic traits, was compared against the model with only behavioural psychopathic traits (with condition having been removed from the model). This comparison was significant, indicating that at least one emotion differed from the others in its effect on accuracy, $\chi^2(3) = 70.52, p < 0.001$. Happy stimuli produced the greatest accuracy for emotion recognition ($M = 0.57, SE = 0.01$), followed by sad ($M = 0.54, SE = 0.01$), then fear ($M = 0.49, SE = 0.01$), with disgust producing the lowest accuracy ($M = 0.47, SE = 0.01$) (see Figure 10).

Figure 10. Effect of emotion type on accuracy for emotion recognition, accounting for behavioural psychopathic traits (Experiment 1). Error bars represent standard error.

The next model explored an interaction between emotion type and behavioural psychopathic traits, comparing this interaction to the previous model with emotion type (accounting for behavioural psychopathic traits). The difference between these two models was not significant, indicating that there was no interaction between emotion and the behavioural component of psychopathic traits, $\chi^2(3) = 5.65, p = 0.129$.

Psychopathy Factor Scores and Empathic Response. Accuracy for empathic response was further analyzed by participants' SRP-III scores separately by factor. This involved collapsing the four factors of the SRP into a more global two-factor structure, capturing the emotional and behavioural components of psychopathy independently.

When a model including the emotional factor scores of psychopathy was compared against the null model using a model fit statistic, the difference between these two models was significant, $\chi^2(1) = 10.26, p < 0.01$. $-0.004, SE = 0.001, p < 0.001$. The negative coefficient indicated that increased scores on the emotional component of SRP were associated with lower accuracy for empathic responding ($b = -0.002, SE = 0.001, p = 0.001$) (see Figure 11).

Figure 11. Effect of psychopathy (SRP-III) emotional factor on accuracy for empathic responding (Experiment 1)

To determine if the emotion cue conditions impacted accuracy rates for empathic response while accounting for emotional psychopathic traits, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic with emotion cue condition (accounting for emotional psychopathic traits) was compared to the model with emotional psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1023.02, p < 0.001$. The slopes of all three conditions significantly differed from one another, $p < 0.001$. As predicted, highest accuracy for empathic response was produced by EE ($M = 0.3, SE = 0.01$), followed by EN ($M = 0.22, SE = 0.01$), with NE producing the lowest empathic response ($M = 0.11, SE = 0.004$).

Next, an interaction between the emotional factor of psychopathic traits and emotion cue condition was explored. A model with this interaction was compared against the previous model, with emotion cue condition accounting for emotional psychopathic traits. The comparison between these two models was significant, $\chi^2(2) = 30.11$, indicating that at least one condition differed in relation to the emotional component of psychopathic traits. All three conditions

differed significantly from one another: EE from NE, $b = -0.003$, $SE = 0.001$, $p < 0.01$; EN from NE, $b = -0.003$, $SE = 0.001$, $p = 0.01$; and EE from EN, $b = -0.002$, $SE = 0.001$, $p < 0.001$ (see Figure 12).

Figure 12. Interaction between psychopathy (SRP-III) emotional factor score and emotion condition on empathic response (Experiment 1)

To determine if type of emotion impacted accuracy rates for empathic response while accounting for emotional psychopathic traits, condition was removed from the model and then three dummy variables which represented the four emotions (disgust, fear, happy, sad) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotions differed from the others in accuracy for empathic response, $\chi^2(3) = 140.88$, $p < 0.001$. All emotion categories significantly differed from one another in the associated empathic response ($p < .001$). The pattern of “accuracy” for empathic response produced differed slightly from that of accuracy for emotion recognition: happy stimuli produced the highest accuracy ($M = 0.35$, $SE = 0.01$), followed by sadness ($M = 0.32$, $SE = 0.01$), with disgust the third highest ($M = 0.26$, $SD = 0.01$), and fear producing the lowest empathic

response in which participants identified their own emotion as matching the emotion of the speaker in the video ($M = 0.24$, $SE = 0.01$) (see Figure 13).

Figure 13. Effect of emotion type on accuracy for empathic response, accounting for emotional psychopathic traits (Experiment 1). Error bars represent standard error.

Next, an interaction between emotional psychopathic traits and emotion on empathic response was explored. The comparison between the model with this interaction and the previous model with emotional psychopathic traits was significant, $\chi^2(3) = 12.64$, $p = 0.01$. Most slopes for emotion types differed from one another in relation to emotional psychopathic traits ($p < 0.05$), except for fear from happy ($p = 0.14$) and disgust from happy ($p = 0.85$). Sad stimuli appeared to have the strongest relationship with psychopathic traits: as psychopathy increased, accuracy for sad stimuli decreased to a greater extent than was true for other emotion types (see Figure 14).

Figure 14. Interaction between psychopathy (SRP-III) emotional factor score and emotion type on empathic response (Experiment 1)

When a model with the behavioural component of psychopathic traits was compared against the null model to determine the effect of this component of psychopathy on accuracy for empathic responding, this comparison was significant, $\chi^2(3) = 15.18, p < 0.001$. The coefficient indicated that an increase in behavioural psychopathic traits produced a decrease in empathic responding $b = -0.004, SE = 0.001, p < 0.01$ (see Figure 15).

Figure 15. Effect of psychopathy (SRP-III) behavioural factor on accuracy for empathic responding (Experiment 1)

To determine if the emotion cue conditions impacted accuracy rates for empathic response while accounting for behavioural psychopathic traits, two dummy variables

representing the three emotion cue conditions (EE, EN, NE) were added into the model at once. The model fit statistic with emotion cue condition (accounting for behavioural psychopathic traits) was compared to the model with behavioural psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1023.02, p < 0.001$. All three conditions significantly differed from one another, $p < 0.001$. As predicted, highest accuracy for empathic response was produced by EE ($M = 0.3, SE = 0.01$), followed by EN ($M = 0.22, SE = 0.01$), with NE producing the lowest empathic response ($M = 0.11, SE = 0.004$).

Next, an interaction between the behavioural factor of psychopathic traits and emotion cue condition was explored. A model with this interaction was compared against the previous model, with emotion cue condition accounting for behavioural psychopathic traits. The comparison between these two models was significant, indicating that at least one condition differed in relation to the behavioural component of psychopathic traits, $\chi^2(2) = 54.98, p < 0.001$. Unlike the models for overall psychopathic traits and the behavioural factor of psychopathic traits, all three conditions differed significantly from one another: EE from NE, $b = -0.005, SE = 0.001, p < 0.001$; EE from EN, $b = -0.003, SE = 0.001, p < 0.001$; and EN from NE, $b = -0.003, SE = 0.001, p = 0.01$ (see Figure 16).

Figure 16. Interaction between psychopathy (SRP-III) behavioural factor score and emotion condition on empathic response (Experiment 1)

Investigating whether type of emotion impacted accuracy rates for empathic response while accounting for behavioural psychopathic traits, condition was removed from the model and then three dummy variables which represented the four emotions (disgust, fear, happy, sad) were added into the model simultaneously. The model fit statistic was compared to the model with behavioural psychopathic traits alone. The new model significantly differed from the previous model, indicating that at least one of the emotions differed from the others in accuracy for empathic response, $\chi^2(3) = 140.89, p < 0.001$. All emotion categories significantly differed from one another in the associated empathic response ($p < .001$). The pattern of “accuracy” for empathic response produced differed slightly from that of accuracy for emotion recognition: happy stimuli produced the highest accuracy ($M = 0.35, SE = 0.01$), followed by sadness ($M = 0.32, SE = 0.01$), with disgust the third highest ($M = 0.26, SD = 0.01$), and fear producing the lowest empathic response in which participants identified their own emotion as matching the emotion of the speaker in the video ($M = 0.24, SE = 0.01$) (see Figure 17).

Figure 17. Effect of emotion type on accuracy for empathic response, accounting for behavioural psychopathic traits (Experiment 1). Error bars represent standard error.

The next model compared an interaction between behavioural psychopathic traits and emotion type against the previous model with emotion type, accounting for behavioural psychopathic traits. This comparison was significant, indicating that at least one of the emotions differed in its effect on empathic responding in relation to behavioural psychopathic traits, $\chi^2(3) = 10.54, p = 0.01$. The only emotion types that did not differ from one another in their relationship with behavioural psychopathic traits (on empathic response) were sad and fear ($p = 0.3$), and disgust and happy ($p = 0.6$). All other emotion types differed significantly from one another in relation to behavioural psychopathic traits, in terms of their effect on empathic responding, $p < 0.05$. Sad and fearful stimuli each appeared to have a stronger relationship with behavioural psychopathic traits in terms of their effect on empathic response performance compared to disgust and happy stimuli, with higher scores on the behavioural factor of psychopathy producing increasingly poor accuracy scores for empathic response (see Figure 18).

Figure 18. Interaction between psychopathy (SRP-III) behavioural factor score and emotion type on empathic responding (Experiment 1)

Experiment 1 Discussion

As predicted, there was a main effect of psychopathic traits on accuracy for emotion recognition, with higher psychopathic traits predicting reduced accuracy. There was also a main effect of emotion cue condition, as predicted, with facial emotion plus vocal tone (EE) the most salient condition, producing the highest level of accuracy for emotion recognition; the second highest accuracy was for the next most salient condition: facial emotion with neutral tone of voice (EN); with the lowest levels of accuracy for the least salient condition: neutral facial expression with emotional tone (NE).

There was a significant interaction between psychopathy and emotion cue condition. However, the two most salient conditions did not differ from one another, and while the NE condition differed from the other two more salient conditions, accuracy rates were very low for this condition (below chance: 22%). It may be the case that the emotion cues in this latter least salient condition were too ambiguous for participants to easily interpret, such that all participants performed poorly, making differences based on psychopathic traits not easily observable. In

other words, interaction between psychopathic traits and perception of emotion based on the salience of emotion cues may not be related to the difference in saliency of the cues, but rather due to the difficulty in perceiving ambiguous emotion cue conditions generating the appearance of an interaction. The slopes of the lines for the different conditions are consistent with this explanation, as the slopes for conditions EE and EN demonstrated a clear relationship between psychopathic traits and accuracy, whereas the slope which represents this relationship for condition NE was marginally different from a flat line.

When psychopathic traits (SRP-III scores) were broken down by emotional and behavioural factors, some, but not all results were consistent with results for overall psychopathic traits. The main difference between analysis of emotion recognition for overall psychopathic traits and analysis by separate factors was that there was no effect of psychopathy for the emotional factor. There was, however, an effect of psychopathy for the behavioural component of the SRP-III, with this factor producing the same results for condition and emotion as were observed for overall psychopathic traits. This is somewhat unexpected, as one might expect the emotion recognition response would be more closely tied to the emotional factor of psychopathy. Results for the behavioural factor of psychopathy mirrored those of overall psychopathy for emotion recognition, with a main effect of condition, the same interaction between condition and psychopathic traits (with no difference between EE and EN), a main effect of emotion, and no interaction between psychopathy and emotion.

A main effect of psychopathic traits was also observed for empathic response, with higher psychopathic traits predicting greater empathic responding (matching between the emotion expressed by the individual in the video and an individual's ratings of their own emotion after observing the stimuli). There was also a main effect of condition on empathic

response. The same trend for emotion cue condition occurred for empathic responding as occurred for accuracy for emotion recognition: the most salient condition, EE, produced the greatest empathic response; the next most salient condition, EN, produced the next highest empathic response; and the least salient condition, NE, produced the lowest empathic response.

An interaction between psychopathic traits and condition for empathic response was observed, demonstrating a relationship between condition and psychopathy similar to that observed for emotion recognition: the two most salient conditions, EE and EN, both differed from the least salient condition, NE, but did not differ from one another. The largest slope in the regression lines was observed for the most salient condition, EE, indicating that the strongest relationship between psychopathic traits and accuracy occurred in this condition. The least salient condition, NE, had the regression line with the least slope, indicating the weakest relationship between psychopathic traits and accuracy for this condition. These results are counter to what I predicted: I expected that the most salient condition would demonstrate the weakest relationship between psychopathic traits and empathic response, as the increasing ambiguity of the stimuli would exaggerate differences in empathy based on psychopathic traits. However, judging from overall performance on accuracy for empathic response in the least salient condition, NE, it appears that the relationship between psychopathic traits and accuracy for this condition in particular was largely influenced by poor overall performance. “Accuracy” for empathic response was poor across all three conditions (46% on average for EE, 30% for EN), but particularly for the least salient condition, NE (12% accuracy on average, which is well below chance). This poor performance in the NE condition may have made it too difficult for participants respond empathically, consistent with the idea that an emotion must be identified in order for the individual to respond to it empathically (Dadds et al., 2012).

When empathic responding was examined as a function of emotional and behavioural psychopathy factor scores, both the emotional and behavioural factors produced results for condition and emotion similar to those that were observed for overall psychopathic traits. A main effect of psychopathy was present for both factors, and an interaction between emotion cue condition and psychopathy was observed. However, the regression lines represented in this interaction were more discrepant among conditions for the behavioural factor, with EE demonstrating the strongest negative relationship between psychopathic traits on this factor and empathic response. Again, this is slightly surprising as one might expect that individual differences in empathic response would be more consistent with the emotional factor of psychopathy.

A main effect of emotion type was found for both emotion recognition and empathic responding. Different patterns emerged for the two dependent variables in terms of which emotions produced the highest accuracy on each of these outcome variables. For emotion recognition, happy stimuli were the easiest to identify, followed by sad, then fear, with disgust producing the lowest accuracy. For empathic responding, sad stimuli produced the highest empathic response, followed by happy, then disgust, with fear producing the lowest empathic response. If empathy for an expressed emotion is closely tied to recognition of that emotion, then one would expect the same pattern of results for both emotion recognition and empathy. The fact that different patterns emerged suggests that the relationship between emotion recognition and empathy is complex.

