

CHILDHOOD MALTREATMENT PREDICTS EI AND TOM

Prediction of Emotional Intelligence and Theory of Mind in Adults who have
Experienced Childhood Maltreatment

by

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Abstract

Impairments in aspects of social cognition have been found in children who have experienced maltreatment; however, the long-term impact of childhood maltreatment on social cognition is less well understood. This study examined areas of social cognition that may be associated with poor psychological, social, and emotional outcomes in adults who have experienced intra-familial childhood maltreatment. In a sample of university students ($N = 68$), childhood maltreatment was associated with social cognitive impairment in two models of emotional intelligence (EI), trait EI and ability EI, and advanced theory of mind (ToM). Higher frequency and severity of specific subtypes of childhood maltreatment predicted lower trait EI, ability EI, and ToM. In particular, neglect predicted lower ToM and ability EI scores. Psychological abuse alone predicted lower trait EI while physical abuse was not a significant predictor for any of the social-cognitive variables. Further, the data showed maternal vs. paternal maltreatment predicted specific social cognitive outcomes. Understanding the relationship between social cognitive deficits and intra-familial maltreatment may guide clinical and community assessment and treatment approaches, as well as provide information on the pervasive and continuing impact of childhood maltreatment.

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Dedication

I dedicate this thesis to my wonderful partner Kristina. I am forever thankful for her insight and unflagging encouragement and support.

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Background and Context

An important outcome in adulthood is the ability to successfully develop and maintain relationships. Challenges in navigating relationships act as barriers that can impact many areas in life. From work life to social role obligations, friendships, and romantic partnerships, relationships underpin all facets of life. Unfortunately, interpersonal difficulties are one area, among many, that may be profoundly affected in adults who were abused or neglected as children by their parents (Briere, Godbout, & Runtz, 2012; Briere & Jordan, 2009; Colman & Widom, 2004; DiLillo et al., 2009; Fraley & Shaver, 2000).

Childhood maltreatment has been linked to wide ranging biological, cognitive, emotional, behavioural, and societal consequences including neurological structural changes in areas of the brain used in social-emotional processing (Anda et al., 2006), cognitive and academic impairment in adolescents (Mills et al., 2011), anti-social behaviour (Jaffee, Caspi, Moffit, & Taylor, 2004) and emotional understanding deficits (Perlman, Kalish, & Pollak, 2008). Overall, research indicates a history of childhood maltreatment is clearly associated with impaired functioning in childhood and adverse psychological, social, and overall developmental outcomes (D'Andrea, Ford, Stolbach, Spinazzola, & Van der Kolk, 2012; Oswald, Heil, & Goldbeck, 2010; Van der Kolk, Roth, Pelcovitz, Sunday, & Spinazzola, 2005). Many of the effects of childhood abuse occur across multiple life areas and extend into adulthood (Irish, Kobayashi, & Delahanty, 2010; Nanni, Uher, & Danese, 2012). For instance, a history of childhood maltreatment is associated with an increased prevalence among adults of depression, anxiety, substance abuse disorders, health risk behaviours, health status, diseases (e.g., cardiovascular disease) (Felitti et al., 1998; Scott, McLaughlin, Smith, & Ellis, 2012; Wegman & Stetler, 2009), and intimate relationship disruption (Colman & Widom, 2004; DiLillo et al., 2009). Evidently, a history of

childhood maltreatment can have a significant negative impact on multiple aspects of development across the lifespan, including social and emotional competencies.

