



Are there differential relationships between nonclinical primary and secondary psychopathy and complex emotion recognition?

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ABSTRACT

Although there is a plethora of studies examining affective processing in clinical psychopathy, the subclinical dimension of psychopathy has remained a largely underresearched area. Previous research has been inconsistent due to methodological shortcomings and theoretical plurality. Addressing the need for methodological modifications in the field, this study utilized the Cambridge Face-Voice Mindreading Battery (Golan, Baron-Cohen & Hill, 2006) and the Reading the Mind in the Films task (Golan, Baron-Cohen, Hill & Golan, 2006) and predicted differential associations between primary and secondary psychopathy and the recognition of negative emotions and the recognition of mental states from movie scenes. The correlation analyses were based on 49 undergraduate students and indicated significant negative correlations between primary psychopathy and the perception of negative emotions and between secondary psychopathy and the performance on the films task only. These correlations were not significant when a Bonferroni adjustment for multiple comparisons was conducted and when accounting for self-reported empathy. These preliminary findings demonstrate the potential of the behavioural affect perception paradigm to distinguish between nonclinical psychopathy subtypes but also emphasize a number of conceptual, methodological and data analytic discrepancies. Alternative explanations of the findings were offered and plausible recommendations for increasing methodological rigour were posited.

KEY WORDS	PSYCHOPATHY	PRIMARY	SECONDARY	SUBCLINICAL	EMOTIONS
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Introduction

Both enigmatic and pervasive, *psychopathy* has been termed the most important clinical (Hare, 1996) and forensic (Monahan, 2006) construct in the criminal justice system. With an estimated prevalence of 1-2% in the general population and 50% in the violent offender population (Hare, 1993; Rutter, 2012), psychopathy has been associated with persistent offending (Woodworth & Porter, 2002), institutional misconduct (Smith, Edens & McDermott, 2013) and negative psychotherapeutic treatment behaviour (Olver & Wong, 2009).

The early case studies by Cleckley (1941) provided influential accounts of the prototypical psychopath as a psychiatric patient with severe behavioural and mental disturbance. The subsequent development of the Psychopathy Checklist-Revised (PCL-R, Hare, 1991; 2003) from offender populations was consistent with Cleckley (1941) on the conceptualization of psychopathy as a *clinical construct*. Based on semi-structured interview and collateral data, the PCL-R assesses psychopathy as a personality disorder characterized by a set of callous and unemotional traits, including a lack of empathy and remorse, dishonesty and low impulse control (*Affective factor*), superficial charm and a pronounced ability to manipulate and exploit others to their advantage (*Interpersonal factor*) and impulsivity and antisocial behaviours (*Lifestyle factor* and *Antisocial factor*). Antisocial behaviours, in particular, can manifest themselves in a range of immoral and/or illegal acts including manipulation, compulsive lying, bullying, sexual and physical abuse (Hare & Newmann, 2008). The total diagnostic psychopathy score obtained from the PCL-R has been shown to predict recidivism and violence (Leistico, Salekin, DeCoster & Rogers, 2008) and to generalize across a range of criminal populations and contexts (Bolt, Hare & Newmann, 2007; Cooke, Michie, Hart & Clark, 2005).

Psychopathic, not Psychopath

Subsequent empirical investigations of the structure of the psychopathy phenomenon vary in their adherence to Cleckley's (1941) original clinical formulations. In line with Cleckley's (1941) work, the majority of taxometric studies of offender and psychiatric patient populations have attempted to identify a superordinate factor that accounts for the majority of the variance in each of the four factors proposed by Hare (1991; 2003; Newmann, Hare & Newman, 2007). Taxonomic approaches have tended to conceptualize psychopathy as a homogeneous construct defined by a broad antisocial disposition. Research examining the taxonicity of psychopathy has assumed that psychopathic and non-psychopathic individuals represent qualitatively distinct categories (Vasey, Kotov, Frick & Loney, 2005).

While appealing for their diagnostic utility and parsimony, taxonomic models of psychopathy have been challenged by accumulating evidence demonstrating that (a) normal-range personality traits in the noninstitutionalized population are

associated with PCL-R factors and predict psychopathic behaviour (Lynam, 2002; Lynam et al., 2007) and that (b) multiple causal pathways rather than a single predisposing factor are likely to lead to manifestations of psychopathy (Blackburn, Logan, Donnelly, & Renwick, 2008; Moffit, 1993). In contrast to the taxonomic or categorical perspective of psychopathy, *the dimensional perspective* has posited that psychopathic affective and behavioural characteristics are extreme variants of normal-range personality traits (Livesley, 2007). As a result, *subclinical psychopaths* have been described as individuals who possess affective and interpersonal traits similar to those of institutionalized psychopaths but who do not engage in criminal activities (Levenson, Kiehl & Fitzpatrick, 1995).

Accordingly, the Levenson Self-Report Psychopathy Scale (LSRP, Levenson et al., 1995) was developed to measure psychopathy as a heterogeneous, dimensional construct in noninstitutionalized populations. The LSRP contains two underlying factors, *primary psychopathy* and *secondary psychopathy*, which seem to have different personality correlates and aetiologies (Blackburn, 2009). The primary phenotype is characterized by low anxiety, a lack of remorse and shallow affect. In contrast, secondary psychopathy encompasses psychopathic behavioural tendencies such as aggression, impulsivity, dishonest and criminal acts (Karpman, 1948). The initial factor analysis of the LSRP showed that compared to primary psychopathy, secondary psychopathy was more strongly correlated with reactivity to stress and antisocial action, whereas primary psychopathy was found to be relatively more strongly correlated with harm avoidance (Levenson et al., 1995). Although the two psychopathic subtypes appear to have similar egoistic, callous-unemotional and manipulative interpersonal styles, they have been argued to have distinct causal pathways: primary psychopathy seems to constitute a genetic deficit, whereas secondary psychopathy may stem from adverse early environmental influences such as parental rejection (Blackburn & Maybury, 1985; Morrison & Gilbert, 2001).

The heterogeneity of explanatory models of the primary-secondary distinction poses, however, challenges to the validation of the *true* concept of primary or secondary psychopathy (Blackburn, 2009). Theoretically derived psychopathy subtypes should be assessed on their predictive and convergent validity. The dimensional structure of the LSRP has shown adequate internal validity (N=487, Levenson et al., 1995), high convergent validity across gender and ethnicities (N=1972, Walters, Brinkley, Magaletta & Diamond, 2008) and good discriminant validity (N=2028, Lynam, Whiteside & Jones, 1999) in both clinical and nonclinical populations.

The utilization of the LSRP for the measurement of subclinical psychopathy rules out confounding variables such as the long-term substance abuse and the negative consequences of incarceration that occur in institutionalized populations (Lilienfeld, 1994). Also, studies comparing incarcerated and nonincarcerated psychopaths have the potential to identify the mechanisms that the latter group uses to avoid institutionalization despite committing antisocial and immoral acts (Mullins-Nelson, Salekin & Leistico, 2006).

A Dysfunction or an Adaptation?

Emotion processing deficits, particularly a lack of empathy and impaired Theory of Mind (ToM), have been a central component in both categorical and dimensional models of psychopathy (Osumi & Ohira, 2010; Wheeler, Book & Costello, 2009). Often referred to as synonymous constructs, empathy and ToM describe an individual's ability to comprehend and infer the mental states, experiences and intentions of other individuals (Jolliffe & Farrington, 2004). Affective deficits in psychopathy have been argued to predispose to instrumental aggression, the disinhibition of disadvantageous decision-making and manipulation and deception for personal gain (Wheeler et al., 2009; Bechara & Damasio, 2005).

Theoretical reasoning and the results from empirical investigations have been inconsistent with regards to the adaptive nature of the affective traits associated with psychopathy. By definition, psychopathic individuals tend to manipulate and exploit others while possessing superficial charm (Hare, 2003). However, the exploitation of others to gain personal advantage is costly (may result in punishment, Frank, 1988). Therefore, to avoid the negative consequences of their socially coercive behaviours, psychopathic individuals should have the capacity to identify vulnerable victims, to flexibly alter between cooperation and cheating to disguise their intentions, to accurately assess the risks of employing exploitative strategies in short-term social interactions and have the capacity to recognize the emotions and intentions of others (Troisi, 2005; Glenn & Raine, 2009). Consistent with adaptationist theories of psychopathy, the characteristics of the primary psychopathy subtype have been associated with reproductive and survival success (Mealy, 1995). Also, Widom (1978) coined the term '*successful psychopath*' to refer to individuals with a psychopathic personality who, however, do not only refrain from committing serious antisocial acts but also achieve financial and professional success by using manipulation and deception.

Numerous studies have shown that psychopathic traits are positively correlated with the accurate perception of victim vulnerability (Book, Costello & Camilleri, 2013), with the efficiency of monitoring their partner's behaviour during bargaining games (Czibor & Bereczkei, 2012) and with verbal intelligence and analytic abilities (Salekin, Neumann, Leistico & Zalot, 2004). This supports theoretical predictions that certain psychopathic traits may be evolutionary adaptive. The results from behavioural and neuroimaging studies investigating emotion recognition and ToM abilities have, however, been mixed. Functional brain imaging studies have repeatedly observed underactivation of the amygdala region in institutionalized psychopaths during the processing of fearful and distress stimuli indicating an affective deficit (Birbaumer, Viet, Lotze, Hermann et al., 2005; Blair, Jones, Clark & Smith, 1997). Two meta-analyses have concluded that both clinical and nonclinical psychopathic individuals have an emotion processing deficit across three modalities (facial, vocal, postural) and across the basic emotions (anger, disgust, fear, sadness, surprise, happiness; N=1369, Dawel, O'Kearney, McKone & Palermo, 2012; N=1387, Wilson, Juodis & Porter, 2011). The meta-analytic evidence should be interpreted with caution for at least three reasons: (1) effect sizes tend to be extremely small ($r < .10$, Wilson et al., 2011), (2) there is still considerable disagreement as to whether affective deficits are universal or restricted to negative emotions (particularly fear and sadness) and

(3) the vast majority of the selected studies measured psychopathy as a unitary construct. To complicate the conclusions further, several studies have failed to find significant associations between psychopathy and emotion processing (Hastings, Tangney & Stuewig, 2008; Fairchild et al., 2010) and others have even shown that individuals high on psychopathic traits tend to be *better* at emotion recognition (Del Gaizo & Falkenbach, 2008; Woodworth and Waschbusch, 2008).