An interaction between emotion type and psychopathic traits was observed for empathic responding. Sad stimuli appeared to have a stronger relationship with psychopathic traits in terms of its effect on empathic response performance compared to the other emotions, with

higher psychopathy scores producing increasingly poor accuracy scores for empathic response; this was true to a lesser extent for fearful stimuli, which was present only for the behavioural factor of psychopathy.

Emotion recognition relative to individual psychopathy factor scores could not really be compared in separate models because there was no relationship between the emotional factor of psychopathy and emotion recognition to begin with. The behavioural factor of psychopathy produced results for the main effect of emotion type on emotion recognition comparable to that observed for psychopathic traits overall. With respect to empathy, when the two factors of psychopathy were accounted for separately in different models in relation to the main effect of emotion type, results for empathic responding changed slightly: the pattern of empathic response produced by individual emotions was the same for behavioural psychopathic traits and for overall traits; however, for the emotional factor of psychopathy, the top two emotions producing the greatest empathic response were reversed, with sad stimuli generating greater empathic response than happy stimuli. No theoretical reason for this reversal is obvious. No interaction was observed between emotion type and psychopathic traits.

Experiment 2

Experiment 2 employed the same stimuli and methodology as Experiment 1, and was also conducted online. It was effectively a complete replication of Experiment 1, with the addition of a measure of alexithymia. As the expected results of Experiment 1 were not fully observed (in particular, the interaction between psychopathy and emotion cue condition was not present), the objective of this study was to observe whether these results would be replicated in a second sample drawn from the same sampling frame. This second experiment also included the

additional measure of alexithymia (the Toronto Alexithymia Scale). Predictions related to psychopathic traits and emotion cue condition were the same as for Experiment 1.

Method

Participants. For Experiment 2, 480 participants were recruited through Carleton's online recruitment system and received course credit in exchange for their participation. Removal of incomplete responses (>50%) resulted in a total of 425 participants included in the analyses. To be eligible for participation in Experiment 2, participants were required have little to no experience with the German language and have normal or corrected to normal vision and hearing. Participants were not eligible if they participated in Experiment 1.

Measures. As in Experiment 1, participants were given the Self-Report Psychopathy scale (SRP-III, short version – see Experiment 1).

In Experiment 2, participants were assessed for alexithymia using the Toronto Alexithymia Scale (TAS-20; Bagby, Taylor, & Ryan, 1986). The TAS-20 assesses difficulties in recognizing and describing emotions as well as external focus of attention and restriction of emotional experience. It has three subscales: Difficulty describing feelings (DDF), Difficulty identifying feelings (DIF), and Externally oriented thinking (EOT). The TAS-20 is widely used for the assessment of alexithymia. The TAS-20 has demonstrated acceptable reliability and validity in community and undergraduate samples (Parker, Bagby, Taylor, Endler, & Schmitz, 1993; Bagby, Taylor, & Parker, 1994; Parker, Taylor, & Bagby, 2003), and has been validated cross-culturally using foreign language versions of the measure in samples from different cultures (Güleç et al., 2009; Jinyao, Shuqiao, & Xiongzhaoh, 2003; Moriguchi et al., 2007; Parker, Shaughnessy, Wood, Majeski, & Eastabrook, 2005).

However, results of the TAS-20 should be interpreted with some caution. A study by Liesing, Grande, and Faber (2009) found high TAS-20 scores to be associated with greater emotional diversity (higher number of emotions, particularly negative ones, and more different emotions). These researchers concluded that the TAS-20 may serve more as a general measure of psychological distress than for its intended purpose of measurement of alexithymia.

Stimuli. Stimuli were the same as in Experiment 1. As in Experiment 1, each stimulus was presented twice, for a total of 96 stimuli presented to each participant.

Procedure. The procedure was the same as for Experiment 1. The only addition was that when participants completed the SRP-III at the beginning of the study, they also completed the TAS-20 immediately after (like the SRP-III, identified to participants as a “personality questionnaire”), prior to engaging in the emotion recognition and empathy task.

Results

Demographics

Table 2. Demographic variables for Experiment 2

Variable	<i>M (SD)</i>
SRP-III Score - Overall	54.03 (15.92)
SRP-III Score - Emotional Factor	25.46 (8.71)
SRP-III Score – Behavioural Factor	28.46 (8.11)
Age (years)	20.08 (4.16)

The mean score for psychopathic traits overall for the Experiment 2 sample scored on the SRP-III was 54.03 ($SD = 15.92$). The two factors of the SRP-III differed slightly, with the emotional factor ($M = 25.46$, $SD = 8.71$) slightly lower than the behavioural factor ($M = 28.46$, $SD = 8.11$). The average age of participants in the sample was 20.08 years ($SD = 4.16$). The sample was made up of 70.4% female participants (29.6% male).

As in Experiment 1, the relation between psychopathy (SRP-III) and response time for accuracy (emotion recognition and empathic response combined) was determined in place of a manipulation check, to explore the possibility that individuals high in psychopathy were responding “too quickly” out of inattention or lack of effort which would influence accuracy. Speed of responding did not vary as a function of psychopathy, $r = 0.06$, $p = 0.23$.

Psychopathy and TAS-20. The mean TAS-20 score for Experiment 2 participants was 58.79 ($SD = 9.79$). Alexithymia (TAS-20) scores were correlated with SRP-III scores, $r = -0.264$, $p < 0.001$. The TAS-20 was not correlated with accuracy for emotion recognition, $r = 0.02$, $p = 0.21$. Because alexithymia was not correlated with the dependent variable, and was correlated with the independent variable of psychopathy, it is not possible to use the TAS-20 scores as a covariate in the analysis of Experiment 2 results. Thus, the scores on the TAS-20 were not included in the remainder of the analyses.

With respect to empathic responding, TAS-20 scores were correlated with accuracy for empathic responding, $r = 0.33$, $p = 0.02$. However, because the SRP-III and TAS-20 scores were also highly correlated, it was not possible to use the TAS-20 scores in a covariate analysis for empathic responding. Thus, scores on this measure were not included for analyses for either emotion recognition or empathic response.

Analyses. The data for Experiment 2 used a two-level multi-level model with the same predictors as those in Experiment 1: condition and emotion at Level 1, and self-report psychopathy and gender at Level 2. The software used to analyze the data was HLM, version 7. Each model included a single dependent variable. Analyses were conducted for two dependent variables: emotion recognition, and empathic response. Predictors were entered into the model in

an additive fashion, with the initial null model representing a model with no predictors. Each subsequent model was compared to the previous model to compare model fit using χ^2 .

The same measurement was used for the dependent variable of emotion recognition as in Experiment 1: this was an accuracy measure wherein participants identified their own emotion, and when that emotion differed from that conveyed by the speaker in the video, it was coded as 0; when participants identified their own emotion as matching the emotion of the speaker in the video, it was coded as 1. As there were multiple stimuli per condition and emotion, accuracy was represented as means across trials for each variable. Variables added into the model for both emotion recognition and empathic response included psychopathy (SRP-III) score at Level 2 (entered grand mean centered), with separate models for overall psychopathy scores, emotional psychopathy factor scores, and behavioural psychopathy factor score. Condition and emotion were variables entered at Level 1 of the model. Both condition and emotion were dummy coded to compare the levels of each variable within the model.

Psychopathy and Emotion Recognition. I predicted there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating reduced accuracy for identification of emotional stimuli. The model with the addition of SRP score was significantly different from the null model, indicating that emotional SRP factor score affected accuracy for emotion recognition, $\chi^2(1) = 11.28, p = 0.001$. The negative coefficient indicated that increased psychopathy (SRP) scores were associated with lower accuracy for emotion recognition ($b = 0.36, SE = 0.005, p < 0.001$) (see Figure 19).

Figure 19. Effect of psychopathy (SRP-III) score on accuracy for emotion recognition (Experiment 2)

When gender was added into the model, the comparison between the new model and the previous model with psychopathic traits only was significant, $\chi^2(1) = 12.1, p < 0.001$.

However, no significant difference was observed between males and females, $p = 0.33$.

Therefore, gender was removed from the model for further analyses.

Next, emotion cue condition was added into the model: as in Experiment 1, two dummy coded variables representing the three conditions were added into the model in a single step. The difference between the model with psychopathic traits only, and with condition accounting for psychopathic traits, was significant, $\chi^2(2) = 2571.94, p < 0.001$. The most salient condition, EE, produced the highest accuracy for emotion recognition ($M = 0.54, SE = 0.008$), followed by EN ($M = 0.36, SE = 0.006$), with the least salient condition, NE, producing the lowest level of accuracy ($M = 0.18, SE = 0.003$).

To investigate the presence of an interaction between psychopathic traits and emotion condition, a model with psychopathic traits inputted at each level of emotion condition was compared to the previous model with emotion condition accounting for psychopathic traits. The comparison between the two models was significant, $\chi^2(2) = 12.91, p = 0.002$. The most salient

condition, EE ($M = 0.54$, $SE = 0.008$), differed from both less salient conditions ($p < 0.05$); however, the two least salient conditions, EN ($M = 0.36$, $SE = 0.006$) and NE ($M = 0.18$, $SE = 0.003$) did not significantly differ, $p = 0.166$ (see Figure 20).

Figure 20. Interaction between psychopathy (SRP-III) score and emotion condition on accuracy for emotion recognition (Experiment 2)

In order to examine the effect of emotion type on accuracy for emotion recognition, a model including emotion type, accounting for psychopathic traits, was compared to a model with psychopathic traits only. The difference between these models was significant, indicating that at least one emotion differed from the others in terms of its effect on emotion recognition, $\chi^2(3) = 137.46$, $p < 0.001$. Emotions generally differed from one another, $p < 0.001$ (happy vs. fear differed at $p < 0.05$). The exception to this was that emotion recognition did not differ between disgust and fear ($p = 0.07$). Emotion recognition was highest for sad stimuli ($M = 0.42$, $SE = 0.01$), then happy ($M = 0.35$, $SE = 0.005$), followed closely by fear ($M = 0.34$, $SE = 0.01$), with disgust producing the lowest accuracy for emotion recognition ($M = 0.32$, $SE = 0.01$) (see Figure 21).

Figure 21. Effect of emotion on accuracy for emotion recognition, accounting for psychopathic traits (Experiment 2). Error bars represent standard error.

When a model including emotion type relative to psychopathic traits was compared against a model with emotion type only, accounting for psychopathic traits, the difference between these two models was not significant, indicating that an interaction between psychopathic traits and emotion was not present, $\chi^2(3) = 3.42, p = 0.331$.

Psychopathy and Empathic Responding. I predicted there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating a lower empathic response to emotional stimuli. The model with the addition of SRP-III score was significantly different from the null model, indicating that SRP-III score did have an effect on emotional response (i.e., produced a match between the participant's rating of their own emotion and the emotion expressed in the video), $\chi^2(1) = 14.39$. The negative coefficient indicated that increased psychopathy (SRP-III) scores were associated with lower empathic response to emotional stimuli, $b = 0.21, SE = 0.007, p < 0.001$ (see Figure 22).

Figure 22. Effect of psychopathy (SRP-III) emotional factor on accuracy for empathic responding (Experiment 2)

When emotion cue condition was added into the model, two dummy coded variables representing the three conditions were added into the model in a single step. The difference between the model with psychopathic traits only, and with condition accounting for psychopathic traits, was significant, $\chi^2(2) = 1023.02, p < 0.001$. The highest empathic response, with the participant's own identified emotion matching the emotion expressed by the speaker in the video, was produced by the most salient condition, EE ($M = 0.3, SE = 0.01$), followed by EN ($M = 0.22, SE = 0.01$), with the least salient condition, NE, producing the lowest level of accuracy ($M = 0.11, SE = 0.004$).

To investigate the presence of an interaction between psychopathic traits and emotion condition, a model with psychopathic traits added at each level of emotion condition was compared to the previous model with emotion condition accounting for psychopathic traits. The difference between the two models was significant, $\chi^2(2) = 49.99, p < 0.001$. All three conditions significantly differed from one another ($p < 0.01$). The most salient condition, EE, showed the steepest slope, with the greatest discrepancy in empathic responding observed

between individuals scoring high and low on psychopathic traits; the second greatest discrepancy was followed by EN; while the least salient condition, NE, produced the least discrepancy in empathic responding across the range of psychopathic trait scores (see Figure 23).

Figure 23. Interaction between psychopathy (SRP-III) score and emotion condition on accuracy for empathic responding (Experiment 2)

To determine the effect of emotion type on accuracy for empathic responding, a model including emotion, accounting for psychopathic traits, was compared to a model with psychopathic traits only. The difference between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 88.16, p < 0.001$. Emotions generally differed from one another, $p < 0.001$, except for disgust and happy ($p = 0.494$). Empathic response was highest for sad stimuli ($M = 0.24, SE = 0.01$), then happy ($M = 0.21, SE = 0.01$), followed closely by disgust ($M = 0.21, SE = 0.01$), with fear producing the lowest empathic response ($M = 0.17, SE = 0.01$) (see Figure 24).

Figure 24. Effect of emotion on accuracy for empathic responding, accounting for psychopathic traits (Experiment 2). Error bars represent standard error.

When a model including emotion type relative to psychopathic traits was compared against a model with emotion type only, accounting for psychopathic traits, the difference between these two models was not significant, $\chi^2(3) = 4.69, p = 0.194$.

Psychopathy Factor Scores and Emotion Recognition. Accuracy for emotion recognition was further analyzed by participants' psychopathy (SRP-III) scores separately for both emotional and behavioural factors.