Children learn how to navigate their social worlds through interacting with peers and other members of their school and community in everyday environments (Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011). In addition, the familial environment plays a large role in the development of social and emotional skills (Reiss et al., 1995). The failure to provide beneficial relational opportunities impedes the facilitation of typical cognitive, socioemotional, and neurobiological development, and is a commonly noted characteristic of maltreating families (Cicchetti & Toth, 2005; Luke & Banerjee, 2013; Shaffer, Yates, & Egeland, 2009). Parenting practices in these contexts tend to be harsh and inconsistent, which provides less opportunity for optimal social emotional development (Bailey, Hill, Oesterle, & Hawkins, 2010; Kawabata, Alink, Tseng, Ijzendoorn, & Crick, 2011; Reiss et al., 1995). These parenting practices result in a "pathogenic relational environment" (Cicchetti and Toth, 2005, p. 414) within maltreating families that increases risk and is in sharp contrast to the adaptive environment provided by healthy families (Cicchetti and Toth, 2005). Maltreating families interact and model relationships in ways that may hinder social and emotional development, which underpins healthy social interactions. Therefore, the lack of provision of an adaptive environment in maltreating families appears to have an additive role to the negative effect of the maltreatment itself on social and emotional development.

Previous research on maltreatment and social and emotional development has centred primarily on the role of a phenomenon called attachment, seen as the emotional bond between parent and child. Infant-caregiver attachment relates to long-term outcomes in self-reliance, emotional regulation, and social competence with peers (Sroufe, 2005). Poor attachment in

childhood, the perception of the caregiver as unreliable and unresponsive, can have a long lasting effect on relationships throughout the lifespan (Fraley, Roisman, Booth-LaForce, Owen, & Holland, 2013; Roisman, Collins, Sroufe, & Egeland, 2005). While attachment-based approaches predominate the literature on childhood maltreatment, alternative and emerging approaches hold promise to provide additional information on social processes and development that may be informed by subsequent experiences beyond infancy and may not be captured via the attachment paradigm. Consequently, it may be useful to consider the processes and characteristics related to optimal social functioning through a social cognitive perspective.

Social cognition is a broad construct that is commonly viewed as how we reason about, comprehend, or process our social and emotional world and is thought to be a core component of human interaction (Carpendale & Lewis, 2004). From a clinical perspective, impairments in social and emotional function, such as difficulty interpreting, understanding, and responding to others, impact everyday interactions, may affect quality of life and other important adaptive outcomes (McKown, Gumbiner, Russo, & Lipton, 2009), and are a central component of establishing and maintaining relationships. In view of the maladaptive relational characteristics of maltreating families it is valuable to explore the influence of intra-familial childhood maltreatment on social and emotional information processing (or social cognition), as limited research exists on the long-term developmental impacts in this area. Constructs such as emotional intelligence (EI) and theory of mind (ToM) reflect aspects of social cognition that relate to social outcomes in both typically and non-typically developing individuals (Ferguson & Austin, 2010; Montgomery, Stoesz, & McCrimmon, 2013; Qualter, Barlow, & Stylianou, 2011). The current study used these two constructs as a lens to view the developmental impact of childhood maltreatment in adults.

The current study was conceptualised in light of several general conclusions drawn from the literature review. First, family context sets the stage for social and emotional development by providing or failing to provide opportunities to interact in a safe and healthy environment therefore influencing how we view and relate to others and ourselves. Second, deficits in social cognition have been proposed as a mechanism that may, in part, explain difficulties in social interactions. Therefore, the environment of a maltreating family limits opportunities for the optimal development of interpersonal skills. Accordingly, childhood maltreatment is associated with long-term social emotional problems (Maguire et al., 2015; Nanni et al., 2012). Based on this foundation, the current study explores the question of whether childhood maltreatment experiences predict social cognition in adults. Further, some social cognitive oriented interventions have been shown to improve social and emotional functioning (Durlak et al., 2011). An examination of ToM and EI in adults maltreated by their parents in early life has potential for understanding and ameliorating interpersonal functioning, and may inform providers of interventions to children with similar experiences.