Most recently, Del Gaizo and Falkenbach (N=175, 2008) studied the relationships between subclinical primary and secondary psychopathy and positive and negative emotion recognition in the facial modality while Ali and Chamorro-Premuzic (N=112, 2010) added neutral emotional stimuli and included the auditory modality. Del Gaizo and Falkenbach (2008) reasoned that because primary psychopathy was associated with callousness, superficial charm and manipulation, those high on primary psychopathic traits were likely to be more adept at the recognition of emotions, particularly fear and distress, in order to successfully execute their exploitative strategies. On the other hand, as secondary psychopathy was characterized with reactive aggression, impulsivity and hostile attribution bias, those high on secondary psychopathic traits were predicted to be more likely to have higher rates of emotion recognition errors. In line with the predictions, the authors found there was a significant positive relationship between the primary subtype and the recognition of fearful (but not happy, sad or angry) faces but, surprisingly, the secondary subtype was unrelated to perceptual errors. In contrast, Ali and Chamorro-Premuzic (2010) predicted that primary and secondary psychopathy would have differential emotion recognition correlates without specifying the direction of the relationships. They found a significant negative correlation between primary psychopathy and the recognition of *neutral* emotions and a significant negative correlation between secondary psychopathy and the recognition of *positive* emotions (but only on the Eyes task and not on the Faces or Voices tasks).

Current Study

In addition to differences in conceptualization (unitary versus dimensional), variations in behavioural emotion recognition batteries could account for the contradictory findings in the field (Wheeler et al., 2009). To demonstrate, Ali and Chamorro-Premuzic (2010) utilized the Faces test (Baron-Cohen, Wheelwright, & Jolliffe, 1997), Reading the Mind in the Eyes Test revised (RMET, Baron-Cohen et al., 2001a) and Reading the Mind in the Voice Test (RMVT, (Golan, Baron-Cohen, Hill, & Rutherford, 2006), which assess only a few basic emotions by presenting black-and-white still images of eyes and faces. The current study argues that the validity and generalizability of results obtained from those batteries are compromised as those instruments do not reflect the range and complexity of emotions experienced and judged in real-life contexts. Also, the stimuli included in those instruments are low in ecological validity because in everyday life interactions, individuals rarely process eyes separately from the holistic faces, neither do individuals process static facial images separately from voices.

The current study is a conceptual replication of Ali and Chamorro-Premuzic's (2010) and Del Gaizo and Falkenbach's (2008) studies. The current study will

utilize two alternative emotion recognition batteries, the Cambridge Mindreading Face-Voice Battery (CAM, Golan, Baron-Cohen & Hill, 2006a) and the “Reading the Mind in Films” Task (Golan, Baron-Cohen, Hill & Golan, 2006b), to assess the relationships between primary and secondary psychopathy and complex emotion recognition. The CAM addresses a number of methodological weaknesses of earlier instruments by testing as many as 20 subtle emotion concepts (positive, negative and neutral) and by using animated facial expressions rather than still images of faces or eyes to increase ecological validity. The RMFT tests ToM abilities by presenting movie scenes of varying valence and intensity. The processing of movie scenes requires the integration of visual (facial and postural expressions, background details) and auditory (prosody, verbal content) input, which is more naturalistic compared to testing each modality separately. Both the CAM and the Films task have shown high internal validity and high discriminant validity (Golan et al., 2006a; Golan et al., 2006b). The current study is the first to utilize the two instruments to examine psychopathic traits.

The current study aimed to (A) build upon extant empirical work on nonclinical psychopathy dimensions and theory of mind abilities, (B) address methodological discrepancies in the field by employing emotion perception measures (the CAM and the RMFT) of a higher construct validity and a higher ecological validity than earlier measures and (C) validate the CAM and the RMFT in the differentiation of the primary and secondary psychopathy subtypes. Given that the CAM contains only three neutral and five positive emotion concepts, the tests of neutral and of positive affect processing are likely to produce near-ceiling performance and have low discriminating power (Strauss, 2001; Perkins, Wyatt & Bartko, 2000). In contrast, the CAM negative emotion subscale assesses 12 emotion concepts and is therefore likely to yield more reliable scores. Therefore, predictions for primary and secondary psychopathy in relation to the perception of negative emotions will be made only. Given the dearth of studies on nonclinical psychopathy and the methodological inconsistencies, the predictions of the current study will be primarily based on Del Gaizo and Falkenbach’s (2008) study and on evidence from evolutionary theory about the potentially adaptive nature of certain psychopathic traits discussed above. In concordance with the dimensional perspective, the two psychopathy subtypes were predicted to be *differentially* related to emotion recognition performance. In particular, it was hypothesised that:

Primary psychopathy would be positively linearly correlated with the number of correctly recognized negative concepts (Faces and Voices tasks combined) and with the number of correct items on the Films task (H1 and H2). In contrast, it was hypothesised that secondary psychopathy would be negatively linearly correlated with the number of correctly recognized negative concepts on the Faces and the Voices tasks combined, and negatively linearly correlated with the number of correct items on the Films task (H3 and H4).

Method

Design

The study employed a correlational design to estimate the magnitude of the relationships between primary and secondary psychopathy and the number of correctly recognized negative concepts in the CAM Face and Voice tasks and the Films task scores. The study used an alpha level of .05.

Participants

49 University of Glasgow undergraduate students (31 (63.3%) female) were recruited. The eligibility requirements included native or advanced level of English language proficiency, normal or corrected-to-normal vision and no hearing impediments (See 'Appendix 1'). 30 (61.2%) English native speakers (27 British and three American) and 19 (38.8%) non-native English-speaking participants with a self-reported native or advanced level of English language proficiency from Hungary (1), Poland (1), Bulgaria (7), Belgium (1), Norway (1), Greece (2), Finland (1), Romania (1), Sweden (2), India (1) and Singapore (1) were tested. The participants' ages ranged from 18 to 27 years ($M=21.65$, $SD=1.8$). Recruitment was conducted via poster advertisements on campus and via an online advertisement on the School of Psychology Participant Pool (See 'Appendix 2'). First-year undergraduates completed the experiment as a course requirement and received four course credits for their participation; second-, third- and fourth-year undergraduates participated voluntarily.

Apparatus and Materials

Levenson Self-report Psychopathy Scale (LSRP)

The LSRP is a 26-item Likert-type self-report measure of primary and secondary psychopathy in nonclinical populations (Levenson, Kiehl, & Fitzpatrick, 1995; see 'Table 1'). The primary subscale consists of 16 items and the secondary subscale consists of 10 items. Unlike the PCL-R (Hare, 2003), the LSRP does not include items on illegal/antisocial activities as such items would be intrusive and would be unlikely to produce reliable responses due to their social undesirability (Fisher, 1993). The LSRP has well-established validity and reliability (Ali & Chamorro-Premuzic, 2010). The LSRP manual was obtained with the permission of Dr Rick Levenson.

Table 1: Items in the Primary and Secondary Psychopathy Scales (Levenson et al., 1995)

Item
<i>Primary Psychopathy</i>
1. Success is based on survival of the fittest; I am not concerned about the losers.
2. For me, what's right is whatever I can get away with.
3. In today's world, I feel justified in doing anything I can get away with to succeed
4. Making a lot of money is my most important goal.
5. My main purpose in life is getting as many goodies as I can

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6. People who are stupid enough to get ripped off usually deserve it
 7. I let others worry about higher values; my main concern is with the bottom line
 8. Looking out for myself is my top priority.
 9. I tell other people what they want to hear so that they will do what I want them to do
 10. I often admire a really clever scam.
 11. I would be upset if my success came at someone else's expense
 12. I make of point of trying not to hurt others in pursuit of my goals
 13. I enjoy manipulating other people's feelings
 14. I feel bad if my words or actions causes someone else to feel emotional pain
 15. Even if I were trying very hard to sell something, I wouldn't lie about it
 16. Cheating is not justifiable because it is unfair to others.

Secondary Psychopathy

1. I find myself in the same kinds of trouble, time after time
 2. I am often bored
 3. I find that I am able to pursue one goal for a long time
 4. I don't plan anything very far in advance
 5. I quickly lose interest in tasks I start.
 6. Most of my problems are due to the fact that other people just don't understand me.
 7. Before I do anything, I carefully consider the possible consequences
 8. When I get frustrated, I often "let off steam" by blowing my top
 9. I have been in a lot of shouting matches with other people.
 10. Love is overrated
-

Empathy Quotient (EQ)

The EQ (Baron-Cohen & Wheelwright, 2004) is a 40-item unidimensional Likert-type measure of global psychopathy used in both clinical and nonclinical populations. A demonstration of its good validity and reliability was provided by Baron-Cohen & Wheelwright (2004). The EQ was included in the current study as Ali and Chamorro-Premuzic (2010) reported it might be a useful predictor of emotion recognition scores. The EQ was obtained from www.autismresearchcentre.com.

The Cambridge Mindreading (CAM) Face-Voice Battery

The CAM consists of 20 emotion concepts derived from 18 of the 24 emotion groups in Baron-Cohen et al.'s (2004) taxonomy (See 'Table 2'). Each emotion concept is represented by five items: ten emotion concepts were represented by three items in the Face task and two items in the Voice task and the other ten emotion concepts-by two items in the Face task and three items in the Voice task. The criterion for passing a concept is the correct recognition of a minimum of four out of the five items across the Faces and Voices tasks (Binomial test, $p < .05$).

Overall, the battery consists of 50 items in the Face task and 50 items in the Voice task. The subset of emotion concepts assessed in the CAM consisted of 12 negative, five positive and three neutral (See 'Table 2'). The Face task involves 3-5-second clips of different actors (males and females, various ethnicities and age groups; see 'Figure 1'). The Voice task consists of short sentences expressing an emotional state. Both tasks included three foils for each target word; a definitions sheet featuring all the target words and the foils is provided (see 'Appendix 10'). The task is not time-limited.

The CAM produces three different scores: *An overall emotion recognition score* is determined by the total correctly recognized items across the two tasks ranging from 0 to 100. Any score greater than 35 is above chance at the $p < .01$ level (Binomial test). *A score for correctly recognized emotion concepts* ranging from 0 to 20 (any score greater than 2 is above chance at the $p < .01$ level, according to Binomial test) and *a score for correctly recognized concepts by subgroups (positive, negative, neutral emotions)*. The CAM was obtained from www.autismresearchcentre.com.