For the emotional factor of psychopathy, a model with emotional psychopathic traits was compared against the null model. This model comparison was significant, $\chi^2(1) = 6.99, p < 0.01$. The negative coefficient demonstrates that an increase in emotional psychopathic traits was associated with lower empathic responding, $b = -0.001, SE = 0.001, p < 0.001$ (see Figure 25).

Figure 25. Effect of psychopathy (SRP-III) emotional factor on accuracy for emotion recognition (Experiment 2)

The effect of emotion cue condition on accuracy for emotion recognition was explored next. The model with condition, accounting for emotional psychopathic traits, was compared against the previous model with emotional psychopathic traits only. The difference between these two models was significant, $\chi^2(2) = 2571.94, p < 0.001$. The highest accuracy for emotion recognition was produced by the most salient condition, EE ($M = 0.54, SE = 0.01$), followed by EN ($M = 0.36, SE = 0.01$), with the least salient condition, NE, producing the lowest level of accuracy ($M = 0.18, SE = 0.003$) (see Figure 26).

Figure 26. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathy emotional factor scores (Experiment 2). Error bars represent standard error.

Then, the presence of an interaction between emotional psychopathic traits and emotion condition was investigated. A model including this interaction was compared to the previous model with emotion condition accounting for emotional psychopathic traits. The comparison between the two models was significant, $\chi^2(2) = 6.92, p = 0.03$. However, none of the three conditions differed significantly from one another (EE against NE, $p = 0.07$; EN against NE, $p = 0.29$; EE against EN, $p = 0.07$).

Condition was then removed from the model and a main effect of emotion type on emotion recognition was explored by comparing a model with emotion type, accounting for emotional psychopathic traits, against an earlier model with emotional psychopathic traits only. These two models significantly differed, $\chi^2(3) = 137.46, p < 0.001$. However, most emotions did not differ in their effect on accuracy ($p = 0.07$ - 0.7). The only emotions that differed significantly were sad and happy ($p = 0.01$), with happy producing higher accuracy ($M = 0.43, SE = 0.01$) than sad ($M = 0.34, SE = 0.004$).

The interaction between the emotional psychopathic factor and emotion type was not significant, with no difference between the model including this interaction and the model with emotion type (accounting for emotional psychopathic traits), $\chi^2(3) = 3.05, p = 0.39$.

The other psychopathy factor, the behavioural factor, was investigated for its potential effect on emotion recognition. A model with the behavioural psychopathic factor was compared against the null model, and this model difference was significant, $\chi^2(1) = 14.07, p < 0.001$. Again, the negative coefficient identified that an increase in behavioural psychopathic traits was associated with a decrease in emotion recognition accuracy, $b = -0.002, SE = 0.001, p < 0.001$ (see Figure 27).

Figure 27. Effect of psychopathy (SRP-III) behavioural factor on accuracy for emotion recognition (Experiment 2)

The next step was to determine the effect of emotion cue condition on emotion recognition accuracy. The model with condition, accounting for the behavioural psychopathic factor, was compared against the previous model with the behavioural psychopathic factor only. The difference between these two models was significant, $\chi^2(2) = 2571.94, p < 0.001$. The highest accuracy for emotion recognition was produced by the most salient condition, EE ($M =$

0.54, $SE = 0.01$), followed by EN ($M = 0.36$, $SE = 0.01$), with the least salient condition, NE, producing the lowest level of accuracy ($M = 0.18$, $SE = 0.003$) (see Figure 28).

Figure 28. Effect of emotion cue condition on accuracy for emotion recognition, accounting for psychopathy behavioural factor scores (Experiment 2). Error bars represent standard error.

A potential interaction between the behavioural psychopathic factor and emotion cue condition was then investigated. A model including this interaction was compared to the previous model with emotion cue condition (accounting for behavioural psychopathic traits in the model). The comparison between the two models was significant, $\chi^2(2) = 17.9$, $p < 0.001$. Unlike the model exploring the interaction between emotion cue condition and the emotional factor of psychopathy, two of the three conditions differed significantly from one another, $p < 0.01$. EE produced the highest accuracy for emotion recognition ($M = 0.54$, $SE = 0.01$), followed by EN ($M = 0.36$, $SE = 0.01$), with NE producing the lowest accuracy for emotion recognition ($M = 0.18$, $SE = 0.003$), as predicted. However, in this case, it was the two least salient conditions, EN and NE, that did not differ significantly from one another, $p = 0.11$.

Condition was then removed from the model and a main effect of emotion type on emotion recognition was explored by comparing a model with emotion type, accounting for

behavioural psychopathic factor, against an earlier model with the behavioural psychopathic factor only. These two models significantly differed, $\chi^2(3) = 137.46, p < 0.001$. Results were slightly different than for the main effect of emotion type for the emotional factor of psychopathy, in that most emotions differed from one another, with the exception of disgust and fear ($p = 0.68$). Fear and happy differed from one another at the 0.05 level, while the other emotion types differed at $p < 0.001$. Sad stimuli produced the greatest accuracy for emotion recognition ($M = 0.42, SE = 0.01$), followed by happy ($M = 0.35, SE = 0.004$), then fear ($M = 0.34, SE = 0.01$), with disgust producing the lowest accuracy for emotion recognition ($M = 0.32, SE = 0.01$) (see Figure 29).

Figure 29. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathy behavioural factor scores (Experiment 2). Error bars represent standard error.

The interaction between the behavioural psychopathic factor and emotion type was not significant, with no difference between the model including this interaction and the model with emotion type (accounting for the behavioural psychopathic factor), $\chi^2(1) = 14.39, p = 0.37$.

Psychopathy Factor Scores and Empathic Responding. Accuracy for empathic responding was also analyzed by participants' psychopathy (SRP-III) scores separately by both emotional and behavioural factors.

When a model including the emotional factor score of psychopathy was compared against the null model using a model fit statistic, the difference between these two models was significant, $\chi^2(1) = 10.89, p < 0.001$. The slope of the emotional psychopathic factor was significant, and was in the same direction as overall psychopathy, indicating that an increase in the emotional factor of psychopathy predicted reduced accuracy for empathic responding, $b = -0.003, SE = 0.0007, p < 0.001$ (see Figure 30).

Figure 30. Effect of psychopathy (SRP-III) emotional factor on accuracy for empathic responding (Experiment 2)

To determine if the emotion cue conditions impacted accuracy for empathic responding, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic was compared to the model with the emotional psychopathic factor only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) =$

1023.02, $p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.001$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.3$, $SE = 0.11$); EN produced the next highest accuracy ($M = 0.22$, $SE = 0.007$); with NE producing the lowest accuracy for empathic responding ($M = 0.11$, $SE = 0.004$).

Examining the interaction between emotion cue condition and the emotional psychopath factor, a model with this interaction was compared to the previous emotion cue condition (accounting for the emotional psychopathic factor). The difference between these models was significant, $\chi^2(2) = 36.17$, $p < 0.001$, indicating that the slopes of at least one of these conditions differed from the others in relation to psychopathy. All conditions differed significantly from one another, $p < 0.01$. As with overall psychopathy, the most salient condition, EE ($M = 0.3$, $SE = 0.01$), showed the steepest slope, with the greatest discrepancy in empathic responding observed between individuals scoring high and low on the emotional factor of psychopathy; the second greatest discrepancy was followed by EN ($M = 0.22$, $SE = 0.007$); while the least salient condition, NE ($M = 0.11$, $SE = 0.004$), produced the least discrepancy in empathic responding across the range of emotional factor scores (see Figure 31).

Figure 31. Interaction between psychopathy (SRP-III) emotional factor score and emotion condition on accuracy for empathic responding (Experiment 2)

Looking at the effect of emotion type on accuracy for empathic responding, a model including emotion, accounting for the behavioural factor of psychopathy, was compared to a model with the behavioural psychopathic factor alone. The difference between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 88.16, p < 0.001$. The results for the emotional factor score of psychopathy (SRP-III) on empathic responding were virtually identical to overall psychopathy scores. All emotions differed from one another, $p < 0.00$, except for the empathic responses to disgust and happy ($p = 0.494$). Empathic response was highest for sad stimuli ($M = 0.24, SE = 0.01$), then happy ($M = 0.21, SE = 0.01$), followed closely by disgust ($M = 0.21, SE = 0.01$), with fear producing the lowest empathic response ($M = 0.17, SE = 0.01$) (see Figure 32).

Figure 32. Effect of emotion on accuracy for empathic responding, accounting for psychopathy emotional factor scores (Experiment 2). Error bars represent standard error.

A model with the behavioural factor of psychopathy was compared to the null model with accuracy for empathic responding only, $\chi^2(2) = 15.18, p < 0.001$. The negative coefficient indicated that as the behavioural factor of psychopathy increased, accuracy for empathic responding decreased, $b = -0.001, SE = 0.004, p < 0.001$ (see Figure 33).

Figure 33. Effect of psychopathy (SRP-III) behavioural factor on accuracy for empathic responding (Experiment 2)

To explore whether the emotion cue conditions impacted accuracy for empathic responding, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic was compared to the model with the behavioural psychopathic factor alone. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1023.02, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.001$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.3, SE = 0.11$); EN produced the next highest accuracy ($M = 0.22, SE = 0.007$); with NE producing the lowest accuracy for empathic responding ($M = 0.11, SE = 0.004$).

Examining the interaction between emotion cue condition and the behavioural psychopathy factor, a model with this interaction was compared to the previous emotion cue condition (accounting for the emotional psychopathy factor). The difference between these models was significant, $\chi^2(2) = 54.98, p < 0.001$, indicating that the slopes of at least one of these conditions differed from the others in relation to psychopathy. All conditions differed significantly from one another, $p < 0.001$. As with overall psychopathy, the most salient condition, EE ($M = 0.3, SE = 0.01$), showed the steepest slope, with the greatest discrepancy in empathic responding observed between individuals scoring high and low on the behavioural factor; the second greatest discrepancy was followed by EN ($M = 0.22, SE = 0.007$); while the least salient condition, NE ($M = 0.11, SE = 0.004$), produced the least discrepancy in empathic responding across the range of behavioural factor scores (see Figure 34).

Figure 34. Interaction between psychopathy (SRP-III) behavioural factor score and emotion condition on accuracy for empathic responding (Experiment 2)

Looking at the effect of emotion type on accuracy for empathic responding, a model including emotion, accounting for the behavioural factor of psychopathy, was compared to a model with the behavioural psychopathy factor only. The difference between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 88.16, p < 0.001$. The results for the behavioural factor score on empathic responding were virtually identical to overall psychopathy. All emotions differed from one another, $p < 0.001$, except for disgust and happy ($p = 0.494$). Empathic response was highest for sad stimuli ($M = 0.24, SE = 0.01$), then happy ($M = 0.21, SE = 0.01$), followed closely by disgust ($M = 0.21, SE = 0.01$), with fear producing the lowest empathic response ($M = 0.17, SE = 0.01$) (see Figure 35).

Figure 35. Effect of emotion on accuracy for empathic responding, accounting for psychopathy behavioural factor scores (Experiment 2). Error bars represent standard error.

Examining the interaction between emotion type and the behavioural psychopathy factor involved comparing a model with this interaction to a model with emotion only (accounting for the behavioural psychopathy factor). The difference between these models was not significant, $\chi^2(3) = 3.27, p = 0.352$, suggesting that accuracy for empathic responding did not differ by emotion for the behavioural psychopathy factor.

Experiment 2 Discussion

Results for Experiment 2 were almost a direct replication of Experiment 1. A main effect of psychopathy was observed for both emotion recognition and empathy, for overall psychopathy and both factors, with higher psychopathic characteristics being associated with poorer recognition of emotions and empathic response.

A main effect of emotion cue condition was also observed for both emotion recognition and empathy, with results in the predicted direction: the most salient condition, EE, producing the highest accuracy for emotion recognition and empathic response, followed by the next most

salient condition, EN, and with the least salient condition, NE, producing the lowest accuracy on both dependent variables.

Response accuracy in Experiment 2 was slightly lower overall than in Experiment 1, for both emotion recognition and empathic response outcome variables; this is somewhat surprising given that the methodology was essentially identical for both experiments. As with Experiment 1, accuracy for both dependent variables was lower than expected, particularly for the least salient condition (NE). Again, this may be due to the fact that stimuli in the less salient conditions in particular were too ambiguous for participants to recognize successfully.

No interaction was observed between psychopathic traits and emotion cue condition for emotion recognition; accuracy did not meaningfully differ based on psychopathy as a function of stimulus ambiguity. Interestingly, despite lower overall accuracy in Experiment 2, an interaction between psychopathy and emotion cue condition was observed for empathic response, with the slopes of all three conditions differing in as a function of psychopathy. This was consistent for both psychopathy factors. The relationship between psychopathy and emotion cue condition for empathy was opposite to what I had predicted; the most salient condition, EE, showed the steepest slope in relation to psychopathic traits (including for both factors), with EN demonstrating a less steep slope, and NE the flattest slope. This indicated that a greater discrepancy in empathy existed across the range of psychopathy for EE, wherein higher psychopathy was associated with increasingly low empathy, with less discrepancy in the EN condition, and little discrepancy in accuracy across the range of psychopathy in the NE condition. Again, it may be the case that the two less salient conditions are too ambiguous for participants to either recognize or feel emotionally connected to in order to feel empathy, regardless of their level of psychopathy. It is interesting to note that this interaction emerged for

the empathic response only, again highlighting the lack of a simple relationship between emotion recognition and associated empathic response.

For emotion type, results were generally similar to those in Experiment 1. A main effect of emotion type was found for both emotion recognition and empathic response, for overall psychopathy and across both factors of psychopathy. In general, most emotions differed from one another in terms of their recognition accuracy. In Experiment 1, happy stimuli had been the most easily recognized; in Experiment 2 it was sad stimuli that were consistently the most easily recognized. Disgust stimuli were again the most challenging to recognize. Sad stimuli also produced the highest empathic response, and fear produced the lowest empathy response. Emotion type and psychopathy did not interact for either emotion recognition or empathic response.