In addition to adopting a social cognitive lens, the developmental perspective is an overarching framework for the present study. The basic premise of a developmental perspective is that psychopathology represents an interaction between person and environment (Cicchetti & Toth, 2005). Although childhood maltreatment increases the likelihood of experiencing psychopathology or atypical developmental outcomes, individuals respond differently to trauma based on the accumulation of risk vs. protective factors in combination with individual differences (Cicchetti & Toth, 2005). The aim is to discover how, why, and what underlies a particular functional difficulty or maladaptation and its subsequent course over time. This information can be used to direct interventions and improve the lives of people who have

experienced adversity (Cicchetti & Toth, 2005; Perry, 2009; Van der Kolk et al., 2005). The goal of the current study was to explore whether adult social cognition, as measured by EI and ToM tests, is affected by maltreatment in childhood. In keeping with the developmental perspective of the importance of person and environment interaction, it was anticipated that due to a maladaptive home environment and parenting practices, ToM and EI would be negatively affected by maltreatment.

Social Cognition

Social cognition is an approach to understanding social reasoning and performance and the cognitive mechanisms and structures involved with processing social and emotional information (Carlston, 2013; Hamilton & Carlston, 2013). Emphasising the individual as the perceiver within the context of a social situation, social cognition is the examination of the mental processes involved with interpersonal perception, memory, attention, and thought (Moskowitz, 2005). An alternative view proposed by Carpendale and Lewis (2004) describes social understanding and understanding of mind (both features of social cognition) as active thinking processes that involve the capacity to recognise and comprehend the emotions, perspectives, and intentions of others. Social understanding and understanding of others thoughts, perceptions, and intentions (i.e., ToM) are developed through social interaction and impact how people relate to the world around them (Carpendale & Lewis, 2004), pointing to the importance of human relationships to social cognition in addition to individual perception.

Social cognition is commonly conceptualised as an umbrella term that encompasses an array of processes underlying social behaviour (Adolphs, 1999; 2009). Social cognition is commonly measured through tests and experiments targeting social understanding, which examine skills such as accurate recognition of facial expressions, appropriately understanding

emotional meaning, awareness of situations that lead to specific emotions, and perspective-taking or ToM related tasks (Luke & Banerjee, 2013). Social cognition has been examined through the social information-processing model (Crick & Dodge, 1994), with the assumption that children respond to social situations based on a confluence of biological capacity, memories, and a series of inputs involving encoding and interpretation of cues, goal selection, response selection, and finally behavioural action. From a social neuroscience perspective, social cognition has generally been investigated through assessing three main areas: emotion recognition (i.e., facial expressions, tone of voice), identifying others intent, beliefs, and desires (referred to as ToM), and social interaction and problem solving (Adolphs, 1999; 2009). Initial arguments for the existence of human social cognitive neural systems emerged from observations of impaired interpersonal abilities related to frontal lobe damage and to autism (Adolphs, 1999). The neural basis of social cognition has been widely researched in the neuropsychological literature. In this context, social and emotional information processing has been examined with reference to four primary networks involving specific brain regions: (a) amygdala network including the amygdala and orbitofrontal brain areas related to threat detection, emotion appraisal, and regulation; (b) mentalising network including the medial prefrontal and superior temporal brain areas involved in mental state attribution; (c) empathy network, including the insula and amygdala brain regions and involved in identification and emotional response to others; and (d) mirror network including the parietal and prefrontal brain areas – neurons that fire when an individual observes and performs an action (see Happé & Frith, 2014). It appears that ToM and many aspects of EI models are reflected in the four areas of neurophysiological activity. As such, evaluating these aspects from a social cognitive perspective (including

examinations of ToM and EI) has the potential to broaden the understanding of the impact of childhood maltreatment.

ToM

ToM is seen as a component of social cognition and is sometimes referred to as mentalising or perspective taking (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Frith, C. & Frith, U., 1999). ToM includes abilities to: perceive that others have thoughts, beliefs, and perceptions that might differ from our own (Premack & Woodruff, 1978), ascribe mental states to self or others (Sedikides & Skowronski, 1995), and reason about mental states to predict and interpret others' behaviour (Astington, 2001; Wellman, Cross, & Watson, 2001). ToM is sometimes seen as a cognitive feature of empathy (Luke & Banerjee, 2013); that is, it involves cognitive reasoning about emotions and emotional experiences. Poor ToM, or difficulty distinguishing that others may hold differing points of view, beliefs, or perceptions from our own, may impede the development of adaptive and meaningful social relationships (Pears & Fisher, 2005).