Figure 1: Still frames from two clips included in the Faces task



Table 2: The 20 emotion concepts comprising the CAM, the emotion group they belong to and their valence (positive, neutral or negative)

<i>Emotion Concept</i>	<i>Emotion Group</i>	<i>Valence</i>
Empathic	Kind	Positive
Exonerated	Happy	Positive

Intimate	Romantic	Positive
Reassured	Liked	Positive
Vibrant	Excited	Positive
Appealing	Wanting	Neutral
Lured	Interested	Neutral
Nostalgic	Touched	Neutral
Appalled	Surprised	Negative
Confronted	Hurt	Negative
Distaste	Disgusted	Negative
Grave	Sad	Negative
Guarded	Disbelieving	Negative
Insincere	Sneaky	Negative
Mortified	Sorry	Negative
Resentful	Unfriendly	Negative
Stern	Unfriendly	Negative
Subdued	Sad	Negative
Subservient	Unsure	Negative
Uneasy	Afraid	Negative

Reading the Mind in Films Task (RMFT)

The RMFT consists of 22 movie clips (5-30 seconds in length, 'Figure 2') that present complex emotional interactions between two to four characters. The task asks participants to label the emotional or mental state of the protagonist at the end of each scene. The target words were: *annoyed, awkward, belittled, bitter, concerned, disconcerted, disliking, embarrassed, enjoying, exasperated, incensed, overcome, pleased, prickly, reflective, resentful, resigned, smug, stern, troubled, unassuming* and *worried*. Three foils were presented with each target word; Baron-Cohen, Golan, Wheelwright and Hill's (2004) emotion taxonomy was used to match the foils with the target words for verbal difficulty. A word definitions sheet featuring all the target words and all the foils is also included in the battery ('Appendix 9'). The RMFT is not time-limited. The RMFT battery was obtained from www.autismresearchcentre.com.

Figure 2: Still frames from two movie scenes included in the Films task



Apparatus

The three emotion recognition tasks were presented by the DMDX software (Forster & Forster, 2003) on a 24-inch Dell Optiplex 9010 with a 1920x1080 resolution. The distance between the participant and the computer screen was 45 cm. Headphones were also provided for the Voice and Films tasks.

Procedure

Participants were tested in a quiet, well-lit laboratory at the School of Psychology and the Centre for Cognitive Neuroimaging at the University of Glasgow. They were explained that they were taking part in a study on personality, interpersonal style and emotion recognition. They were then presented with the Research informed consent form outlining the nature, purpose, the expected outcomes of the study as well as the researchers' contact information ('Appendix 3'). Participants were explained the benefits and potential discomforts involved in participating particularly the answering of questions about personality and everyday life behaviours. They were assured they could withdraw from the study at any moment without explanation and without penalty. After they had read and signed the consent form, participants were given the opportunity to ask questions.

After the participants' questions were answered satisfactorily, participants completed a background information sheet, the EQ and the LSRS. Then, the Face, Voice and Films tasks were presented in counterbalanced order. Participants were handed an answer sheet and a definitions sheet for each task; participants were asked to make their selection by circling the correct answer on the answer sheets (see Appendices 6-8). At the beginning of each task, the researcher completed two practice trials with the participant. They were also given the opportunity to take breaks during the tasks. The study took between 50 and 90 minutes depending on the individual pace of each participant. After completion of the study, they were orally debriefed, encouraged to ask questions and reminded they can request their individual scores.

Participant identity was protected by assigning individual participant numbers prior to commencing the study. The data were anonymised and stored in a password-protected computer. The scoring was performed manually by the

researcher. The data analyses were conducted with SPSS®. Prior to testing, the study was approved by the Ethics Committee of the School of Psychology at the University of Glasgow. No realistic risks of physical or psychological distress were identified.

Results

Emotion recognition scores were obtained by calculating the total number of correct items and the number of correctly recognized emotion concepts for each valence; the number of correct responses was also calculated for the Films task. All participants scored above chance on all emotion recognition measures. After the validation of model assumptions, Hypotheses 1-4 were tested by conducting bivariate Pearson's correlations. The supplementary analyses included partial correlations controlling for covariates and emotion recognition performance for the native and non-native participants separately. A demographic analysis of the sample is also briefly considered. Power calculations were obtained for the different tests.

Assessment of the Assumptions of the Correlation Models

The outlined behavioural, physiological and anatomical evidence in the 'Introduction' supports the plausibility of an *existence* of relationships between primary and secondary psychopathy and emotion recognition performance. The scatterplots in Figures 3-6 demonstrate *linear* relationships between the pairs of variables. The observations seem symmetrically distributed around the fitted regression lines, which further supports the assumption of *linearity*. Also, each observation was *independently* collected from unique individuals.

Visual inspection of the quantile-quantile plots for each variable suggested that the total emotion recognition scores and the primary psychopathy scores might not be normally distributed. However, the skewness and kurtosis were below two for all variables, which was considered satisfactory (Tabachnick & Fidell, 2007). Therefore, no nonparametric tests were performed and the data were assumed to have arisen from a *plausibly normal distribution*.

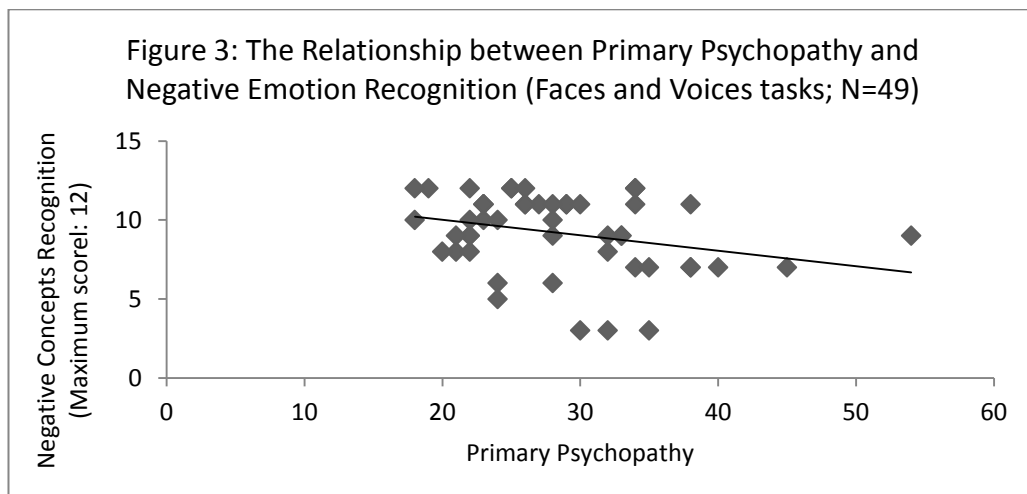
The plots of residuals versus fitted values showed a random pattern so the *constant variance* assumption was validated. Inspection of the boxplots of residuals for all variables showed a number of outliers. Cook's distance analysis for each outlier produced a $D_i < 1$ in all cases demonstrating that none of the outliers were highly influential in the correlation models (Cook & Weisberg, 1982). Based on the validation of the model assumptions, Bivariate Pearson's correlation analyses were conducted.

Primary Analyses

Primary Psychopathy and Emotion Recognition

It was hypothesised that primary psychopathy would be *positively* correlated with the number of correctly recognized negative emotions (H1).

The Pearson's bivariate correlation analysis ('Table 3', 'Figure 3') showed that there was a marginally significant *negative* relationship between primary psychopathy ($M=28.51$, $SD=7.29$) and the score on the negative emotion items ($M=9.18$, $SD=2.47$): $r(47) = -.289$, $p=.044$, $p<.05$, two-tailed, uncorrected. The statistical power of the correlation analysis was estimated at $1-\beta=0.53$ (G*Power 3.1., Faul, Erdfelder, Buchner & Lang, 2009); the probability of committing a Type 2 error was .47. The required sample size to obtain a power level of .80 for a small to moderate effect size (.30) in a Pearson's bivariate correlation model was estimated at 84 (G*Power 3.1., Faul, et al., 2009).



The output of the primary analyses included a total of 18 bivariate correlations (correlations between the three psychopathy measures (global, primary and secondary) and the six emotion recognition measures (total emotion recognition, total concepts correct, positive, negative and neutral concepts and the films task; see 'Table 3'). Therefore, to reduce the probability of Type I error, the p-values were adjusted using the Bonferroni correction:

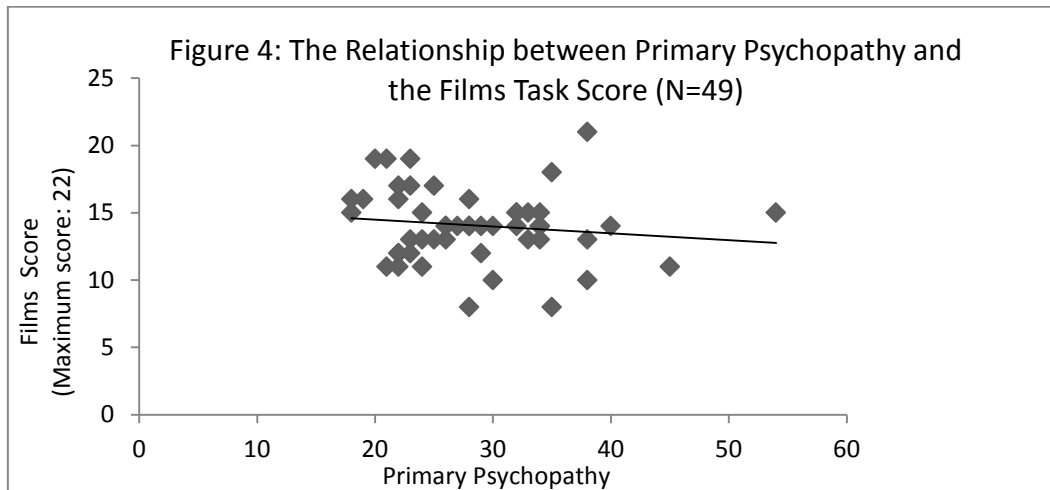
$P\text{-value (adj.)} = p\text{-value} \times 18$, where 18 is the number of total bivariate correlations.

Using this approach, the correlation between primary psychopathy and the score on the negative emotion items was found to be non-significant: $r(47) = -.289$, $p_{(adj)} = 0.792 > .05$. Therefore, the hypothesis was not supported.

It was also hypothesised that primary psychopathy would be positively correlated with the number of correctly recognized items on the Films task (H2).