Because of the surprisingly low accuracy rates observed in Experiments 1 and 2, which may have affected the interaction between emotion conditions and psychopathy score, response options were modified slightly in Experiment 3 in an attempt to remedy this.

Experiment 3

The objective of Experiment 3 was to utilize the same stimuli and methodology used in Experiments 1 and 2, but the response options were modified slightly in an attempt to increase accuracy of responses. In the emotion recognition task in Experiments 1 and 2, participants were given the option of responding by identifying each stimulus as one of the four represented emotion categories or identifying the stimulus as neutral. I thought that participants may have been inclined to categorize stimuli as neutral as a default response, particularly as the study was fairly time-consuming to complete and participant fatigue may have been a factor. Thus, Experiment 3 provided the same four emotion categories as response options, but removed the option for participants to respond by classifying stimuli as representing neutral emotion. I

predicted that this would target responses more effectively and increase accuracy rates overall, allowing for any potential interaction between emotion condition and psychopathy to be revealed. Predictions relevant to psychopathic traits and emotion cue condition were the same as for Experiments 1 and 2.

Method

Participants. Experiment 3 included 368 participants who were recruited through Carleton's online recruitment system and received course credit in exchange for their participation. After removing incomplete responses (>50%), the final sample was 336 participants whose data were included in the analyses. To be eligible for participation in Experiment 3, participants were required have little to no experience with the German language and have normal or corrected to normal vision and hearing. Participants were not eligible if they participated in Experiment 1 or 2.

Measures. Participants were given the Self-Report Psychopathy scale (SRP-III, short version – see Experiment 1). As in Experiment 2, participants were assessed for the presence of alexithymia using the Toronto Alexithymia Scale (TAS-20).

Stimuli. Participants were presented with the same stimuli used in Experiments 1 and 2. The only element of the task in Experiment 3 that differed from that of Experiments 1 and 2 was that the response options for categorization of emotion were restricted to only the four emotion categories (disgust, fear, happy, and sad), and neutral was not provided as an option. The response options for empathic response remained unchanged (disgust, fear, happy, sad, neutral).

Procedure. The procedure for Experiment 3 was the same as for Experiments 1 and 2. Experiment 3 was also conducted online using Qualtrics software. Participants responded in the

same way to both the emotion recognition and empathic response components of the task for each stimulus: by pressing a key to indicate which emotion the speaker in the video had expressed (emotion recognition) and which emotion they felt after viewing the video (empathic response). The only difference was that one less option was presented on the screen: they were provided with four options (disgust, fear, happy, sad) rather than five, as neutral was not included as a response option. As with Experiments 1 and 2, all stimuli were presented twice so that the order in which participants identified their own emotion and categorized the emotion of the speaker following the video were counterbalanced.

Results

Demographics

Table 3. Demographic variables for Experiment 3

Variable	<i>M (SD)</i>
SRP-III Score - Overall	55.71 (16.0)
SRP-III Score - Emotional Factor	28.15 (9.41)
SRP-III Score – Behavioural Factor	27.57 (7.59)
Age (years)	20.06 (3.47)

The mean overall psychopathy score for the Experiment 3 sample, as scored on the SRP-III, was 55.71 ($SD = 16.0$). The two factors of the SRP-III differed slightly, with the emotional factor ($M = 28.15$, $SD = 9.15$) very similar to but slightly higher than the behavioural factor ($M = 27.57$, $SD = 7.59$). The average age of participants in the sample was 20.06 years ($SD = 3.47$). The sample was made up of 66.7% female participants (33.3% male).

As in Experiments 1 and 2, the relation between psychopathy (SRP-III) and response time for accuracy (emotion recognition and empathic response combined) was determined in place of a manipulation check, to explore the possibility that individuals high in psychopathy

were providing responses too quickly due to inattention or lack of effort, which would influence accuracy. No relationship between psychopathy and response time was observed, indicating that speed of responding did not vary as a function of psychopathy, $r = -0.02$, $p = 0.69$.

Psychopathy and TAS-20. The mean TAS-20 score for Experiment 3 participants was 58.89 ($SD = 10.6$). A correlation between psychopathic trait (SRP-III) and alexithymia (TAS-20) scores was performed. The TAS-20 scores were correlated with SRP-III scores, $r = -0.177$, $p < 0.001$. The TAS-20 was not correlated with accuracy for emotion recognition, $r = 0.004$, $p = 0.89$. Because alexithymia was not correlated with the dependent variable, and it was correlated with the independent variable of psychopathy, it was not possible to use the TAS-20 scores in any sort of covariate analysis.

TAS-20 scores were not correlated with accuracy for empathic responding, $r = 0.001$, $p = 0.98$.; therefore, it was not possible to use the TAS-20 scores in a covariate analysis for empathic responding. Thus, as in Experiment 2, scores on the TAS-20 were not included in the analyses of either emotion recognition or empathic responses.

Analyses. The data for Experiment 3 used a two-level multi-level model with the same predictors as those in Experiments 1 and 2: condition and emotion at Level 1, and self-report psychopathy and gender at Level 2. Each model included a single dependent variable. Analyses were conducted for two dependent variables: emotion recognition and empathic response. Predictors were entered into the model in an additive fashion, with the initial null model representing a model with no predictors. Each subsequent model was compared to the previous model using χ^2 .

Experiment 3 used the same accuracy metrics for the dependent variables of emotion recognition and empathic response as used in Experiments 1 and 2. Similarly, the same variables

were added into the model as in Experiments 1 and 2: psychopathy (SRP-III) score at Level 2 (entered grand mean centered), with separate models for overall psychopathy scores, emotional psychopathy factor scores, and behavioural psychopathy factor score. Condition and emotion were variables entered into the model at Level 1. As in Experiments 1 and 2, both condition and emotion were dummy coded to compare the levels of each variable within the model.

Psychopathy and Emotion Recognition. Following Experiments 1 and 2, I predicted a main effect of psychopathy, with individuals high in psychopathy demonstrating reduced accuracy for identification of emotional stimuli. The model with the addition of SRP score was significantly different from the null model, indicating that psychopathy did have an effect on accuracy for emotion recognition, $\chi^2(1) = 13.96, p < 0.001$. The negative coefficient indicated that increased psychopathy (SRP) scores were associated with lower emotion recognition accuracy ($b = -0.02, SE = 0.01, p < 0.001$) (see Figure 36).

Figure 36. Effect of psychopathy (SRP-III) score on accuracy for emotion recognition (Experiment 3)

Gender was then added into the model that included psychopathy. The comparison between the previous model with psychopathy and the new model including gender (accounting

for psychopathy) was not significant, $\chi^2(1) = 1.19, p = 0.276$. Therefore, gender was not included in the model for further analyses.

To explore whether the emotion cue conditions impacted accuracy for emotion recognition, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1461.4, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.001$. As was observed for the model for overall psychopathy, the most salient condition, EE, was most accurate ($M = 0.77, SE = 0.11$); EN was next highest accurate ($M = 0.66, SE = 0.01$); and NE was the least accurate ($M = 0.32, SE = 0.01$).

Examining the interaction between emotion cue condition and psychopathy, a model with this interaction was compared to the previous emotion cue condition (accounting for psychopathic traits). The difference between these models was significant, $\chi^2(2) = 7.35, p = 0.03$, indicating that the slopes of at least one of these conditions differed from the others in relation to psychopathic traits. The most salient condition, EE ($M = 0.77, SE = 0.01$), differed from both less salient conditions ($p < 0.05$); however, the two least salient conditions, EN ($M = 0.66, SE = 0.01$) and NE ($M = 0.32, SE = 0.01$) did not significantly differ, $p = 0.404$ (see Figure 37).

Figure 37. Interaction between psychopathy (SRP-III) score and emotion condition on accuracy for emotion recognition (Experiment 3)

The next model explored was a comparison between emotion type, accounting for psychopathic traits, versus the model with psychopathic traits alone. The difference between these models was significant, indicating that at least one of the emotions differed from the others in terms of its effect on accuracy for emotion recognition, $\chi^2(3) = 123.11, p < 0.001$. The only emotions that did not differ from one another were fear and sadness, $p = 0.765$. All other emotions differed significantly from one another, $p < 0.001$. Happy stimuli produced the highest accuracy for emotion recognition ($M = 0.68, SE = 0.01$), followed by fear, ($M = 0.57, SE = 0.01$), then closely by sad ($M = 0.57, SE = 0.01$), with disgust producing the lowest accuracy for emotion recognition ($M = 0.51, SE = 0.01$) (see Figure 38).

Figure 38. Effect of emotion on accuracy for emotion recognition (Experiment 3). Error bars represent standard error.

When the interaction between emotion type and psychopathic traits was added to the model and compared against the previous model, this comparison was not significant, $\chi^2(3) = 5.11, p = 0.162$.

Psychopathy and Empathic Response. I predicted there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating a lower empathic response to emotional stimuli. The model with the addition of SRP-III score was significantly different from the null model, indicating that SRP-III score did have an effect on emotional response (i.e., produced a match between the participant's rating of their own emotion and the emotion expressed in the video), $\chi^2(1) = 23.22, p < 0.001$. The negative coefficient indicated that increased psychopathy (SRP) scores were associated with lower empathic response to emotional stimuli, $b = -0.002, SE = 0.01, p < 0.001$ (see Figure 39).

Figure 39. Effect of psychopathy (SRP-III) score on accuracy for empathic responding (Experiment 3)

In order to determine whether the emotion cue conditions impacted accuracy for empathic responding, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic was compared to the model with psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 215.28, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.001$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.63, SE = 0.01$); EN produced the next highest accuracy ($M = 0.48, SE = 0.01$); and NE producing the lowest accuracy for empathic responding ($M = 0.46, SE = 0.01$) (see Figure 40).

Figure 40. Effect of emotion cue condition on accuracy for empathic responding (Experiment 3). Error bars represent standard error.

Examining the interaction between emotion cue condition and psychopathy, a model with this interaction was compared to the previous emotion cue condition (accounting for psychopathic traits). The difference between these models was not significant, $\chi^2(2) = 1.61, p > 0.5$, indicating that the slopes of at the three emotion cue conditions did not differ.

The next model explored was a comparison between emotion type, accounting for psychopathic traits, and psychopathy alone. The difference between these models was significant, indicating that at least one of the emotions differed from the others in terms of its effect on emotion recognition accuracy, $\chi^2(3) = 147.94, p < 0.001$. The only emotions that did not differ were happy and sad. Happy stimuli produced the highest accuracy for emotion recognition ($M = 0.59, SE = 0.01$), followed by sad, ($M = 0.56, SE = 0.01$), then fear ($M = 0.52, SE = 0.01$), with disgust producing the lowest accuracy for emotion recognition ($M = 0.42, SE = 0.01$) (see Figure 41).

Figure 41. Effect of emotion type on accuracy for empathic response, accounting for psychopathic traits (Experiment 3). Error bars represent standard error.

When a model with the interaction between psychopathic traits and emotion type was compared to the model with emotion type (accounting for psychopathy), the models were significantly different, indicating that at least one of the emotions differed from the others, $\chi^2(3) = 9.29, p = 0.03$. However, when the coefficients of each of the emotions were examined in relation to one another, only happy ($M = 0.59, SE = 0.01$) and fear ($M = 0.52, SE = 0.01$) differed significantly from one another.

Psychopathy Factor Scores and Emotion Recognition. Accuracy for emotion recognition was further analyzed by participants' psychopathy (SRP-III) scores separately for both emotional and behavioural factors. When a model including the emotional factor was compared against the null model, the difference between these two models was significant, $\chi^2(1) = 10.39, p < 0.01$. The slope of emotional factor was significant, and was in the same direction as psychopathy overall with an increase in the emotional factor of psychopathy predicting reduced emotion recognition accuracy, $b = -0.002, SE = 0.01, p < 0.001$ (see Figure 42).

Figure 42. Effect of psychopathy (SRP-III) emotional factor score on accuracy for emotion recognition (Experiment 3)

To determine if the emotion cue conditions impacted accuracy for empathic responding, two dummy variables which represented the three emotion cue conditions (EE, EN, NE) were added into the model in a single step. The model fit statistic was compared to the model with emotional psychopathic traits only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1461.47, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.01$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.77, SE = 0.01$); EN produced the next highest accuracy ($M = 0.66, SE = 0.01$); and NE producing the lowest emotion recognition accuracy ($M = 0.32, SE = 0.01$; see Figure 43).

Figure 43. Effect of emotion cue condition on accuracy for emotion recognition, accounting for psychopathy emotional factor traits (Experiment 3). Error bars represent standard error.

Examining the interaction between emotion cue condition and the emotional factor, a model with this interaction was compared to the previous emotion cue condition (accounting for emotional psychopathic traits). The difference between these models was not significant, $\chi^2(2) = 4.53, p = 0.1$, indicating that the slopes of these conditions did not differ from one for the emotional factor.

Looking at the effect of emotion type on accuracy for emotion recognition, a model including emotion, accounting for the emotional factor, was compared to a model with emotional factor only. The difference between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 123.12, p < 0.001$ (see Figure 44).

Figure 44. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathy emotional factor traits (Experiment 3). Error bars represent standard error.

A model including the behavioural factor scores of the SRP-III was compared against the null model to examine their effect on emotion recognition accuracy. The comparison between these models was significant, $\chi^2(1) = 14.91, p < 0.001$. The negative coefficient indicated that accuracy for emotion recognition decreased as behavioural psychopathy factor score increased, $b = -0.003, SE = 0.001, p < 0.001$ (see Figure 45).