Development of ToM has been described as a staged progression with understanding simple belief and desire states beginning between ages 3 and 4 years, often tested through False Belief tests (differentiating another's beliefs from reality), and awareness of others' complex mental states or advanced ToM emerging in middle childhood, frequently measured by a test of understanding faux pas (Pears & Fisher, 2005; Wellman et al., 2001). For typically developing children, advanced ToM begins to develop between ages 9 and 11 years and continues to develop throughout adolescence and adulthood (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999). The development of ToM is likely influenced by conversational interactions and use of mental state language in the home, which may reflect parenting style (Benarous, Guilé, Consoli,

& Cohen, 2015) in addition to socioeconomic and/or educational attainment. Children from higher socioeconomic status (SES) families have been found to have higher or more advantaged ToM development, thought to be due to middle and higher SES families engaging in frequent conversational interactions from an early age (Shatz, Diesendruck, Martinez-Beck, & Akar, 2003). Moreover, gender differences have been found in some ToM tasks in adults with women scoring higher than men, potentially linked to verbal IQ scores, but these findings are inconsistent (Vellante et al., 2013). While ToM impairments commonly occur in many clinical groups such as affective and personality disorders (Brüne & Brüne-Cohrs, 2006) and autism (Baron-Cohen et al., 2001), the developmental course of ToM is unclear or unknown in many clinical groups. However, poor social skills or delays in social development are widely proposed to reflect primary deficits in ToM (e.g., Cutting & Dunn, 2006; Dissanayake & Macintosh, 2003) and are commonly referenced as a key component of effective social emotional functioning.

ToM has been defined in various ways; researchers have divided it into two components: social-cognitive ToM, also referred to as social/emotional knowledge, and social-perceptual ToM, which involves the active processing of mental states (Tager-Flusberg & Sullivan, 2000). This division has also been understood to reflect explicit vs. implicit social cognitive tasks. Implicit ToM tasks have been proposed as automatic processes that are involved in the ability, for example, to use faces, voices, or gestures to interpret mental states, also referred to as social-perceptual ToM (i.e., Reading the Mind in the Eyes test; EYES; Baron-Cohen et al., 2001) whereas explicit or conscious ToM tasks involve mental effort, as reflected in social-cognitive ToM (i.e., Faux Pas test; Stone, Baron-Cohen, & Knight, 1998). Both social-perceptual and social-cognitive components of ToM are important for social relationships and can operate relatively independently (Frith, C. & Frith, U., 2008; Hughes & Leekam, 2004). The EYES is a

widely used social-perceptual performance test of ToM designed for adults requiring the inference of mental states from photographs of eyes. This measure has been well established in research and published psychometric information is available (see Method section). Another more recently developed ToM test designed for adults is the Short Story Task (SST; Dodell-Feder, Lincoln, Coulson, & Hooker, 2013). The SST was tested on a small group of participants and was found to be highly correlated with the EYES test (Dodell-Feder et al., 2013). Despite widespread use, criticisms of ToM measures include that they are not sensitive to individual differences, particularly when distinguishing between clinical conditions, and lack defensible standardisation information. This is particularly the case with advanced measures of ToM (Sprung, 2010). Other challenges include a diversity of available measures used across previous research that can make comparison difficult, especially in terms of perspective taking tasks.