The Pearson's bivariate correlation analysis ('Table 3', 'Figure 4') showed that the relationship between primary psychopathy ($M=28.51$, $SD=7.29$) and the number of correct items on the Films task ($M=14.06$, $SD=2.71$) was not significant: $r(47) = -.137$, $p > .05$, two-tailed, uncorrected. The adjusted p-value was non-significant: $p_{(adj)} > .05$. The required sample size to obtain a power level of .80 for a small effect size (.15) in a Pearson's bivariate correlation model was estimated at 346.

The hypothesis was not supported.

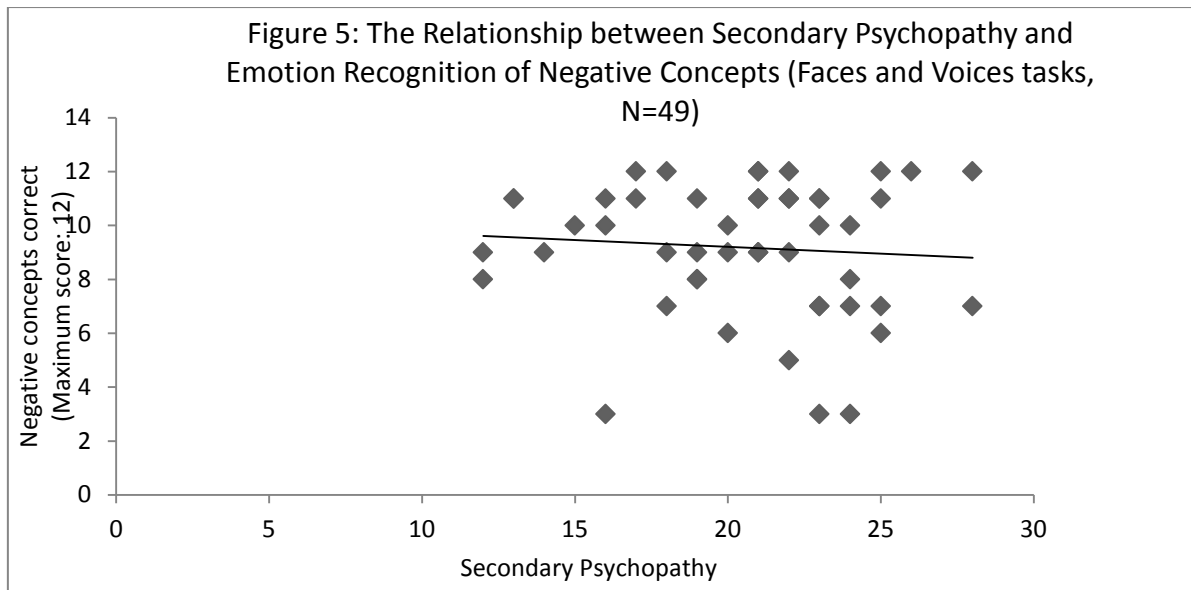


Secondary Psychopathy and Emotion Recognition

Hypothesis 3 stated that secondary psychopathy would be negatively correlated with the number of correctly recognized negative emotion items from the Faces and the Voices tasks.

The Pearson's bivariate correlation analysis ('Table 3', 'Figure 5') demonstrated that the relationship between secondary psychopathy ($M=20.47$, $SD=3.99$) and the correct negative emotion items ($M=9.18$, $SD=2.47$) was not significant: $r(47) = -.083$, $p > .05$, two-tailed, uncorrected. The adjusted p-value was non-significant: $p_{(adj)} > .05$.

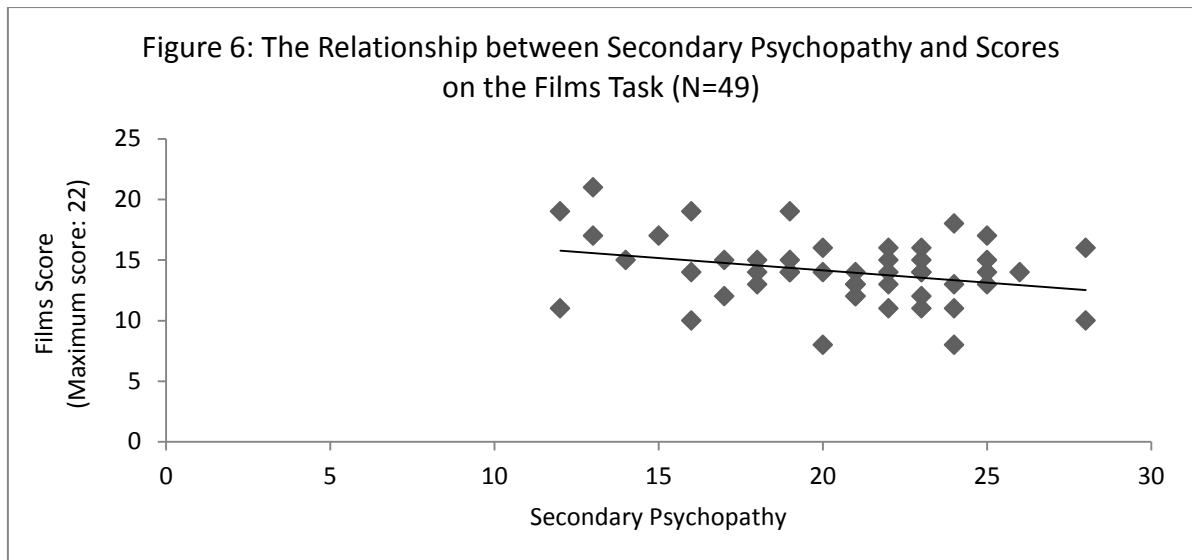
Hypothesis 3 was not supported.



Finally, hypothesis 4 stated that secondary psychopathy would be negatively correlated with the number of correct items on the Films task.

The Pearson's bivariate correlation analysis ('Table 3', 'Figure 6') showed that the relationship between secondary psychopathy ($M=20.47$, $SD=3.99$) and the Films task score ($M=14.06$, $SD=2.71$) was marginally significant: $r(47) = -.299$, $p=.037$, $p<.05$, two-tailed, uncorrected. The statistical power of the analysis was estimated at $1-\beta=.56$ indicating a .44 probability of committing a Type 2 error. The required sample size to obtain a power level of .80 for a small to moderate effect size (.30) in a Pearson's bivariate correlation model was estimated at 85 (G*Power 3.1., Faul et al., 2009).

The uncorrected Pearson's correlation analysis supports the hypothesis. However, the hypothesis is not supported when a Bonferroni correction for multiple comparisons was applied: $r(47) = -.299$, $p_{(adj)} = 0.666 > .05$.



The supplementary correlation analyses found no significant correlations between global psychopathy score and the emotion recognition measures and no significant correlations between primary and secondary psychopathy and the total emotion recognition score, the number of correctly recognized concepts or the scores for positive or neutral items ('Table 3'). The two psychopathy subscales were weakly correlated ($r=.095$).

	1	2	3	4	5	6	7	8	9	10	<i>M</i>	<i>SD</i>
1. Global psychopathy		.887**	.544**	-.591**	-.19	-.206	-.279	-.053	.084	-.257	48.98	8.65
2. Primary psychopathy			.095	-.399**	-.199	-.207	-.289*	-.053	.092	-.137	28.51	7.29
3. Secondary psychopathy				-.544**	-.044	-.067	-.083	-.012	.027	-.299*	20.47	3.99
4. Empathy quotient (EQ)					.231	.286*	.286*	.087	.177	.116	45.1	9.55
5. Total emotion recognition correct (faces and voices task)						.949**	.862**	.622**	.612**	.298*	82	8.57
6. Total emotion concepts							.903**	.636**	.666**	.298*	15.14	3.52
7. Negative concepts								.355*	.346*	.384**	9.18	2.47
8. Neutral concepts									.491**	.054	2.08	.81
9. Positive concepts										.002	3.91	1.11
10. Films task score											14.06	2.71

Table 3^a: Intercorrelations: bivariate Pearson correlation coefficients (N=49; M=mean; SD=standard deviation).

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

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

^a None of the correlation coefficients between the psychopathy measures (global, primary and secondary) and the emotion recognition measures was significant when a Bonferroni correction for multiple comparisons was applied.

Secondary Analyses

Controlling for Covariates

As 'Table 3' demonstrates, EQ was significantly correlated with both primary psychopathy ($r(47) = -.399$, $p < .01$, two-tailed, uncorrected) and the emotion recognition of negative concepts ($r(47) = -.286$, $p < .05$, two-tailed, uncorrected). To avoid the problem of multicollinearity (Nathans, Oswald & Nimon, 2012), a multiple linear regression model with EQ and primary psychopathy as predictor variables and the number of negative concepts correct as the outcome variable was not conducted. Instead, partial correlation analysis between primary psychopathy ($M=28.51$, $SD=7.29$) and negative concepts correct ($M=9.18$, $SD=2.47$), after controlling for EQ ($M=45.1$, $SD=9.55$), was conducted. The partial correlation was not significant ($r(46) = -.199$, $p = .176 > .05$, two-tailed) indicating that EQ is likely to be responsible for the simple bivariate correlation between primary psychopathy and negative concepts correct.

Analogically, as EQ was significantly correlated with secondary psychopathy ($r(47) = -.544$, $p < .01$, two-tailed, uncorrected, 'Table 3'), partial correlation analysis between secondary psychopathy ($M=20.47$, $SD=3.99$) and the score on the Films task ($M=14.06$, $SD=2.71$), after controlling for EQ ($M=45.1$, $SD=9.55$), was also conducted. The partial correlation was marginally insignificant ($r(46) = -.283$, $p = .052 > .05$, two-tailed) showing that EQ may have an effect on the simple bivariate correlation between secondary psychopathy and the performance on the Films task. The estimated power was $1-\beta = .51$.