Figure 45. Effect of psychopathy (SRP-III) behavioural factor score on accuracy for emotion recognition (Experiment 3). Error bars represent standard error.

Examining the impact of emotion cue condition for empathic responding involved adding two dummy variables representing the three emotion cue conditions (EE, EN, NE) into the model

at once. The model fit statistic was compared to the model with the behavioural psychopathic factor alone. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 1461.38, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.001$. Consistent with overall psychopathic traits, the most salient condition, EE, produced the highest accuracy ($M = 0.77, SE = 0.01$); EN produced the next highest accuracy ($M = 0.66, SE = 0.01$); and NE produced the lowest accuracy for emotion recognition ($M = 0.32, SE = 0.01$).

A model examining the interaction between the behavioural factor relative to emotion cue condition was then compared to the previous model with emotion cue condition (accounting for the behavioural factor). The difference between these two models was significant, indicating that there was an interaction between the behavioural factor scores on the SRP-III and emotion cue condition, $\chi^2(2) = 9.56, p = 0.002$. The two most salient conditions, EE ($M = 0.77, SE = 0.01$) and EN ($M = 0.66, SE = 0.01$), differed significantly from the least salient condition, NE ($M = 0.32, SE = 0.01$), $p < 0.05$. However, EE and EN did not differ from one another in relation to the behavioural factor (see Figure 46).

Figure 46. Interaction between psychopathy (SRP-III) behavioural factor score and emotion condition on accuracy for emotion recognition (Experiment 3)

To explore the effect of emotion type on accuracy for emotion recognition, emotion cue condition was removed from the model and a model with emotion type, accounting for the behavioural factor, was compared to a model with the behavioural factor alone. The difference between these two models was significant, indicating that at least one emotion differed from the others in terms of accuracy for emotion recognition, $\chi^2(3) = 123.1, p < 0.001$. All emotions differed from one another in accuracy resulting from presentation by each type of stimuli, except for fear and sad. Happy stimuli produced the greatest accuracy ($M = 0.68, SE = 0.01$), followed by fear ($M = 0.57, SE = 0.01$), and then closely by sad ($M = 0.57, SE = 0.01$), with disgust producing the lowest accuracy for emotion recognition ($M = 0.51, SE = 0.01$) (see Figure 47).

Figure 47. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathy behavioural factor traits (Experiment 3). Error bars represent standard error.

When a model exploring the interaction between the behavioural factor and emotion was compared against the model with emotion (accounting for the behavioural factor), the difference between these two models was not significant, indicating that accuracy did not differ by emotion type in relation to the behavioural factor, $\chi^2(3) = 4.97, p = 0.173$.

Psychopathy Factor Scores and Empathic Responding. Examining the emotional and behavioural factors of psychopathy in relation to empathic responding, first, a model including the emotional factor was compared against the null model using a model fit statistic. The difference between these two models was significant, $\chi^2(1) = 22.97, p < 0.001$. The slope of the emotional factor was significant, and was in the same direction as overall psychopathy, indicating that an increase in the emotional factor of psychopathy predicted reduced accuracy for empathetic responding, $b = -0.004, SE = 0.01, p < 0.001$ (see Figure 48).

Figure 48. Effect of psychopathy (SRP-III) emotional factor score on accuracy for empathic responding (Experiment 3)

Determining the impact of emotion cue condition on empathic responding involved adding two dummy variables representing the three emotion cue conditions (EE, EN, NE) into the model in a single step. The model fit statistic was compared to the model with the emotional factor only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 215.3, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.01$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.63, SE = 0.01$); EN produced the next highest accuracy ($M = 0.48, SE = 0.01$); and NE produced the lowest accuracy for empathetic responding ($M = 0.46, SE = 0.01$) (see Figure 49).

Figure 49. Effect of emotion cue condition on accuracy for empathic responding, accounting for psychopathy emotional factor traits (Experiment 3). Error bars represent standard error.

Examining the interaction between emotion cue condition and the emotional factor, a model with this interaction was compared to the previous emotion cue condition (accounting for the emotional factor). The difference between these models was not significant, $\chi^2(2) = 4.53$, $p = 0.1$, indicating that the slopes of these conditions did not differ from one other for the emotional factor.

Looking at differences in empathic responding relative to emotion type, a model with emotion type was compared to a model with the emotional factor only. The difference between these models was significant, indicating that at least one emotion differed from the others in terms of empathic response, $\chi^2(6) = 159.12$, $p < 0.001$. However, the only two emotions that differed significantly in the empathic response that each produced were sad ($M = 0.59$) and fear ($M = 0.52$), $p = 0.02$. Thus, no meaningful difference in empathic responding was found for different emotion types in the model with the emotional factor.

A model with the behavioural factor was compared to the null model with accuracy for empathic responding only, $\chi^2(2) = 17.42, p < 0.001$. The negative coefficient indicated that as the behavioural factor of psychopathy increased, accuracy for empathic responding decreased, $b = -0.004, SE = 0.01, p < 0.001$ (see Figure 50).

Figure 50. Effect of psychopathy (SRP-III) behavioural factor score on accuracy for empathic responding (Experiment 3)

Determining the impact of emotion cue condition on empathic responding involved adding two dummy variables representing the three emotion cue conditions (EE, EN, NE) into the model. The model fit statistic was compared to the model with the factor only. The new model significantly differed from the previous model, indicating that at least one of the emotion cue conditions differed from the others, $\chi^2(2) = 215.26, p < 0.001$. The regression coefficients indicated that all three conditions significantly differed from one another, $p < 0.01$. Consistent with overall psychopathy, the most salient condition, EE, produced the highest accuracy ($M = 0.63, SE = 0.01$); EN produced the next highest accuracy ($M = 0.48, SE = 0.01$); and NE produced the lowest accuracy for empathetic responding ($M = 0.46, SE = 0.01$) (see Figure 51).

Figure 51. Effect of emotion cue condition on accuracy for empathic responding, accounting for psychopathy behavioural factor traits (Experiment 3). Error bars represent standard error.

Examining the interaction between emotion cue condition and the behavioural factor, a model with this interaction was compared to the previous emotion cue condition (accounting for the behavioural factor). The difference between these models was significant, indicating that the new model differed from the previous model, $\chi^2(2) = 2479.28, p < 0.001$. However, when the individual slopes from the three conditions were compared, none of the slopes varied significantly from one another, $p = 0.34-0.73$.

Exploring the effect of emotion type on empathic response, a model with emotion type (accounting for the behavioural factor) was compared to a model with the behavioural factor only. The comparison between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(7) = 147.93, p < 0.001$. All emotions differed from one another, except for sad and happy, $p = 0.1$. Happy stimuli produced the highest accuracy ($M = 0.59, SE =$

0.01), followed by sad ($M = 0.56$, $SE = 0.01$), then fear ($M = 0.52$, $SE = 0.01$), with disgust producing the lowest empathic response ($M = 0.42$, $SE = 0.01$) (see Figure 52).

Figure 52. Effect of emotion type on accuracy for empathic responding, accounting for psychopathy behavioural factor traits (Experiment 3). Error bars represent standard error.

When an interaction between the behavioural factor and emotion type on empathic responding was explored (by comparing a model with this interaction to the previous model with emotion type, accounting for the behavioural factor), the model fit statistic was not significant. This indicated that there was no interaction between emotion type and the behavioural factor of psychopathy for empathic responding, $\chi^2(3) = 6.16$, $p = 0.1$.

Experiment 3 Discussion

The goal of Experiment 3 was to increase accuracy performance by eliminating the response of “Neutral” as a default option. Accuracy for emotion recognition was slightly higher than for Experiments 1 and 2, although it did not notably increase for EE (from 75% and 54% in Experiments 1 and 2, respectively, to 77% in Experiment 3 in the model for psychopathic traits overall). There was a notable increase for EN (54% and 36% in Experiments 1 and 2, respectively, to 66% in Experiment 3 for psychopathic traits overall), although perhaps not as

much of an increase as may have been expected. Accuracy did increase for NE (from 18% and 11% in Experiments 1 and 2, respectively, to 32% in Experiment 3 for psychopathic traits overall); however, it still remained quite low – not much higher than chance. Interestingly, performance on the outcome of empathic response increased considerably: overall and for all three emotion cue conditions (for Experiments 1, 2, and 3 respectively (EE = 46%, 30%, 63%; EN = 30%, 22%, 48%; NE = 12%, 11%, 46%).

Despite the attempt to increase accuracy rates, results remained similar to those of Experiments 1 and 2. The main effect of psychopathy was observed for both outcome variables, with an increase in psychopathy (and either factor score) associated with a decrease in accuracy for both emotion recognition and empathic response. The main effect of emotion cue condition was again present, with the most salient condition, EE, producing the greatest accuracy for both emotion recognition and empathic response, followed by the next most salient condition, EN, and with the least salient condition, NE, generating the poorest performance for emotion recognition and empathy. However, there were no interactions between emotion cue condition and psychopathic traits for either emotion recognition or empathic response.

There was again a main effect of emotion type. The pattern of results for this effect on emotion recognition mirrored those for Experiment 1: happy stimuli produced the highest accuracy, followed by sad, then fear, with disgust producing the lowest accuracy. This was true for psychopathic traits overall as well as for both factors of psychopathy. For empathic response, however, results differed slightly from the previous experiments, and followed the pattern that was observed for emotion recognition: empathy was highest for happy stimuli, followed by sad, then fear, with disgust producing the lowest empathic response. There was little difference based

on factor score, with comparable results to the overall psychopathy score when results were broken down by Factor 1 and Factor 2.

The low accuracy rates for Experiments 1, 2, and 3, particularly for the most ambiguous condition (NE), raised the question of whether the stimuli in the two less salient conditions may have been too ambiguous for participants to identify, making differences in recognition and empathic response based on psychopathic scores unable to be observed due to a floor effect for accuracy. This possibility led to a manipulation of ambiguity of the emotional stimuli in Experiment 4.

Experiment 4

The objective of Experiment 4 was to investigate the relationship between psychopathic traits, emotion recognition, and empathy, using a different approach to the manipulation of ambiguity of the emotional stimuli. In this experiment, rather than manipulation of the channels or types of emotion cues, the length of the stimuli was manipulated. Because accuracy rates were so low in Experiments 1 to 3, particularly for the least salient condition (NE), and to a lesser extent, the condition with the moderate level of relative saliency (EN), Experiment 4 utilized stimuli from the most salient condition (EE), for which accuracy rates for both emotion recognition and empathy were higher. The stimuli from this condition were shortened, and the original “long” stimuli plus the new shortened stimuli were used as two conditions representing varying ambiguity. As with the previous three experiments, a main effect of psychopathic traits was predicted, with psychopathic traits expected to predict lower accuracy for emotion recognition and empathic response. I predicted that the long stimuli condition would produce higher accuracy than the short stimuli condition, as the long stimuli included a greater variety of emotion cues across the length of presentation than did the short stimuli. I also predicted that

psychopathic traits would produce a greater discrepancy in accuracy for emotion recognition and empathy, with higher psychopathic traits producing disproportionately lower accuracy in the Short stimuli condition (the most ambiguous condition) compared to accuracy in the long stimuli condition. Unlike in Experiments 1 to 3, each stimulus was only presented once. This was to minimize participant fatigue, and to minimize the potential for participants becoming apathetic towards stimuli as a result of being exposed to a large volume of stimuli as they were in the previous experiments.

Method

Participants. Experiment 4 included 398 participants who were recruited through Carleton's online recruitment system and received course credit in exchange for their participation. After removing incomplete responses (>50%), the final sample was 368 participants. To be eligible for participation in Experiment 4, participants were required have little to no experience with the German language and have normal or corrected to normal vision and hearing. Participants were not eligible if they participated in Experiments 1, 2, or 3.

Measures. Participants were given the Self-Report Psychopathy scale (SRP-III, short version – see Experiment 1). As in Experiments 2 and 3, participants were assessed for the presence of alexithymia using the Toronto Alexithymia Scale (TAS-20).

Stimuli. A subset of the stimuli used in Experiments 1, 2, and 3 was used in Experiment 4. Only stimuli from the most salient (EE) condition were used in Experiment 4. The full set of stimuli from this condition was shortened in length to create two conditions: long stimuli condition (original stimuli used in Experiments 1-3, with each video clip approximately 12 seconds in length), and short stimuli condition (with shortened stimuli, each video approximately

one second in length). The modified stimuli for the short stimulus condition involved taking a segment corresponding to the apex of the emotional expression at the end of the original video clip. Thus, video clips in the long stimulus condition remained in their full length, beginning with the speaker in the video conversing (in German) in an emotionally neutral disposition, with emotional expression (both facial expression and vocal tone) increasing towards the full expression of the emotion at the end of the clip. The video clips in the short stimulus condition captured only this full expression (approximately one second). Thus, the length of the short stimuli was not determined based on a set presentation length, but rather the duration of the video clip that captured the apex of the emotional expression. A study by Calvo and Lundquist (2008) found that when individuals were presented with images of facial expressions at varying intervals between 25 ms and an unlimited length of time (25 ms, 50 ms, 100 ms, 250 ms, 500 ms, and unlimited), accuracy increased as the length of stimulus presentation increased, up to 500 ms presentation length, beyond which there was no advantage (no difference in accuracy between 500 ms presentation and unlimited length of presentation). Calvo and Lundquist's results suggest that an optimal length of presentation exists, beyond which there are diminishing returns. However, it is also important to remember that the stimuli used in their study were static, such that the information presented in the stimuli did not vary as the length of presentation changed. As the stimuli in the present study are dynamic, a longer duration may be required for presentation in order to allow the necessary cues to unfold dynamically over time. For this reason, the stimulus presentation length was determined based on the time required to express the maximum expression, rather than on a predetermined length of time.