EI

EI has been conceptualised as a set of hierarchical competencies considered to enable individuals to identify, process, and regulate their own emotions, or as a set of self-perceptions regarding emotions (Qualter et al., 2011). Generally, EI has been conceptualised as either cognitive, called ability EI, or non-cognitive, called trait EI. Ability EI is thought to consist of the capacities to: (a) process emotional information from self and others, and (b) utilise emotional information to direct behaviour, whereas non-cognitive (trait EI) has been found to relate to motivation, personality traits, temperament, and affect or emotional expression (Roberts, MacCann, Mathews, & Zeidner, 2010). Ability EI and ToM, both performance tests, are moderately correlated, but are generally considered two separate constructs (Ferguson & Austin, 2010). Specifically, ToM involves the specific ability to ascribe mental states to others

whereas ability EI involves a broader approach, including emotional perception and identification as subcomponents of the construct (Ferguson & Austin, 2010).

Ability EI. Ability EI reflects cognitive reasoning with and about emotions through a four-dimensional model that together comprise global EI: Managing Emotions, Understanding Emotions, Utilizing Emotions, and Perceiving Emotions (Mayer et al., 2002). Each dimension characterises a skillset that ranges in difficulty level along a continuum. For example, the skill of perceiving emotions can range from basic emotion recognition (e.g., identify happy or sad faces), to correctly distinguishing more complex emotions and micro-expressions, very brief facial expressions that are a form of non-verbal communication. Ability EI scores vary by age and gender in typical adults, with older individuals scoring slightly higher than younger individuals and women scoring slightly higher than men (Brackett, Rivers, Shiffman, Lerner, & Salovey, 2006; Goldenberg, Matheson, & Mantler, 2006). Considering that ability EI captures many components of the overarching social cognition framework, ability EI holds potential to provide additional information on specific cognitive skills and competencies that may be impaired by childhood maltreatment. Ability EI is generally measured by performance based tests, reflecting that actual performance on social emotional tasks provides important information about strengths and limitations in naturalistic contexts.

A widely used and standardised measure of ability EI is the MSCEIT (Mayer et al., 2002). Another measure of ability EI includes the Multifactor Emotional Intelligence Scale, a predecessor of the MSCEIT, that also measures a four branch model of EI: Perceiving, Assimilating, Managing, and Understanding emotions (MEIS; Mayer et al., 2002). The MEIS is moderately correlated with trait EI (Mayer et al., 2002) whereas there is a low correlation between trait EI and the MSCEIT (Brackett, Rivers, Shiffman, Lerner, & Salovey, 2006).

Trait EI. Trait EI is a primarily non-cognitive combination of personal characteristics and competencies (e.g., stress management, flexibility) associated with adaptive social-emotional competence. Trait EI reflects individuals' self-perceived competence within the social realm in addition to related personal characteristics such as optimism (Ciarrochi, Forgas, & Mayer, 2001) and captures how an individual feels about their performance in social-emotional contexts. Trait EI is generally measured through self-report (Zeidner, Mathews, & Roberts, 2012). The general concept of trait EI predicts adaptive social outcomes (peer relations, social network size) (Austin, Saklofske, & Egan, 2005; Frederickson, Petrides, & Simmonds, 2012), impacts daily functioning, and is associated with mental and physical health (Martins, Ramalho, & Morin, 2010; Schutte, Malouff, Thornsteinson, Bhullar, & Rooke, 2007).

The Bar-On Emotional Quotient Inventory 2.0, a revision of the EQ-i (EQ-i 2.0; Bar-On, 1997, 2004), is a widely used trait EI measure in the literature and is comprised of five composite scales: Self Perception, Self Expression, Interpersonal intelligence, Decision Making, and Stress Management (see Appendix C Table C2 for more detail). Other self-report measures of trait EI described in the literature include the Schutte Emotional Intelligence Scale (SEIS; Schutte et al., 1998), a predecessor to the EQ-i. In an independent analysis, the 33 item SEIS has been found to have a three-factor model whereas the EQ-i is based on a five-factor model (Austin, Saklofske, Huang, & McKenny, 2004). Comparisons of subscales between the SEIS and a brief version of the EQ-i (EQ-i: S; Bar-On, 2002) are between .08 and .71 (Austin et al., 2004), demonstrating very low to medium correlations across scales and suggesting that these measures may be quite different in some respects. Specifically the EQ-i scale item adaptability, which includes the self-perception of personal and interpersonal problem solving, reality testing, and flexibility (same subscale items on the EQ-i 2.0), is not measured by the SEIS. The EQ-i 2.0