English Language Proficiency and Emotion Recognition

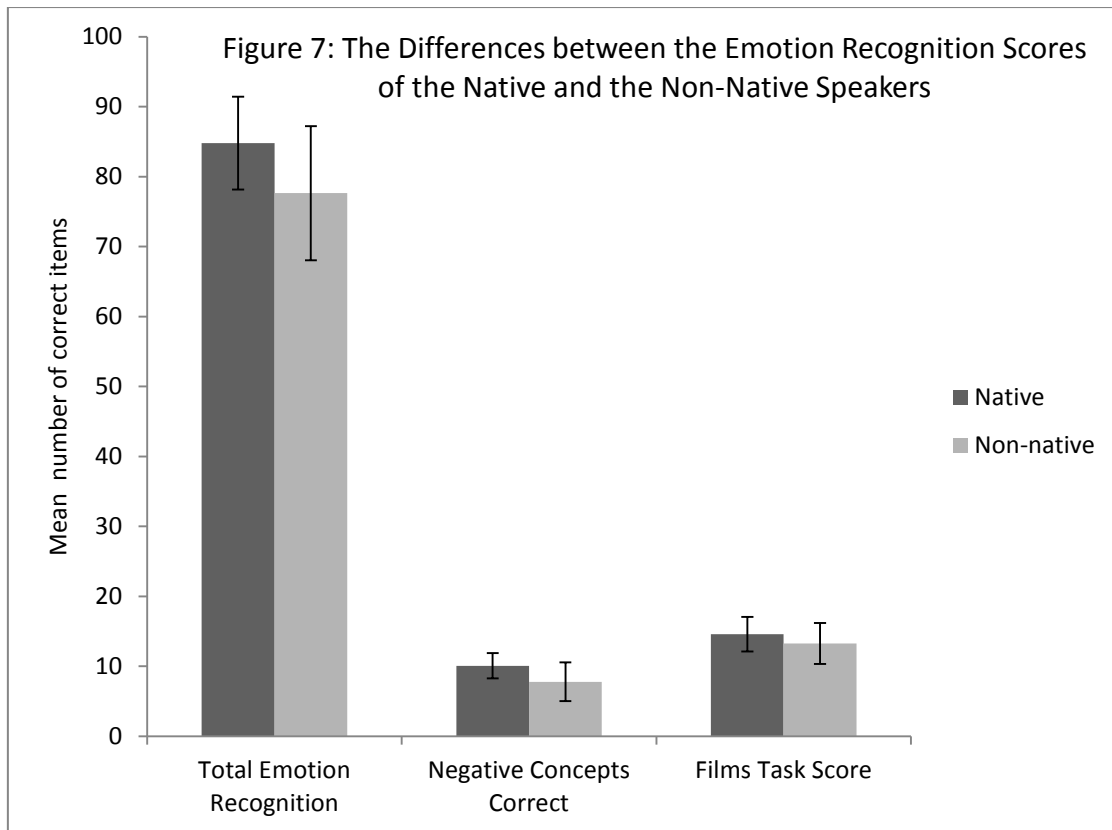
Two-tailed independent-samples t-tests were conducted to compare the emotion recognition performance on the Faces, Voices and Films tasks, and on the negative concepts only (Faces and Voices tasks) between the native English ($N=30$) and the non-native participants ($N=19$). On the faces and Voices tasks combined, the native speakers produced an average score of 84.77 out of 100 ($SD=6.64$) while the non-natives had an average score of 77.63 out of 100 ($SD=9.59$, see 'Table 4' and 'Figure 7'). The mean difference between the two groups was 7.14 items ($SE=2.32$) and was statistically significant ($t(47) = 3.08$, $p = .003 < .05$, Cohen's $d = .87$).

For the negative emotion concepts only, the natives had a mean score of 10.07 items out of 12 ($SD=1.81$), while the non-natives scored, on average, 7.79 out of 12 ($SD=2.76$, see 'Table 4' and 'Figure 7'). The mean group difference was 2.28 items ($SE=.65$) and was statistically significant ($t(47) = 3.48$, $p = .001 < .05$, Cohen's $d = .98$).

Finally, on the Films task, the mean difference between the performance of the natives ($M=14.57$, $SD=2.47$, see 'Table 4' and 'Figure 7') and the non-natives ($M=13.26$, $SD=2.94$) was found to be 1.3 items ($SE=.78$), which was not significant ($t(47) = 1.67$, $p = .102 > .05$).

Table 4: The Differences between the Emotion Recognition Scores of the Native and Non-Native Speakers (N=49; SD=standard deviation)

<i>Emotion Recognition Score</i>	<i>English Language Proficiency</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Mean Difference (Equal Variances Assumed)</i>	<i>Standard Error Difference (Equal Variances Assumed)</i>	<i>Significance (2-tailed)</i>																				
Total correct (Faces and Voices)	Native	30	84.77	6.64	7.14	2.32	.003																				
	Non-native	19	77.63	9.59				Negative concepts correct	Native	30	10.07	1.81	2.28	.65	.001	Non-native	19	7.79	2.76	Films task score	Native	30	14.57	2.47	1.3	.78	.102
Negative concepts correct	Native	30	10.07	1.81	2.28	.65	.001																				
	Non-native	19	7.79	2.76				Films task score	Native	30	14.57	2.47	1.3	.78	.102	Non-native	19	13.26	2.94								
Films task score	Native	30	14.57	2.47	1.3	.78	.102																				
	Non-native	19	13.26	2.94																							



On average, therefore, in the general population, native English-speaking individuals are likely to score higher on the Faces and Voices tasks combined and on the negative emotion concepts specifically than non-native English-speaking individuals. However, on average, the two groups are likely to have similar scores on the Films task.

Gender and Psychopathy

A two-tailed independent-samples t-test was conducted to compare the psychopathy scores of females (N=31) and males (N=18). The analysis showed that the female participants had an average psychopathy score of 47.9 (SD=9.09) and the male participants-an average score of 50.83 (SD=7.71). This difference was found not to be significant: $t(47) = 1.15, p = .26 > .05$.

Gender and Emotion Recognition

A two-tailed independent-samples t-test was conducted to compare the emotion recognition performance between the female (21 native, 10 non-native) and the male (9 native, 9 non-native) participants. On the Faces and Voices tasks combined, the female participants (M=83.9, SD=8.26) scored higher, on average, than the male participants (M=78.72, SD=8.32) by 5.18 items (SE=2.45). This difference was marginally significant: $t(47) = 2.11, p = .04 < .05$, Cohen's $d = .64$. On the Films task, however, there was no significant difference between the performance of the females (M=14.19, SD=2.65) and of the males (M=13.83, SD=2.87): $t(47) = .45, p = .66 > .05$.

Summary

Opposite to the prediction, the correlation analysis showed a marginally significant negative relationship between primary psychopathy and the correct recognition of negative emotions. In line with the prediction, secondary psychopathy was significantly negatively correlated with the number of correct items on the Films task although the significance was only marginal. The current study found no significant relationships between primary psychopathy and the correct items on the Films task or between secondary psychopathy and the correctly recognized negative emotion items so hypotheses 3 and 4 were not supported.

None of the correlation coefficients from the preliminary analyses were significant after applying a Bonferroni adjustment for multiple comparisons and after controlling for EQ score. Overall, the correlation analyses had very limited statistical power to detect significant relationships between the variables of interest.

Additionally, natives seemed to perform significantly better on the Faces and Voices tasks than non-natives; however, there were no significant differences in the performance on the Films task. Females seemed to perform better than males on the Faces and Voices tasks but not on the Films task. Male and females did not differ on overall psychopathy rates.

Discussion

The current study investigated dimensional subclinical psychopathy (primary and secondary) in relation to complex emotion recognition in the facial and auditory domains separately (the Faces and Voices tasks) and integrated (the Films task). Differential relationships between the primary and the secondary psychopathy subtypes and emotion recognition for negative emotion concepts and for films were predicted. In particular, it was hypothesised that primary psychopathy would be positively correlated with the number of correctly recognized negative concepts and with the number of correctly recognized items on the Films task (H1 and H2). Conversely, negative correlations were predicted between secondary psychopathy and the correctly recognized negative concepts and between secondary psychopathy and the correct Films items (H3 and H4).

The preliminary, uncorrected analyses demonstrated that, contrary to the prediction (H1), primary psychopathy was *negatively* associated with the ability to recognize negative concepts (mortified, resentful, appalled, grave and so on). This relationship, however, was explained by the variance of the empathy quotient scores. This seems at odds with theoretical reasoning that psychopathy is an evolutionary strategy such that in order for psychopaths to employ their characteristic cheating and manipulative behaviours, they should possess the specified emotional, cognitive and behavioural features (Glenn & Raine, 2009); enhanced emotion recognition, particularly of fear, sadness and anger, might be one such adaptation. The current findings also contradict empirical work showing that higher primary psychopathy scores were associated with better recognition of fearful faces (Del Gaizo & Falkenbach, 2008) and that higher levels of callous-

unemotional traits predicted better performance on the recognition of fearful faces (Woodworth & Waschbusch, 2007). The comparability of the current study with previous work is, however, limited as the current study utilized a wider range of subtle negative emotion concepts that were presented via the more ecologically valid video clips and movie scenes. Studies utilizing emotion stimuli of higher complexity tend to report more performance deficits indicating that task type is likely to be potential mediator for obtained results in the field (Brook, Brieman & Kosson, 2013).

The lack of a stable, significant relationship between primary psychopathy and emotion recognition is concurrent with the only other study that investigated dimensional subclinical psychopathy and the perception of positive, neutral and negative emotions: Ali and Chamorro-Premuzic (2010) found that the psychopathy subtypes were unrelated to emotion recognition for negative concepts but predicted a decreased recognition of neutral and positive emotions. Their study, therefore, is consistent with the failure of the current study to establish significant relationships between primary psychopathy and Films task performance (H2) and between secondary psychopathy and the recognition of negative emotions (H4). Importantly, however, Ali and Chamorro-Premuzic (2010) failed to account for individual differences in self-reported empathy (EQ), which might have resulted in inflated correlations.

In contrast, the current results partially support the prediction for a negative relationship between secondary psychopathy and the performance on the Films task (H2). The findings are inconclusive as the correlation was rendered marginally insignificant when EQ was accounted for. Although statistically unstable, this correlation might be important as it indicates that secondary psychopathy could potentially be associated with dysfunctional perceptual processing of intentionality and social context. Indeed, secondary psychopathy was initially operationalized as aggression, emotional reactivity, social alienation and hostile attribution bias (Karpman, 1948; Hare, 2003). In addition, aetiological investigations have attributed secondary psychopathic traits to adverse early circumstances such as poor parenting predisposing to impaired socialization skills (Blackburn & Maybury, 1985; Levenson et al., 1995; Morrison & Gilbert, 2001).