The stimulus set for Experiment 4 included 32 distinct stimuli: four different clips (i.e., four separate talkers) per emotion category by four emotion categories, within each of the two stimulus length conditions (Short and Long).

Procedure. The procedure for Experiment 4 was the same as for Experiments 1, 2, and 3, except that participants were presented with the 32 stimuli representing the two stimulus length conditions (i.e., each stimulus was presented once) instead of 96 total stimuli (48 stimuli each presented twice) from the three conditions that participants were exposed to in the first three experiments. Short and long stimuli were randomized within two blocks which were presented separately, and the order of these two blocks was counterbalanced.

Results

Demographics

Table 4. Demographic variables for Experiment 4

Variable	<i>M (SD)</i>
SRP-III Score - Overall	57.50 (18.08)
SRP-III Score - Emotional Factor	28.78 (10.21)
SRP-III Score – Behavioural Factor	28.72 (8.78)
Age (years)	19.92 (3.85)

The mean overall score for psychopathic traits for the Experiment 3 sample measured by the SRP-III was 57.5 ($SD = 18.08$). The distribution of the two factors of the SRP-III was almost identical; the mean for the emotional factor was 28.78 ($SD = 10.21$) and the mean for the behavioural factor was 28.72 ($SD = 8.78$). The average age of participants in the sample was 19.92 years ($SD = 3.85$). The sample was made up of 66% female participants (44% male).

The relation between psychopathy (SRP-III) and response time for accuracy (emotion recognition and empathic response combined) was determined in place of a manipulation check,

to explore the possibility that individuals high in psychopathy were providing responses too quickly due to inattention or lack of effort, which would influence accuracy. A significant negative relationship between psychopathy and response time was observed, $r = -0.15$, $p < 0.01$. Higher psychopathy was associated with a slower average response time. This result is indicative of: 1) a low likelihood of inappropriate response to the task (i.e., responding too quickly, suggesting inattention or lack of effort) by individuals high on psychopathy, and 2) an association between psychopathy and more effortful processing of emotional stimuli.

Psychopathy and TAS-20. The mean TAS-20 score for Experiment 4 participants was 76.55 ($SD = 11.95$). Note that these values were higher than for the previous two experiments.

TAS-20 scores were correlated with SRP-III scores, $r = 0.05$, $p < 0.01$. TAS-20 scores were not correlated with accuracy for emotion recognition, $r = 0.01$, $p = 0.52$. The TAS-20 was also correlated with accuracy for empathic response, $r = -0.156$, $p < 0.001$. Alexithymia was correlated with both dependent variables, but was also correlated with the independent variable of psychopathy. Thus, scores on this measure were not included for analyses for either emotion recognition or empathic response.

Analyses. Data analysis for Experiment 4 used a two-level multi-level model with virtually the same predictors as those in Experiments 1, 2, and 3. The only difference in the model was that the variable of stimulus length replaced condition. Analyses were conducted for two dependent variables: emotion recognition, and empathic response. Each model included a single dependent variable. Predictors were entered into the model in an additive fashion, with the initial null model representing a model with no predictors. Each subsequent model was compared to the previous model using χ^2 .

The same variables were added into the model as in Experiments 1, 2, and 3: psychopathy (SRP-III) score at Level 2 (entered grand mean centered), with separate models for overall psychopathy scores, emotional psychopathy factor scores, and behavioural psychopathy factor scores. Length and emotion were variables at Level 1. As in experiments 1, 2, and 3, both condition and emotion were dummy coded to compare the levels of each variable within the model (although in this case, stimulus length had only two levels to be dummy coded rather than the three levels of the Condition variable included in the previous models).

Psychopathy and Emotion Recognition. As in the previous experiments, I predicted there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating reduced accuracy for identification of emotional stimuli. The model with the addition of SRP score was significantly different from the null model, indicating that psychopathy did have an effect on emotion recognition accuracy, $\chi^2(1) = 13.17, p < 0.001$. The negative coefficient indicated that increased psychopathy (SRP-III) scores were associated with lower emotion recognition accuracy ($b = -0.002, SE = 0.001, p < 0.01$) (see Figure 53).

Figure 53. Effect of psychopathy (SRP-III) score on accuracy for emotion recognition (Experiment 4)

Gender was then added into the model that included psychopathic traits. The comparison between the previous model with psychopathy, and the new model including gender (accounting for psychopathic traits) was not significant, $\chi^2(1) = 0.23, p > 0.5$. Therefore, gender was not included in the model for further analyses.

The next step in the model development involved adding the stimulus length variable in order to determine the impact of stimulus length on emotion recognition accuracy. This step involved adding a single dummy variable representing the two stimulus length conditions (short, long) into the model. The model fit statistic for the model with stimulus length (accounting for psychopathy) was compared to the model with psychopathy only. The new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(2) = 164.64, p < 0.001$. Contrary to what was predicted, accuracy for emotion recognition was higher for short stimuli ($M = 0.82, SE = 0.01$) than for long stimuli ($M = 0.71, SE = 0.01$) (see Figure 54).

Figure 54. Effect of stimulus length on accuracy for emotion recognition, accounting for psychopathic traits (Experiment 4). Error bars represent standard error.

To examine whether an interaction between stimulus length and psychopathy was present, a model with psychopathy at both levels of stimulus length was compared to the previous model with stimulus length, accounting for psychopathy. This model comparison was not significant, indicating that there was no interaction between psychopathic traits and stimulus length on accuracy for emotion recognition, $\chi^2(1) = 0.11, p > 0.5$.

Looking at the potential effect of emotion type on emotion recognition, a model with emotion type (accounting for psychopathy) was compared to a model with psychopathy only. The comparison between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 319.88, p < 0.001$. All emotions differed from one another ($p < 0.01$) except for disgust and happy, $p = 0.46$. Happy stimuli produced the highest accuracy ($M = 0.89, SE = 0.01$), followed by fear ($M = 0.76, SE = 0.01$), then sad ($M = 0.71, SE = 0.01$), and then disgust which produced the lowest accuracy ($M = 0.70, SE = 0.01$) (see Figure 55).

Figure 55. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathic traits (Experiment 4). Error bars represent standard error.

When an interaction between psychopathy and emotion type was explored, with a model including psychopathy at each level of emotion compared against the previous model with

emotion only (accounting for psychopathy), the comparison was not significant; psychopathy did not interact with emotion type, $\chi^2(3) = 2.33, p > 0.5$.

Psychopathy and Empathic Responding. As in the previous experiments, I predicted there would be a main effect of psychopathy, with individuals high in psychopathy demonstrating a lower empathic response to emotional stimuli. The model with the addition of psychopathy (SRP-III) score was significantly different from the null model, indicating that psychopathy had an effect on emotional response (i.e., produced a match between the participant's rating of their own emotion and the emotion expressed in the video), $\chi^2(1) = 18.45, p < 0.001$. The negative coefficient indicated that increased psychopathy was associated with lower empathic response to emotional stimuli, $b = -0.002, SE = 0.001, p < 0.001$ (see Figure 56).

Figure 56. Effect of psychopathy (SRP-III) score on accuracy for empathic responding (Experiment 4)

The next step was to determine whether stimulus length impacted accuracy for empathic responding. This involved adding the stimulus length variable into the model, in the form of a single dummy variable representing the two stimulus length conditions (short, long). The model fit statistic for the model with stimulus length (accounting for psychopathy) was compared to the

model with psychopathy alone. The new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(1) = 103.41, p < 0.001$. Contrary to what I predicted, accuracy for emotion recognition was higher for short stimuli ($M = 0.75, SE = 0.01$) than for long stimuli ($M = 0.64, SE = 0.01$) (see Figure 57).

Figure 57. Effect of stimulus length condition on accuracy for empathic responding, accounting for psychopathic traits (Experiment 4). Error bars represent standard error.

An interaction between stimulus length and psychopathic traits was explored next. The comparison between a model representing this interaction and the previous model with stimulus length condition (accounting for psychopathy) was found to be non-significant, indicating no interaction between stimulus length and psychopathy, $\chi^2(1) = 0.28, p > 0.5$.

In order to determine the effect of emotion type on empathic responding, a model with emotion type (accounting for psychopathy) was compared to a model with psychopathy only. The comparison between these models was significant, indicating that at least one emotion differed from the others, $\chi^2(3) = 308.69, p < 0.001$. All emotions differed from one another ($p < 0.01$), except for fear and sad, $p = 0.20$. Happy stimuli produced the highest accuracy ($M = 0.85$,

$SE = 0.01$), followed by sad ($M = 0.67$, $SE = 0.02$), then fear ($M = 0.65$, $SE = 0.02$), with disgust producing the lowest accuracy ($M = 0.62$, $SE = 0.02$) (see Figure 58).

Figure 58. Effect of emotion type on accuracy for empathic responding, accounting for psychopathic traits (Experiment 4). Error bars represent standard error.

The interaction between psychopathy and emotion type was explored, with a model including psychopathy at each level of emotion compared against the previous model with emotion only (accounting for psychopathy). This comparison was not significant, indicating no interaction between psychopathy and emotion type, $\chi^2(3) = 1.72$, $p > 0.5$.

Psychopathy Factor Scores and Emotion Recognition. Accuracy for emotion recognition was further analyzed by participants' psychopathy (SRP-III) scores separated by emotional and behavioural factors. When a model including the emotional factor score of psychopathy was compared against the null model using a model fit statistic, the difference between these two models was significant, $\chi^2(1) = 6.74$, $p < 0.01$. The slope of the emotional factor was significant, and was in the same direction as overall psychopathy, indicating that an increase in the emotional factor predicted reduced accuracy for emotion recognition, $b = -0.002$, $SE = 0.0001$, $p = 0.02$ (see Figure 59).

Figure 59. Effect of psychopathy (SRP-III) emotional factor score on accuracy for emotion recognition (Experiment 4)

In order to determine whether stimulus length impacted accuracy for emotion recognition, the stimulus length variable was inputted into the model in the form of a single dummy variable representing the two stimulus length conditions (short, long). The model fit statistic for the model with stimulus length (accounting for the emotional factor) was compared to the model with the emotional factor only. The new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(1) = 164.62, p < 0.001$. Contrary to what I predicted, although consistent with the model with stimulus length condition for overall psychopathy, accuracy for emotion recognition was higher for short stimuli ($M = 0.82, SE = 0.01$) than for long stimuli ($M = 0.71, SE = 0.01$) (see Figure 60).

Figure 60. Effect of stimulus length condition on accuracy for emotion recognition, accounting for psychopathy emotional factor traits (Experiment 4). Error bars represent standard error.

The interaction between emotional psychopathic traits and stimulus length condition on emotion recognition was explored next. A model with the emotional factor added at both levels of stimulus length was compared to the previous model with stimulus length (accounting for the emotional factor). These models did not significantly differ, indicating there was no interaction between the emotional factor and stimulus length, $\chi^2(1) = 0.02, p > 0.5$.

Exploring whether an effect of emotion type on emotion recognition was present, a model with emotion type (accounting for the emotional factor) was compared to a model with the emotional factor only. The comparison between these models was significant, indicating that at least one emotion differed from the others in its effect on emotion recognition, $\chi^2(3) = 319.88, p < 0.001$. All emotions differed from one another ($p < 0.05$) except for disgust and sad, $p = 0.46$. Happy stimuli produced the highest accuracy ($M = 0.90, SE = 0.01$), followed by fear ($M = 0.76, SE = 0.01$), then sad ($M = 0.71, SE = 0.01$), with disgust producing the lowest recognition accuracy ($M = 0.70, SE = 0.01$) (see Figure 61).

Figure 61. Effect of emotion type on accuracy for emotion recognition, accounting for emotional psychopathic traits (Experiment 4). Error bars represent standard error.

An interaction between the emotional factor and emotion type was explored, with a model including the emotional factor at each level of emotion compared against the previous model with emotion only (accounting for the emotional factor). This comparison was not significant, indicating that there was no interaction between the emotional factor traits and emotion type on recognition accuracy, $\chi^2(3) = 1.46, p > 0.5$.

Once analysis of the emotional factor of psychopathy was completed, the behavioural factor, was examined. When a model of the behavioural factor was compared against the null model using a model fit statistic, the difference between these two models was significant, $\chi^2(1) = 19.82, p < 0.001$. The slope of the behavioural factor was significant, and was in the same direction as overall psychopathy, indicating that an increase in psychopathy based on the behavioural factor predicted reduced accuracy for emotion recognition, $b = -0.004, SE = 0.001, p < 0.001$ (see Figure 62).

Figure 62. Effect of psychopathy (SRP-III) behavioural factor score on accuracy for emotion recognition (Experiment 4)

In order to determine whether stimulus length impacted emotion recognition accuracy, the stimulus length variable was added into the model in the form of a single dummy variable representing the two stimulus length conditions (short, long). The model fit statistic for the model with stimulus length (accounting for the behavioural factor) was compared to the model with the behavioural factor alone. The new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(1) = 164.62, p < 0.001$. Contrary to what was predicted, although consistent with the model with stimulus length condition for overall psychopathic traits, emotion recognition accuracy was higher for short stimuli ($M = 0.82, SE = 0.01$) than for long stimuli ($M = 0.71, SE = 0.01$) (see Figure 63).

Figure 63. Effect of stimulus length condition on accuracy for emotion recognition, accounting for psychopathy behavioural factor traits (Experiment 4). Error bars represent standard error.

The interaction between the behavioural factor and stimulus length condition on emotion recognition was then explored. A model with the behavioural factor added at both levels of stimulus length was compared to the previous model with stimulus length (accounting for the behavioural factor). These models did not significantly differ, indicating there was no interaction between the behaviour factor and stimulus length, $\chi^2(1) = 0.74, p > 0.5$.

Looking at the effect of emotion type on emotion recognition, a model with emotion type (accounting for the behavioural factor) was compared to a model with the behavioural factor only. The comparison between these models was significant, indicating that at least one emotion differed from the others in its effect on emotion recognition, $\chi^2(3) = 319.88, p < 0.001$. All emotions differed from one another ($p < 0.001$) except for disgust and sad, $p = 0.46$. Happy stimuli produced the highest accuracy ($M = 0.90, SE = 0.01$), followed by fear ($M = 0.76, SE = 0.01$), then sad ($M = 0.71, SE = 0.01$), with disgust producing the lowest recognition accuracy ($M = 0.70, SE = 0.01$) (see Figure 64).

Figure 64. Effect of emotion type on accuracy for emotion recognition, accounting for psychopathy behavioural factor traits (Experiment 4). Error bars represent standard error.

An interaction between the behavioural factor and emotion type was examined next. A model including the behavioural factor at each level of emotion was compared against the previous model with emotion only (accounting for the behavioural factor). This comparison was not significant, indicating that there was no interaction between the behavioural factor of psychopathic traits and emotion type, $\chi^2(3) = 3.1, p = 0.38$.

Psychopathy Factor Scores and Empathic Responding. Looking at the emotional and behavioural factors of psychopathy in relation to empathic responding, a model including scores on the emotional factor was compared against the null model using a model fit statistic. The difference between these two models was significant, $\chi^2(1) = 12.94, p < 0.001$. The slope of emotional factor was significant, and was in the same direction as overall psychopathy, indicating that an increase in the emotional factor of psychopathy predicted reduced accuracy for empathetic responding, $b = -0.004, SE = 0.01, p < 0.001$ (see Figure 65).

Figure 65. Effect of psychopathy (SRP-III) emotional factor score on accuracy for empathic responding (Experiment 4)

Examining the impact of stimulus length on accuracy for empathic responding, the stimulus length variable was added into the model in the form of a single dummy variable representing the two stimulus length conditions (short, long). The model fit statistic for the model with stimulus length (accounting for the emotional factor) was compared to the model with the emotional factor only. The new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(1) = 103.41, p < 0.001$. Contrary to what I predicted, although consistent with the model with stimulus length condition for overall psychopathy, accuracy for empathic responding was higher for short stimuli ($M = 0.75, SE = 0.01$) than for long stimuli ($M = 0.64, SE = 0.01$) (see Figure 66).

Figure 66. Effect of stimulus length condition on accuracy for empathic responding, accounting for psychopathy emotional factor traits (Experiment 4). Error bars represent standard error.

The interaction between the emotional factor and stimulus length condition on empathic responding was then explored. A model with the emotional factor added at both levels of stimulus length was compared to the previous model with stimulus length (accounting for the emotional factor). These models did not significantly differ, indicating there was no interaction between the emotional factor and stimulus length, $\chi^2(1) = 0.8, p > 0.5$.

Examination of the effect of emotion type on empathic responding involved comparison of a model with emotion type, accounting for the emotional factor, against a model with the emotional factor only (having removed the stimulus length variable). This model fit statistic was significant, indicating that at least one emotion differed from the others in its effect on empathic responding, $\chi^2(3) = 308.69, p < 0.001$. All emotions differed significantly from one another ($p < 0.01$) except for sad and fear, $p = 0.2$. Happy stimuli produced the greatest empathic response ($M = 0.85, SE = 0.01$), followed by sad ($M = 0.67, SE = 0.02$), then fear ($M = 0.65, SE = 0.02$), with disgust producing the lowest empathic response ($M = 0.61, SE = 0.02$) (see Figure 67).

Figure 67. Effect of emotion type on accuracy for empathic responding, accounting for psychopathy emotional factor traits (Experiment 4). Error bars represent standard error.

An interaction between emotion type and the emotional factor for empathic responding was explored. The model fit statistic representing the difference between the model with this interaction and the previous model (emotion type, accounting for the emotional factor) was non-significant, indicating no interaction, $\chi^2(3) = 1.12, p > 0.5$.

Accuracy for empathic responding was also explored for the behavioural psychopathic factor. A model with the behavioural factor was compared against the null model. The difference between these two models was significant, $\chi^2(1) = 21.58, p < 0.001$. Consistent with previous findings, the negative coefficient indicated that an increased score on the behavioural factor produced a decrease in empathic response, $b = -0.01, SE = 0.001, p < 0.001$ (see Figure 68).

Figure 68. Effect of psychopathy (SRP-III) behavioural factor score on accuracy for empathic responding (Experiment 4)

The impact of stimulus length on empathic responding accuracy was examined by adding the stimulus length variable into the model in the form of a single dummy variable representing the two stimulus length conditions (short, long). The model fit statistic for this model with stimulus length (accounting for the behavioural factor) was compared to the model with the behavioural factor only. Results were virtually identical to those for emotional factor; the new model significantly differed from the previous model, indicating that the two stimulus length conditions differed from one another, $\chi^2(1) = 103.41, p < 0.001$. Contrary to what I predicted, although consistent with the model with stimulus length condition for overall psychopathy, empathic responding accuracy was higher for short stimuli ($M = 0.75, SE = 0.01$) than for long stimuli ($M = 0.64, SE = 0.01$) (see Figure 69).

Figure 69. Effect of stimulus length condition on accuracy for empathic responding, accounting for psychopathy behavioural factor traits (Experiment 4). Error bars represent standard error.

Looking at the interaction between the behavioural factor and stimulus length condition, a model including this interaction was compared against the previous model with stimulus length condition (accounting for the behavioural factor). These models did not differ significantly, indicating no interaction, $\chi^2(1) = 0.002, p > 0.5$.

The effect of emotion type on empathic responding was examined next. This involved comparison of a model with emotion type, accounting for the behavioural factor, against the model with behavioural factor only (with stimulus length removed). This model fit statistic was significant, indicating that at least one emotion differed from the others in its effect on empathic responding, $\chi^2(3) = 308.69, p < 0.001$. Results were virtually identical to those for the behavioural factor: all emotions differed significantly from one another ($p < 0.01$) except for sad and fear, $p = 0.2$. Happy stimuli produced the greatest empathic response ($M = 0.85, SE = 0.01$),

followed by sad ($M = 0.67$, $SE = 0.02$), then fear ($M = 0.65$, $SE = 0.02$), with disgust producing the lowest empathic response ($M = 0.61$, $SE = 0.02$) (see Figure 70).

Figure 70. Effect of emotion type on accuracy for empathic responding, accounting for psychopathy behavioural factor traits (Experiment 4). Error bars represent standard error.

An interaction between emotion type and the behavioural factor on empathic responding was explored. The model fit statistic representing the difference between the model with this interaction and the previous model (emotion type accounting for the behavioural factor) was non-significant, indicating no interaction, $\chi^2(3) = 2.2$, $p > 0.5$.

Experiment 4 Discussion

Experiments 1-3 used variations in the three emotion cue conditions to explore the effect of ambiguity of emotional stimuli on emotion recognition and empathic response. All three experiments revealed the same effect of increasing stimulus ambiguity on accuracy for both emotion recognition and empathic response; however, increasing ambiguity did not have the expected interaction with psychopathy. Experiment 4 used a different approach to test this relationship by manipulating the length of the stimuli rather than the presence or absence of emotion cues per se. The length manipulation produced some unexpected results. First, one of

the goals of using stimulus length to test the effect of ambiguity on emotion perception and empathy was that the relationship between psychopathic traits and ambiguity of stimuli on emotion recognition and empathic responses was not observed in the previous three studies. One explanation for this was that the stimuli, particularly the least salient condition, NE, were altogether too ambiguous for participants, and thus the relationship was not observed due to poor overall performance on accuracy for both dependent variables. Using this new approach by manipulating stimulus length was a means of testing this relationship using only stimuli from the most salient condition, EE. However, no interaction was observed between varying stimulus length and psychopathy. However, overall accuracy was higher for both emotion recognition and empathy in Experiment 4 compared to the three previous experiments.

Second, I predicted that the long stimuli would produce greater accuracy for both emotion recognition and empathic response than the shorter stimuli. I assumed that the long stimuli would provide the full gamut of emotion cues, especially as the long stimuli were designed to reflect dynamic emotion in their progressive increase from a neutral expression to the apex of the emotion being expressed, and that this would be easier to recognize or have an empathetic response to than a short (approximately one second) snippet of emotional expression. In contrast to my expectations, the short stimuli yielded more accurate emotion recognition and empathic response than the longer stimuli. One potential explanation for this result is that the short stimulus presentation captures the apex of the expression, to which the long stimulus presentation progresses from a neutral expression. Thus, it appears to be easier for people to identify a short stimulus conveying maximum expression than a longer (approximately 13 second) stimulus that varies (increases) from neutral to a brief maximum level emotion expression.

As with Experiments 1, 2, and 3, responses varied as a function of emotion type for both outcome variables. For empathic response, accuracy followed a typical pattern with happy producing the greatest empathy, followed by sad, then fear, then disgust. For emotion recognition, happy was the most easily recognized emotion type stimuli; however, surprisingly, fear was the second most accurately recognized, followed by sad and then disgust. As with Experiments 1-3, no interaction between psychopathy and emotion type was observed.

Similar to Experiments 1-3, little difference was observed as a function of factor score, with comparable results to the overall psychopathy score when results were broken down by Factor 1 and Factor 2.

General Discussion

Across Experiments 1-4, I found that individuals high in psychopathy were poorer at identifying dynamic emotional stimuli and showed reduced empathic response to these stimuli. The finding that higher levels of psychopathy is associated with decreased recognition of emotional stimuli is consistent with previous literature, and adds to it by providing the first known study examining emotion perception relative to psychopathy using dynamic stimuli.

In terms of psychopathy scores, mean SRP scores in the present study ranged from 54% to 57%. A recent study of the validity of the SRP-III short version identified a mean of 52.5 for the SRP-III in a community samples, with males scoring higher ($M = 56.5$) than females ($M = 48.2$; Gordts et al., 2015). Thus, the SRP scores of the present sample are comparable, although perhaps slightly higher, which is surprising given that the samples used in the present study were predominantly female.

Gender was included in the model with psychopathic traits in all four experiments. Gender was included as there is mixed evidence on gender differences in psychopathy and empathy, and thus it was important to examine these gender differences in the context of the present experiments. In each case, the addition of gender did not add anything meaningful to the model of the relationship between psychopathic traits and either emotion recognition or empathic response.

A measure of alexithymia was included in Experiments 2 and 4 because I thought that this construct describing an inability to identify and understand emotion would be useful as a potential covariate with psychopathy. However, across the three experiments, inconsistent results were observed for alexithymia (measured using the TAS-20). Sometimes alexithymia scores correlated with psychopathy scores, and sometimes alexithymia scores were correlated with overall accuracy for the dependent variables; however, none of these relationships were consistently observed. Therefore, the variable of alexithymia was not explored any further in this study.

A widely held belief is that, in order to experience empathy for an emotion, one must first recognize and correctly interpret that emotion. The findings in the present study are consistent with this explanation of empathy, as both empathic responding and emotion recognition are reliably present together. In particular, these results suggest that this relationship between emotion recognition and empathy, with emotion recognition as the basis for empathic responding, may be relevant for individuals across the spectrum of psychopathy as well, as these two responses were generally both observed across different levels of psychopathy.

The finding that psychopathy is associated with decreased empathic response using an “objective” form of empathy (matching one’s own emotion with the emotion expressed by an individual in a video clip) is novel. Not only is this the first study to measure empathic response relative to psychopathic traits in response to dynamic stimuli, but it also one of the few to use a more objective measure of empathy. It is difficult, and in fact, may be impossible, to measure empathy without a degree of subjectivity. There is subjectivity in the fact that participants provide self-reported ratings of their own emotions. However, I believe that the measure used, including the matching of the emotion rating to the emotion expressed in the video clip, is still one of the “purest” ways to capture empathy and limit the influence of subjectivity.

An interaction between psychopathy and individual emotion type was not observed, other than for empathic responding in Experiment 1. Even when this interaction was observed in Experiment 1, it seemed to be due to the sad emotion category, with a steeper slope indicating that higher psychopathy produced increasingly poor accuracy for this emotion in particular. This is somewhat surprising, considering that a considerable breadth of literature and theory exist which cite a lack of understanding and experience of the emotion of fear as a core deficit of psychopathy. As suggested in a recent review, conflicting results related to psychopathy and fearful stimuli such as these may be indicative of the fact that what has been observed to be a fear processing deficit in psychopathy is more specific to threat detection and responsivity than the emotion of fear itself (Hoppenbrouwers, Bulten, & Brazil, 2016). Happy and sad stimuli were consistently the two easiest emotions to identify and also had the highest empathic response, whereas disgust and fear tended to consistently produce the lowest accuracy for emotion recognition and empathic response, although in Experiment 4, fearful stimuli produced the second highest accuracy for emotion recognition, so this pattern of results generated by

individual emotion types is somewhat unreliable, especially given the large sample sizes in the present study. Further, within the same experiment, the emotion conditions producing the highest and lowest accuracy for emotion recognition were not necessarily the exact same emotions producing the lowest empathic response. This suggests that there may not be a perfect linear relationship between recognition of an emotion and ability to empathize with it, as disgust appears to be the most difficult to recognize, yet fear is the most challenging to empathize with.