While theoretical work seems to provide a preliminary explanation of the finding, it remains unclear which aspects of the movie scenes contributed to the participants' processing difficulties. One possibility is that individuals high on secondary psychopathy traits may be impaired in the ability to sustain their attention during the processing of complex, dynamic scenes where the online appraisal of the emotional states of the actors is required. In support of this proposition, Blair and Mitchell's (2009) review summarized behavioural and functional neuroimaging evidence that incarcerated psychopaths have dysfunctional top-down attentional control particularly when having to monitor dynamic stimulus changes and resolve conflict between simultaneously occurring stimuli. It may be that the abnormal attention to socially relevant cues associated with clinical psychopathy underlies emotion recognition deficits (Dadds et al., 2011b). The current investigation failed to identify empirical studies generalizing the attentional dysfunction hypothesis to nonclinical populations. Future work should attempt to differentiate between primary and secondary psychopathy by

employing social context processing paradigms and by manipulating the attentional load of the social scenes.

The quality of the conclusions from the current study is severely compromised by the marginally significant p-values, which were rendered insignificant when correcting for multiple comparisons and when controlling for covariates even when applying a liberal alpha level of .05. Partially attributed to the very small sample size, the insufficient power of the current study may explain the failure to establish stable significant correlation coefficients across the variable pairs of interest. It is imperative that future work increase the sample size to detect relationships of a small magnitude (Wilson et al., 2011). To illustrate, as Dawel et al. (2012) reasoned, to establish an effect size of $r=.100$ in a correlational design, a sample size of 614 is required to obtain a power of .80 (G*Power 3.1.; Faul et al., 2009). Additional methodological problems include the uneven gender ratio (63.3% females) and the inclusion of non-native English speakers (38.8%). Both gender and English language proficiency seem to be confounding factors as females and native speakers were found to perform significantly better on the Faces and Voices tasks than males and non-native speakers respectively. To eliminate potential confounds such as linguistic ability and to increase the generalizability of results, future studies should employ a gender-balanced sample and include native English speakers only.

Overall, the lack of evidence of the adaptive nature of certain psychopathic traits from the current study seems to undermine the validity of the *successful psychopath* concept (Widom, 1978). It must be noted, however, that the current study utilized an undergraduate student sample while the *true* successful psychopaths have been conceptualized as high-achieving individuals, both personally and professionally (DeMatteo et al., 2005). In contrast, Akhtar and colleagues (2013) conducted a more valid investigation of successful psychopaths by recruiting young high-earning professionals and assessing the relationship between psychopathic traits and entrepreneurial success using biographical and self-reported data. Also, to overcome the inherent subjectivity of self-report measures, Curry, Chesters and Viding (2011) employed a prisoner's dilemma paradigm to investigate whether high levels of psychopathic traits would predict more effective and flexible economic decision-making. It may be that successful psychopaths utilize mechanisms other than mindreading to obtain personal benefit at the expense of other individuals including cost-benefit analysis incorporating appraisals of social hierarchies, group demography and situation-specific factors (Bergmueller, Schuerch & Hamilton, 2010). It appears that studies of psychopathy utilizing the emotion recognition paradigm have been conducted under the assumption that the performance on the emotion recognition tasks should be indicative of successful functioning in social settings. However, the manipulative and exploitative behaviours of psychopathic individuals are likely to be the product of complex decision-making that occurs in dynamic contexts. Therefore, attempts should be made to complement self-reported and behavioural measures of empathy functioning with observer ratings of naturalistic behaviours or with behavioural paradigms assessing context-based economic decision-making (Radke, Güroglu & Bruijn, 2012).

At minimum, the findings of the current study demonstrate the potentiality of investigating the heterogeneity of nonclinical psychopathy in relation to complex

emotion recognition particularly considering the dearth of studies of the dimensionality of psychopathy and its implications for affect perception. The current study produced no conclusive evidence that one psychopathy subtype is associated with more or qualitatively distinct affective dysfunction than the other. At the same time, two psychopathy subscales of the LSRP were only weakly correlated, which rendered the use of a global psychopathy measure redundant. Importantly, the process of hypotheses generation of the current study may be criticized for being biased in its selection of evidentiary support. However, given the contradictory results on clinical psychopathy and affect perception and the dearth of studies on subclinical psychopathy, the degree of evidentiary support required for hypotheses generation in the field remains debatable. The current study argues that the results from Del Gaizo and Falkenbach's (2008) study, in addition to the evidence from evolutionary theory, are sufficient justification for the generation of specific, directional predictions about primary and secondary psychopathy.

The second aim of the current study was to validate the CAM (Golan et al., 2006) and the RMFT (Golan et al., 2006) in the study of emotion recognition in relation to psychopathic traits. This was in accordance with Wilson et al.'s (2011) emphasis on the importance to identify procedural differences that could account for the discrepant findings in the field. In particular, the inconsistent findings might be due to the low incremental validity of the commonly utilized Faces test (Baron-Cohen, Wheelwright, & Jolliffe, 1997), Reading the Mind in the Eyes Test revised (RMET, Baron-Cohen et al., 2001) and Reading the Mind in the Voice Test (RMVT, (Golan, Baron-Cohen, Hill, & Rutherford, 2006), which assess a severely restricted range of basic emotion only. The CAM extends extant emotion recognition batteries by the inclusion of a wider range of complex, subtle emotions, particularly in the negative emotion subgroup. It may be that ambiguous and subtle emotions have the highest potential to distinguish between low and high levels of psychopathic traits, especially in nonclinical populations (Levenson et al., 1995; Ali & Chamorro-Premuzic, 2010). The current study is consistent with the predominant focus on negative emotions in the study of nonclinical psychopathy (Dawel et al., 2012).

However, the utility of the CAM remains limited in the study of positive and neutral emotions. This is concerning given the reported recent preliminary evidence that primary psychopathy may be negatively correlated with neutral but not with positive or negative emotion recognition, whereas secondary psychopathy-with positive but not neutral or negative emotion recognition (N=112; Ali & Chamorro-Premuzic, 2010). Also, while psychopathic individuals' ability to read intense or extreme emotions has been thoroughly investigated (Wilson et al., 2011), little focus has been devoted to neutral and ambiguous emotions. In the current study deficits in the perception of positive or neutral, or pervasive emotion recognition deficit cannot be ruled out. Comprehensive categorization in terms of emotion valence is required to increase the validity of the CAM.

The current study argues that the RMFT is the most ecologically valid behavioural measure of complex emotion recognition and mindreading abilities utilized in the field of nonclinical psychopathy to date. The RMFT is both a realistic test tapping into theory of mind abilities (Golan et al., 2006) and a test that allows participants to get emotionally involved and thus produce more valid responses

(Ali, Amorim & Chamorro-Premuzic, 2009). Yet, the current study produced inconclusive evidence that scores on the CAM and the RMFT are predictive of individual differences in psychopathic traits. As this was the first study to utilize those batteries in relation to psychopathy, further assessment of their incremental validity is required.

The other two measures utilized in the current study, the EQ and the LSRP, demonstrate the inherent problems of self-reports including the limited internal validity and generalizability (Rutter, 2005). The problem is particularly salient in the study of psychopathy: as psychopathic individuals tend to have shallow affect and a possible deficit in the understanding of social cues, they should not be capable of reporting their own personality and behavioural tendencies reliably (Rutter, 2005). Thus, further work should investigate the convergence between questionnaire assessment and reports from parents, siblings, peers and teachers (Vasey et al., 2005). While recognizing the inherent limitations of self-reports of psychopathic tendencies, the current study utilized a well-validated psychopathy assessment tool because this method is less time-consuming and more cost-effective compared to alternative assessment methods (observer ratings, physiological assessment), and because it allows for the comparison of the findings with a large body of research on self-reported psychopathy (Ali & Chamorro-Premuzic, 2010; Mahmut et al., 2008; Del Gaizo & Falkenbach, 2008).

Ultimately, given the methodological problems associated with investigating nonclinical psychopathy and affect perception, the utility of the behavioural emotion recognition paradigm requires systematic assessment. The emotion recognition paradigm has produced a large body of evidence about the relationship between psychopathic traits and both pervasive and specific emotion recognition abilities in several modalities (Dawel et al., 2012). While the results from those studies have been inconsistent, partially due to conceptual, methodological, sampling and data analytic variables (Wilson et al., 2011), they may have important implications for neurobehavioural and cognitive research. In particular, if affective deficits in psychopathy are limited to fearful and sad expressions, behavioural results may be indicative of abnormal functioning in the amygdala as this region has frequently been associated with fear recognition, responses to threat and aversive conditioning (Blair, 2003; Calder, Young, Rowland, Perrett, Hodges & Etcoff, 1996). Pervasive affective impairment, on the other hand, has been attributed to abnormal attention to the eyes region (Dadds, Masry, Wimalaweera & Guastella, 2008). Indeed, the eyes are an important socially relevant cue for emotion recognition and resolving ambiguity in expressions (Adolphs, 2010).

However, the traditional emotion recognition studies may not be the optimal paradigmatic approach in the field of psychopathy and affect from at least two perspectives. First, the traditional emotion recognition paradigm is based on the assumption that emotion recognition and the perception of social context can be studied in terms of the individual's response to a predefined set of emotion stimuli. This approach neglects the essentially dynamic nature of social interactions as the mental states and behaviours of the individual are heavily dependent on the changing mental states and behaviours of other agents (Rilling, King-Casas, & Sanfey, 2008). Second, the *perceiving* and the *experiencing* of emotions may be

operated by distinct mechanisms so emotion recognition studies may only partially address affect perception (Wheeler et al., 2009). In support of this distinction, Del Gaizo and Falkenbach (2008) found that the perceptual errors on vocal and facial recognition tasks and the self-reported experiences of positive and negative affect were differentially related to nonclinical primary and secondary psychopathy. Thus, a paradigm shift may be required in order to overcome the inherent conceptual and methodological problems of behavioural emotion recognition studies. Hybrid designs utilizing a combination of interactive social cognition tasks such as neuroeconomic decision-making games (Sharp, 2012), tasks evaluating affective functioning heterogeneously (recognition versus experience) and a physiological marker of affective processing (startle reflex, skin conductance, autonomic activation, Brook, Brieman & Kosson, 2013) are likely to provide valid, reliable and comprehensive assessment of psychopathy and emotion.

Finally, the sampling choice of the current study (noninstitutionalized undergraduate students) was based on the assumption that nonclinical psychopathy represents a less extreme version of clinical psychopathy in that the former has the psychopathic personality component but not the criminal behaviour (antisocial) component of the latter (Hall & Benning, 2006). Another possibility, however, is that clinical psychopaths lack the protective factors such as high socioeconomic status, parental support and high intelligence that prevent nonclinical psychopaths from committing illegal acts. The third possibility is that the personality and the antisocial component of psychopathy are entirely independent and have distinct aetiologies (Hall & Benning, 2006). Future work should compare clinical and subclinical samples and investigate the range of protective factors that distinguishes the two groups. The current study argues that one promising protective factor may be the magnitude and the specificity of affective deficits.