Across Experiments 1-3, the main effect of emotion cue condition was replicated, with the most salient combination of emotion cues (EE: facial expression plus vocal affect) producing both the highest emotion recognition and empathy, followed by the next most salient condition (EN: facial expression plus neutral affect), with the least salient condition (NE: neutral facial expression plus vocal affect) producing the poorest performance on accuracy for emotion recognition and empathy. These results are consistent with findings from previous studies using these stimuli conducted by Regenbogen and colleagues, thus demonstrating two things: 1) these stimuli are effective at producing a differential effect in a Canadian sample, and 2) even with elimination of semantic information from the stimuli, leaving only the two less salient types of emotion cues (facial expression and vocal affect), the same effects of saliency of emotion cues on emotion recognition and empathy are observed. However, the expected interaction between emotion cue condition and psychopathic traits was not observed. I expected that increasingly ambiguous stimuli would sharpen differences in emotion perception and empathy based on psychopathy, with higher scores on psychopathy predicting poorer accuracy as ambiguity increased. This relationship was not observed. Perhaps the stimuli in the two least salient conditions (EN and NE) in Experiments 1 to 3 were too ambiguous: accuracy for both outcome variables was poor overall for these two conditions, particularly for the NE condition, and it may

be that participants in general had such difficulty identifying and empathizing with these expressions of emotion that no meaningful individual differences could be discerned. Experiment 4 made an attempt to overcome this concern by including only the most salient stimuli and manipulating the length of the stimuli as a measure of ambiguity rather than the emotion cues presented. However, performance in response to these conditions was contrary to what I predicted, with greater accuracy for the short stimuli than the long stimuli. The long stimulus condition was initially assumed to be less ambiguous than the short stimulus condition, due to the presence of sustained emotion cues in the long stimuli that were thought to replicate the dynamic expression of emotion more effectively than in the short 1 s stimuli. The fact that participants had an easier time recognizing and empathizing with the brief presentation of “maximum” emotion in the short stimulus condition suggests that this paradigm may not have been an effective manipulation of ambiguity for emotional stimuli. Future studies could include semantic content because it is a more salient emotion cue, thereby yielding higher accuracy and therefore possibly more likely to yield the predicted differences in emotion perception and empathic response performance based on psychopathic traits. Additionally, as Olderbak and Wilhelm (2017) suggest, issues with measurement of both emotion and empathy constructs may partly contribute to the lack of relationship observed between psychopathic traits and perception of emotion or empathy. Olderbak and Wilhelm suggest caution in interpreting relationships between emotion recognition and empathy due to the fact that different measurement approaches are applied to these two constructs: empathy is evaluated as a typical behaviour (i.e., trait or personality-like constructs), whereas emotion recognition is evaluated using measures of maximal effort (i.e., an ability). Typical behaviours are everyday behaviours without a veridical answer or response; these behaviours are usually assessed with self-report measures wherein

participants are asked to rate how closely they believe their everyday behaviour approximates statements provided about everyday behaviour. Maximal effort, on the other hand, is assessed with performance measures for which there is a veridical answer, and participants are asked to perform to the best of their ability. The authors argue that measuring empathy as a maximal effort is challenging, although the measure used in the present study (self-matching target strategy) may more closely approximate this type of assessment of empathy than most others.

Contrary to what I predicted, psychopathy factors did not yield significant differences in results. Emotion recognition and empathic response in relation to psychopathic traits were not associated with the emotional factor of psychopathy, as I expected. Perhaps the homogeneity in a university sample significantly limits variation in psychopathy that can be attributed to differences between emotional and behavioural factors.

A potential mundane explanation for any effect of psychopathy in the present experiments is that psychopathy is associated with inattention or failure to appropriately comply with task requirements. In other words, reduced accuracy associated with psychopathy is an artifact of failure to perform the task rather than reduced emotion-processing. However, simple bivariate correlations between overall response times for each stimulus and psychopathy do not indicate that psychopathy is associated with a greater likelihood of “cheating” by responding “too quickly” to the stimuli, which would reflect failure to complete the task appropriately. Rather, these correlations across experiments are either nonsignificant, indicating no relationship between psychopathy and speed of responding, or highlight a negative correlation between psychopathy and response time, which is more likely indicative of slower and more effortful processing by people high in psychopathy. A more thorough exploration of response times as part of a laboratory-based study where more control over the experiment setting is possible

would be useful to confirm these findings that individuals high in psychopathy demonstrate reduced emotion-processing in the form of increased response latencies.

Limitations and Future Directions

One limitation of the experiments that may have reduced any effect of empathic response, particularly Experiments 1-3, was the duration of the task. All three experiments included 96 video clips, which is 33% more stimuli than in the original studies conducted by Regenbogen and colleagues, which included 64 clips. Participants were expected to respond empathically to the video clips, in addition to providing additional behavioural responses. Even if participants experienced an empathic response during the initial portion of the trials, they may have become increasingly apathetic as additional stimuli were presented. For this reason, it would have been ideal to have had the option to analyze the data by individual trial, in order to determine whether such practice effects developed over the course of the task. Unfortunately, the format in which data were exported from Qualtrics did not allow for analysis of individual observations in the sequence participants viewed them. Even if it had been possible to analyze the data in this form, it would have added a level to the multi-level model, making it a three-level model, which adds considerably more complexity to an already complex model.

The experiments were all conducted online. Studies have shown that online experiment results can be as reliable and valid as those conducted in a lab, with the online format offering additional advantages such as rapid recruitment and increased diversity of participants (Buhrmester, Kwang, & Gosling, 2011; Lutz, 2016). However, online experiments also have limitations. First, the attrition rate of those who do not complete the experiment is high. Thus, there may be some characteristic of individuals who do not complete the experiment such that removal of these individuals due to lack of complete responses may generate some degree of

selection bias for participants included in the final sample. Second, it is more difficult to monitor participant behaviour and ensure that participants are following instructions properly. For example, the instructions indicate that participants must both be able to view and listen to the video clips in order to make judgments about the emotion expressed; however, there is no way to control whether or not participants read and follow these instructions, so they may not be attending to the stimuli as they should be. Similarly, participants are asked to complete the study in a quiet area; and yet, the researcher has no control over the conditions under which the participant engages in the experiment (e.g., whether they may be viewing the video clips in an environment with considerable noise and/or distractions). Without having included a manipulation check for attention, it is difficult to know definitively whether participants were attending appropriately to the stimuli. However, the fact that response times were not positively correlated with psychopathy suggests that it is unlikely that individuals high in psychopathy were more likely to produce inappropriate responses (i.e., due to inattention or low effort). Thus, any failures to attend or respond appropriately to the task do not appear to be a function of psychopathy.

The interaction between instructions and stimulus format may also have affected participants' performance. Participants were instructed to both watch and listen to the video and make a determination about the emotion represented; they were not given specific instructions as to which type of emotion cue to focus on. They were also not informed that different types and combinations of emotion cues were manipulated in the stimuli. In the case of the EE condition, this is not a factor as both types of emotion cues were present, and offered congruent emotional information. In the case of the EN condition, this also likely wasn't a factor, as the visual information of the face would have taken precedence over auditory information in targeting

attentional focus; the auditory information was less “helpful” in augmenting the emotion of the visual information, which explains why this condition would produce lower accuracy than the EE condition. However, in the NE condition, which turned out to be most ambiguous condition, participants may have had difficulty identifying the emotion represented as they would have to essentially inhibit their response to the facial expression in order to focus on the emotion conveyed in the voice of the speaker. Phenomena such as the McGurk effect (McGurk & McDonald, 1979) demonstrate that visual information generally takes precedence over auditory information; therefore, participants would likely have difficulty processing emotional auditory information in the presence of conflicting neutral visual information.

The rationale for exploring the relationship between ambiguity of emotion cues and psychopathy came from a previous (unpublished) study that I conducted (Mackenzie & Logan, 2014b), wherein psychopathy was associated with reduced processing of spoken affective word-length stimuli, but no differences based on psychopathy were observed for spoken affective sentence-length stimuli. These results seemed to provide evidence of the relationship between psychopathy and increasing ambiguity of emotional stimuli in demonstrating exaggerated processing deficits in individuals higher in psychopathy (the brief word-length stimuli had lower accuracy overall and were thus deemed to be more difficult to process, and to provide fewer emotion cues than the sentence-length stimuli). However, in Mackenzie and Logan, a single type of emotion cue (vocal prosody) was isolated, and there was no competition from other types of emotion cues. Thus, this methodology may have been targeting a different process than the ones used in the present study. Additionally, the word-length stimuli used in Mackenzie and Logan (2014b) were quite short (approximately 500 ms each): about half the length of the “short” video clips used in Experiment 4 (approximately 1 s each). The word-length stimuli produced lower

accuracy than the corresponding sentence-length stimuli in Mackenzie and Logan, whereas the short video clips used in Experiment 4 produced higher accuracy than the corresponding sentence-length “long” video clips in that study. Thus, the exact duration of the “short” stimuli may be key to producing sufficiently ambiguous stimuli: the short video clips from Experiment 4 may have been long enough (particularly with an additional type of emotion cue) to provide an ideal depiction of a particular emotion, compared with the very brief word-length stimuli. One strategy to assess this possibility would be to generate 500 ms or shorter versions of the Regenbogen stimuli, including both audio and visual cues, and compare that with an audio-only version of Regenbogen’s stimuli.

Using Regenbogen et al.’s (2012) German stimuli with Canadian participants comes with several caveats. First, it may have been more difficult for Canadian participants to identify the emotions specified in the tasks than if they were produced by Canadians. Although research has shown that perception of affect permeates cultural boundaries, slight differences occur in processing of affective stimuli across different cultural groups (Engelmann & Pogosyan, 2013). Therefore, the potential exists for Canadian participants to perceive the emotions associated with the stimuli accurately but not to perceive them as clearly or with the same intensity as German participants. Cultural differences in perception of emotional stimuli have been observed primarily between Eastern and Western cultures (e.g., European/American vs. Asian), rather than between Western sub-groups. Nevertheless, the potential exists for cultural differences between the present sample and the German samples used to originally validate the stimuli. However, it should be noted that direct comparisons cannot be drawn between the results of the studies by Regenbogen et al. in terms of obtained accuracy, as the least salient condition in those studies was the most salient condition in experiments 1 to 3 (and all stimuli used in experiment 4). The

emotion recognition accuracy ratings for this condition in the Regenbogen et al. studies ranged from 70 to 80%, and empathic response “accuracy” ranged from 30 to 49%, both of which were comparable to what was observed for this condition in the present study.

Note that intensity ratings of emotion, both observed and experienced, were collected but not analyzed due to time constraints and the volume of data already included in the study. Cultural differences in perception of emotion have been identified in particular for relative ratings of intensity of observed emotion (e.g., Engelmann & Pogosyan, 2013). Therefore, a next step would be to explore the intensity ratings and compare these against the intensity ratings observed in the samples used by Regenbogen et al. to determine whether perceptual differences between these and the present sample exist. Additionally, while no interaction was observed between psychopathy and ambiguity of the stimuli when the outcome variables of emotion recognition and empathic response were evaluated using accuracy measures, differences in ratings of intensity may emerge in relation to psychopathic traits and ambiguity: accuracy may be comparable for emotion recognition and empathic response for individuals across the spectrum of psychopathy, but higher psychopathy may be associated with lower ratings of intensity for emotion recognition and/or empathic response.

In considering cultural differences, another variable that may have played a role in the present study is the ethnicity of participants. Carleton University, where the study was conducted, has an ethnically diverse student population. The stimuli used by Regenbogen et al. (2012) were produced in Germany with a sample of Caucasian participants (both those portraying the emotions in the stimuli and respondents to the stimuli). It is possible that participants whose ethnicity differs from that of the individuals depicted in the stimuli may have

had a greater difficulty identifying with the individual than would someone whose ethnicity matches the “other” individual in the stimulus. Studies of psychopathy have also been conducted almost exclusively with Caucasian participants, and there is some evidence that psychopathic traits may manifest differently in individuals from other ethnic backgrounds (Baskin-Sommers, Newman, Sathasivan, & Curtin, 2011; Baskin-Sommers et al., 2016). Thus, future studies exploring the relationship between psychopathic traits, empathy, and emotion recognition should explore whether there are any differences based on participant ethnicity.

However, the findings of a main effect of condition, for both emotion recognition and empathy, across all studies, as well as a main effect of psychopathic traits for both of these outcome variables, suggests that these stimuli are valid for investigating emotion recognition and empathy in the sample of Canadian participants used in the present study.

Future research with individuals who have higher levels of psychopathy is also warranted. Using a sample of undergraduates as I did here undoubtedly attenuates the range of psychopathy, which likely reduces the possibility of observing an effect of psychopathy, especially for interactions with stimulus manipulations. Having a sample with more extreme levels of psychopathy may make it easier to see such effects if they actually exist. Counter to this argument, however, is the fact that I had previously observed an effect of stimulus length as a function of psychopathy in a sample of undergraduates (Mackenzie & Logan, 2014b).

Conclusions

While some differences may have emerged based on cultural differences between the sample population and the original (German) population for which the stimuli were intended, the findings of an effect of empathy and emotion recognition as a function of varying emotion cues

were consistently observed across multiple experiments and are consistent with the findings of Regenbogen and colleagues.

Psychopathy was consistently associated with reduced processing of emotional stimuli, as well as a reduced empathic response. Analyses by behavioural and emotional factors of psychopathy revealed results consistent with psychopathy overall, and few meaningful differences based on factor scores. While the expected interaction between psychopathy and ambiguity of emotional stimuli was not observed despite the use of several different methodological strategies aimed at testing this relationship, it may be a reflection of the stimuli used, in particular, the presence of specific emotion cues and/or the duration of the stimuli designated as highly “ambiguous”. The consistent findings across the four experiments in this study support and augment existing literature demonstrating an association between psychopathy and reduced processing of emotional stimuli, particularly supporting evidence for this relationship in a sample of individuals varying along a continuum of psychopathic traits; as well as supporting previous theory and literature documenting evidence of a negative relationship between psychopathy and empathy. The findings related to empathy are particularly novel as they utilize an objective measure of empathy in response to dynamic stimuli.

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