Conclusion

Recognizing the importance of studying the dimensional nature of psychopathy, this study contributed to the dearth of extant work on subclinical (primary and secondary) psychopathy and multimodal emotion recognition. Based on the investigations conducted by Del Gaizo and Falkenbach (2008) and by Ali and Chamorro-Premuzic (2010) and on adaptationist models of psychopathy, the current study predicted differential relationships between the two psychopathy subtypes and the emotion recognition for negative emotions and for films. It also introduced the CAM and the RMFT to psychopathy research arguing for the need of developing instruments with high reliability, ecological validity and discriminant validity. The current study produced preliminary evidence that psychopathic traits might be associated with emotion recognition deficits even in student populations, and that the specificity of those deficits might differ for the primary and secondary subtypes. No evidence was obtained that psychopathy traits can serve an adaptive purpose. Conclusions were, however, limited due to insufficient power, the unstable correlation coefficients, the effect of confounds and the correlational nature of the findings. The results were discussed on statistical, methodological and theoretical grounds.

Above all, this study posits that affect perception is indeed a central component of the psychopathy phenomenon and that further replication is

recommended to disentangle the degree and direction of the influence that emotion exerts on psychopathic traits. In addition to its theoretical and neurological implications discussed above, research into affective processing in subclinical psychopathy has recently been applied to devise therapeutic programmes such as emotion recognition training (Dadds et al., 2012). While clinical trials have just commenced, the application of emotion perception research to the understanding and reduction of violence and offending remains a fascinating prospect.

References

Adolphs, R., (2010). What does the amygdala contribute to social cognition? *Annals of the New York Academy of Sciences* 1191, 42–61

Akhtar, R., Ahmetoglu, G. & Chamorro-Premuzic, T. (2013). Greed is good? Assessing the relationship between entrepreneurship and subclinical psychopathy. *Personality and Individual Differences* 54: 420-425

Ali, F., Amorim, I. S., & Chamorro-Premuzic, T. (2009). Empathy deficits and trait emotional intelligence in psychopathy and Machiavellianism. *Personality and Individual Differences*, 47, 758–762.

Ali, F. & Chamorro-Premuzic, T. (2010). Investigating Theory of Mind deficits in nonclinical psychopathy and Machiavellianism. *Personality and Individual Differences* 49: 169-174

Baron-Cohen, S. (1996). Reading the mind in the face: A cross-cultural and developmental study. *Visual Cognition*, 3(1), 39-60.

Baron-Cohen, S., Jolliffe, T., Mortimore, C., Robertson, M., 1997. Another advanced test of theory of mind: evidence from very high functioning adults with autism or Asperger syndrome. *J. Child. Psychol. Psychiatr.* 38, 813–822

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders*, 34(2), 163-175

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., Plumb, I., (2001a). The “Reading the Mind in the Eyes” test revised version: A study with normal adults, and adults with Asperger Syndrome or high-functioning autism. *J. Child Psychol. Psychiatr.* 42, 241–251

Bechara, A., & Damasio, A. R. (2005). The somatic marker hypothesis: A neural theory of economic decision. *Games and Economic Behaviour*, 52, 336–372

Bergmüller, R., Schürch, R., & Hamilton, I. M. (2010). Evolutionary causes and consequences of consistent individual variation in cooperative behaviour. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1553), 2751-2764.

Birbaumer, N., Viet, R., Lotze, M., Erb, M., Hermann, C., Grodd, W., et al. (2005). Deficient fear conditioning in psychopathy: A functional magnetic resonance imaging study. *Archives of General Psychiatry*, 62(7), 799–805

Blackburn, R. (2009). Subtypes of psychopath. In M. McMurrin and R. Howard (Ed.) *Personality, Personality Disorder and Violence* (pp. 113-133). West Sussex: John Wiley & Sons, Ltd.

Blackburn, R., Logan, C., Donnelly, J. P., & Renwick, S. J. (2008). Identifying psychopathic subtypes: Combining an empirical personality classification of offenders with the psychopathy checklist-revised. *Journal of Personality Disorders*, 22, 604–622

Blackburn, R., & Maybury, C. (1985). Identifying the psychopath: The relation of Cleckley's criteria to the interpersonal domain. *Personality and Individual Differences*, 6, 375–386

Blair, R.J.R., 2003. Neurobiological basis of psychopathy. *The British Journal of Psychiatry: the Journal of Mental Science* 182, 5–7.

Blair RJ, Jones L, Clark F, Smith M. (1997) The psychopathic individual: a lack of responsiveness to distress cues? *Psychophysiology* 34: 192–8

Blair, R. J. R., & Mitchell, D. G. V. (2009). Psychopathy, attention and emotion. *Psychological medicine*, 39(4), 543.

Blair, R. J. R., Mitchell, D. G., Peschardt, K. S., Colledge, E., Leonard, R. A., Shine, J. H., et al. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences*, 37, 1111-1122

Blair, K. S., Richell, R. A., Mitchell, D. G. V., Leonard, A., Morton, J., & Blair, R. J. R. (2006). They know the words, but not the music: Affective and semantic priming in individuals with psychopathy. *Biological Psychology*, 73, 114-123

Bolt DM, Hare RD, Neumann CS. (2007). Score metric equivalence of the Psychopathy Checklist-Revised (PCL-R) across criminal offenders in North America and the United Kingdom. *Assessment* 14:44–56

Book, A., Costello, K. & Camilleri, J.A. (2013). Psychopathy and victim selection: The use of gait as a cue to vulnerability. *Journal of Interpersonal Violence* 28: 2368

Brook, M., Brieman, C. L., & Kosson, D. S. (2013). Emotion processing in Psychopathy Checklist—assessed psychopathy: A review of the literature. *Clinical psychology review*, 33(8), 979-995.

Brüne, M. & Brüne-Cohrs, U. (2006). Theory of mind—evolution, ontogeny, brain mechanisms and psychopathology. *Neuroscience and Biobehavioural Reviews* 30: 437-455

Calder, A.J., Young, A.W., Rowland, D., Perrett, D.I., Hodges, J.R., Etcoff, N.L., (1996). Facial emotion recognition after bilateral amygdala damage: differentially severe impairment of fear. *Cognitive Neuropsychology* 13, 699–745

Cleckley H. (1941). *The Mask of Sanity*. St. Louis, MO: Mosby

Cook, R. Dennis & Weisberg, Sanford (1982); *Residuals and influence in regression*, New York, NY: Chapman & Hall

Cooke DJ, Michie C, Hart SD, Clark D. (2005). Searching for the pan-cultural core of psychopathic personality disorder. *Personal. Individ. Differ.* 39: 283-95

Curry, O., Chesters, M. J., & Viding, E. (2011). The psychopath's dilemma: The effects of psychopathic personality traits in one-shot games. *Personality and Individual Differences, 50*(6), 804-809.

Czibor, A. & Bereczkei, T. (2012). Machiavellian people's success results from monitoring their partners. *Personality and Individual Differences 53*: 202-206

Dadds, M.R., Cauchi, A.J., Wimalaweera, S., Hawes, D.J., Brennan, J., 2012. Outcomes, moderators, and mediators of empathic-emotion recognition training for complex conduct problems in childhood. *Psychiatry Research, 1–8*

Dadds, M.R., Jambrak, J., Pasalich, D., Hawes, D.J., Brennan, J., (2011b). Impaired attention to the eyes of attachment figures and the developmental origins of psychopathy. *Journal of Child Psychology and Psychiatry, and Allied Disciplines 52*, 238–245

Dadds, M.R., El Masry, Y., Wimalaweera, S., Guastella, A.J., (2008). Reduced eye gaze explains fear blindness in childhood psychopathic traits. *Journal of the American Academy of Child and Adolescent Psychiatry 47*, 455–463.

Dawel , A., O’Kearney ,R., McKone, E., and Palermo, R.(2012). Not just fear and sadness: Meta-analytic evidence of pervasive emotion recognition deficits for facial and vocal expressions in psychopathy. *Neurosci. Biobehav. Rev. 36*: 2288–2304.

Del Gaizo, A.L. & Falkenbach, D.M. (2008) Primary and secondary psychopathic-traits and their relationship to perception and experience of emotion. *Personality and Individual Differences 45*: 206-212

DeMatteo, D., Heilbrun, K. & Marczyk, G. (2005). Psychopathy, risk of violence and protective factors in a noninstitutionalized and noncriminal sample. *International Journal of Forensic Mental Health 4 (2)*: 147-157

Fairchild, G., Stobbe, Y., van Goozen, S.H.M., Calder, A.J., Goodyer, I.M. (2010). Facial expression recognition, fear conditioning, and startle modulation in female subjects with conduct disorder. *Biological Psychiatry 68*, 272–279

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160

Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research 20*, 303–315

Forster, K. L., & Forster, J. C. (2003). DMDX: A windows display program with millisecond accuracy. *Behavior Research Methods Instruments & Computers, 35*, 116–124

Forth, A. E., Brown, S. L., Hart, S. D., & Hare, R. D. (1996). The assessment of psychopathy in male and female noncriminals: Reliability and validity. *Personality & Individual Differences, 20*, 531-543

Frank, R. H. (1988). *Passions within reason: The strategic role of emotions*. New York: Norton.

Glass, S., & Newman, J. (2006). Recognition of facial affect in psychopathic offenders. *Journal of Abnormal Psychology, 115*, 815-820

Glenn, A.L. & Raine, A. (2009). Psychopathy and instrumental aggression: evolutionary, biological and legal perspectives. *International Journal of Law and Psychiatry 32: 253-258*

Golan, O., Baron-Cohen, S., & Hill, J. J. (2006a). The Cambridge Mindreading (CAM) Face-Voice Battery: testing complex emotion recognition in adults with and without Asperger Syndrome. *Journal of Autism and Developmental Disorders, 36(2)*, 169-183.

Golan, O., Baron-Cohen, S., Hill, J.J. & Golan, Y. (2006b). The “Reading the Mind in Films” Task: Complex emotion recognition in adults with and without autism spectrum conditions. *Social Neuroscience 1 (2): 111-123*

Gummelt, H. (2010). Successful psychopaths: Investigating the relationship between psychopathy, protective factors and antisocial behaviour. *Electronic Theses, Treatises and Dissertations. Paper 3918*.

Hall, J. R. & Benning, S. D. (2006). The “successful” psychopath. In C. J. Patrick (Ed.), *Handbook of psychopathy* (Pp. 459 – 478). New York, London: Guilford

Hare, R. D. (1991). *Manual for the Revised Psychopathy Checklist* (1st ed.). Toronto, Ontario, Canada: Multi-Health Systems

Hare, R.D. (1993). *Without Conscience: The Disturbing World of the Psychopaths Among us*. New York, NY: Guilford

Hare, R. D. (1996). Psychopathy a clinical construct whose time has come. *Criminal justice and behavior, 23(1)*, 25-54.

Hare, R. D. (2003). *Hare Psychopathy Checklist – Revised 2nd edition, technical manual*. Toronto, Ontario, Canada: Multi-Health Systems

Hare, R. D., & Neumann, C. N. (2006). The PCL-R assessment of psychopathy: Development, structural properties, and new directions. In C. Patrick (Ed.), *Handbook of psychopathy* (pp. 58–88). New York: Guilford

Hare, R. D., & Neumann, C. S. (2008). Psychopathy as a clinical and empirical construct. *Annu. Rev. Clin. Psychol., 4*, 217-246.

Hastings, M.E., Tangney, J.P., Stuewig, J. (2008). Psychopathy and identification of facial expressions of emotion. *Personality and Individual Differences 44*, 1474–1483.

Hicks, B. M., Markon, K. E., Patrick, C. J., Krueger, R. F., & Newman, J. P. (2004). Identifying psychopathy subtypes based on personality structure. *Psychological Assessment, 16*, 276–288

Jarrold, C., Butler, D.W., Cottingham, E.M., Jimenez, F., 2000. Linking theory of mind and central coherence bias in autism and in the general population. *Dev. Psychol.* 36, 126–138

Jolliffe, D., & Farrington, D. P. (2004). Empathy and offending: A systematic review and meta-analysis. *Aggression and Violent Behaviour*, 9, 441–476.

Karpman B (1948): The myth of the psychopathic personality. *Am J Psychiatry* 104: 523–534

Leistico, A. M. R., Salekin, R. T., DeCoster, J., & Rogers, R. (2008). A large-scale meta-analysis relating the Hare measures of psychopathy to antisocial conduct. *Law and human behavior*, 32(1), 28-45.

Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. (1995). Assessing psychopathic attributes in a noninstitutionalized population. *Journal of Personality and Social Psychology*, 68, 151-158

Lilienfeld, S. O. (1994). Conceptual problems in the assessment of psychopathy. *Clinical Psychology Review*, 14(1), 17-38

Lilienfeld, S. O. & Andrews, B. P. (1996). Development and preliminary validation of a self-report measure of psychopathic personality traits in non-criminal populations. *Journal of Personality Assessment*, 66, 488-524

Livesley WJ. (2007). A framework for integrating dimensional and categorical classifications of personality disorder. *J. Personal. Disord.* 21:199–224

Lorenz, A. R., & Newman, J. P. (2002). Deficient response modulation and emotion processing in low-anxious Caucasian psychopathic offenders: Results from a lexical decision task. *Emotion*, 2, 91-104

Lynam DR. (2002). Psychopathy from the perspective of the five-factor model of personality. See Costa & Widiger 2002, pp. 325–48

Lynam DR, Caspi A, Moffitt TE, Loeber R, Stouthamer-Loeber M. (2007). Longitudinal evidence that psychopathy scores in early adolescence predict adult psychopathy. *J. Abnorm. Psychol.* 116:155–65

Lynam, D. R., Whiteside, S., & Jones, S. (1999). Self-reported psychopathy: A validation study. *Journal of Personality Assessment*, 73(1), 110-132

Marsh, A. (2013). What can we learn about emotion by studying psychopathy. *Frontiers in Human Neuroscience* 7: Article 181

Marsh, A.A., and Blair, R.J. (2008). Deficits in facial affect recognition among antisocial populations: a meta-analysis. *Neurosci.Biobehav. Rev.* 32, 454–465.

Mahmut, M. K., Homewood, J., & Stevenson, R. J. (2008). The characteristics of noncriminals with high psychopathy traits: Are they similar to criminal psychopaths? *Journal of Research in Personality*, 42, 679–692.

McHoskey, J. W., Worzel, W., & Szyarto, C. (1998). Machiavellianism and psychopathy. *Journal of Personality and Social Psychology*, 74, 192–210

Mealy L. (1995). The sociobiology of sociopathy: an integrated evolutionary model. *Behav Brain Sci* 18:523–99

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behaviour: a developmental taxonomy. *Psychological review*, 100(4), 674

Monahan, J. (2006). [Comments on cover jacket]. In C. J. Patrick, (ed.), *Handbook of psychopathy*. New York: Guilford Press

Morrison, D., & Gilbert, P. (2001). Social rank, shame and anger in primary and secondary psychopaths. *Journal of Forensic Psychiatry*, 12(2), 330–356.

Mullins-Nelson, J. L., Salekin, R. T., & Leistico, A. M. R. (2006). Psychopathy, Empathy, and Perspective-Taking Ability in a Community Sample: Implications for the Successful Psychopath. *International Journal of Forensic Mental Health*, 5, 133 – 149

Nathans, L. L., Oswald, F. L., & Nimon, K. (2012). Interpreting multiple linear regression: A guidebook of variable importance. *Practical Assessment, Research & Evaluation*, 17(9), 2.

Neumann CS, Hare RD and Newman JP. (2007). The superordinate nature of the Psychopathy Checklist-Revised. *J. Personal. Disord.* 21:102–7

Olver, M. E., & Wong, S. C. (2009). Therapeutic responses of psychopathic sexual offenders: treatment attrition, therapeutic change, and long-term recidivism. *Journal of consulting and clinical psychology*, 77(2), 328

Osumi, T., & Ohira, H. (2010). The positive side of psychopathy: Emotional detachment in psychopathy and rational decision-making in the ultimatum game. *Personality and individual differences*, 49(5), 451-456

Perkins, D.O., Wyatt, R.J., Bartko, J.J., (2000). Penny-wise and pound-foolish: the impact of measurement error on sample size requirements in clinical trials. *Biological Psychiatry* 47, 762–766

Radke, S., Güroğlu, B., & de Bruijn, E. R. (2012). There's something about a fair split: intentionality moderates context-based fairness considerations in social decision-making. *PloS one*, 7(2), e31491

Rilling, J. K., King-Casas, B., & Sanfey, A. G. (2008). The neurobiology of social decision-making. *Current Opinion in Neurobiology*, 18, 159–165

Ross, S.R., Benning, S.D., Patrick, C.J., Thompson, A. & Thurston, A. (2009). Factors of the Psychopathic Personality Inventory: Criterion-related validity and relationship to the BIS/BAS and Five-factor models of personality. *Assessment* 16: 71

Ross, S. R., & Rausch, M. K. (2001). Psychopathic attributes and achievement disposition in a college sample. *Personality & Individual Differences*, 30, 471-480

Rutherford, M. D., Baron-Cohen, S., & Wheelwright, S. (2002). Reading the mind in the voice: A study with normal adults and adults with Asperger syndrome

and high functioning autism. *Journal of Autism and Developmental Disorders*, 32(3), 189-194.

Rutter, M. (2005). Commentary: What is the meaning and utility of the psychopathic concept? *Journal of Abnormal Child Psychology* 33 (4): 499-503

Rutter, M. (2012). Psychopathy in childhood: is it a meaningful diagnosis? *Br. J. Psychiatry* 200, 175–176

Salekin, R. T., Neumann, C. S., Leistico, A. M., & Zalot, A. A. (2004). Psychopathy in youth and intelligence: An investigation of Cleckley's hypothesis. *Journal of Clinical Child and Adolescent Psychology*, 33, 731–742

Shamay-Tsoory, S.G., Tomer, R., Berger, B.D., Goldsher, D., Aharon-Peretz, J., (2005). Impaired “affective theory of mind” is associated with right ventromedial prefrontal damage. *Cogn. Behav. Neurol.* 18, 55–67

Sharp, C. (2012). The use of neuroeconomic games to examine social decision making in child and adolescent externalizing disorder. *Current Directions in Psychological Science*, 21(3), 183–188

Skilling, T. A., Quinsey, V. L., & Craig, W. M. (2001). Evidence of a taxon underlying serious antisocial behaviour in boys. *Criminal Justice & Behaviour*, 28, 450-470

Smith, S.T., Edens, J. F. & McDermott, B.E. (2013). Fearless dominance and self-centred impulsivity interact to predict predatory aggression among forensic psychiatric inpatients. *International Journal of Forensic Mental Health* 12 (1): 33-41

Strauss, M. E. (2001). Demonstrating specific cognitive deficits: A psychometric perspective. *Journal of Abnormal Psychology*, 110(1), 6–14.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics (5th ed.)*. Boston, MA: Pearson Education

Trevethan, S. D., & Walker, L. J. (1989). Hypothetical versus real-life moral reasoning among psychopathic and delinquent youth. *Development & Psychopathology*, 1, 91-103

Troisi, A. (2005). The concept of alternative strategies and its relevance to psychiatry and clinical psychology. *Neuroscience & Biobehavioral Reviews*, 29(1), 159-168

Vasey, M. W., Kotov, R., Frick, P. J., & Loney, B. R. (2005). The latent structure of psychopathy in youth: A taxometric investigation. *Journal of Abnormal Child Psychology*, 33, 411–429

Walters, G. D., Brinkley, C. A., Magaletta, P. R., & Diamond, P. M. (2008). Taxometric analysis of the Levenson self-report psychopathy scale. *Journal of Personality Assessment*, 90(5), 491-498.

Wheeler, S., Book, A. & Costello, K. (2009). Psychopathic traits and perceptions of victim vulnerability. *Criminal Justice and Behaviour* 36: 635

Widom, C. S. (1978). A methodology for studying non-institutionalized psychopaths. *Journal of Counseling and Clinical Psychology, 45*, 674–683

Wilson, K., Juodis, M., and Porter, S. (2011). Fear and loathing in psychopaths: A meta-analytic investigation of the facial affect recognition deficit. *Crim.Just.Behav. 38*, 659–668

Woodworth, M., & Porter, S. (2002). In cold blood: Characteristics of criminal homicides as a function of psychopathy. *Journal of Abnormal Psychology, 111*(3), 436–445

Woodworth, M. and Waschbusch, D. (2008). Emotional processing in children with conduct problems and callous/unemotional traits. *Child: Care, Health and Development 34*, 234–244