is a normed and standardised measure that most broadly covers trait EI and as such is considered to be a comprehensive approach to measuring the construct (Saklofske, Austin, Rohr, & Andrews, 2007).

A number of controversies surrounding EI have been identified in the literature (see MacCann, Joseph, Newman, & Roberts, 2014; Maul, 2012; Mayer, Salovey, & Caruso, 2012). The first controversy is whether ability EI represents a true construct or is a composite of a number of skills related to reasoning and using emotion. Mayer, Caruso, and Salovey (1999) maintain that EI meets the four criteria for a standard intelligence (see Mayer et al., 1999) as it is a group of inter-correlated reasoning tests that are moderately correlated with verbal intelligence. In this way it does not replicate verbal intelligence but demonstrates the role of cognitive processing involved in this model. The second controversy is whether measuring trait EI is actually the measurement of personality traits, because scores on trait EI are correlated with scores for Neuroticism, Extraversion, and Openness to Experience as measured by the NEO Five-Factor Personality Inventory (NEO; Costa & McCrae, 1992). With regard to this criticism, it is important to note that while trait EI has been found to be related to personality, it has also been found to predict distinct outcomes from personality measures (Petrides, Pita, & Kokkinaki, 2007). For example, Trait EI mediates personality traits Neuroticism and Extraversion, as measured by the NEO, and attitude to exercise and health behaviours (regular and frequent exercise) (Saklofske, Austin, Rohr, & Andrews, 2007). Moreover, some have found that trait EI predicts important outcomes such as psychological health (Day, Therrien, & Carroll, 2005) and life satisfaction (Palmer, Donaldson, & Stough, 2002) that are not likewise predicted by personality tests. The third criticism is that the theoretical basis of trait EI needs to be strengthened, specifically to clarify how personality as a latent construct relates to trait EI

(Zeidner, Roberts, & Mathews, 2008). However, the Bar-On model reflects the central components of generally accepted definitions of social-emotional intelligence, namely emotional awareness and expression, relating with and understanding others, flexibility, and ability to solve interpersonal problems, self-motivation, and positive affect (Bar-On, 2006), providing overlap with a widely referenced approach to EI. Both the Bar-On and MSCEIT models were developed and tested through factor analysis (Bar-On, 2006; Mayer, Salovey, & Caruso, 2012), indicating evidence of construct validation. Moreover, EI has been found to underlie adaptive social outcomes (Marquez, Martin, & Brackett, 2006; Martins, Ramalho, & Morin, 2010), predict social outcomes, and provide useful information for intervention design (Montgomery, McCrimmon, Schwean, & Saklofske, 2010), suggesting an acceptable "consequential basis of test validity," (Messick, 1987, p. 17) that is the test meets criteria for potential and actual social utility. Examination of EI in clinical groups generates important information about specific impairments in clinical populations (Cha & Nock, 2009; Eack et al., 2010; Montgomery et al., 2010, 2013).

Clinical implications of EI and ToM. Impairment in EI and ToM has been found in number of diverse clinical groups. For example, deficits in ToM and EI have been found in individuals with autism (ToM and EI; Montgomery et al., 2013); Schizophrenia (EI; Eack et al., 2010), maltreated children in care (ToM; Pears & Fisher, 2005), Borderline Personality Disorder (EI, understanding emotions; Peter et al., 2013) and mild Major Depression symptoms (advanced ToM; Cusi, Nazarov, MacQueen, & McKinnon, 2013). Emerging evidence indicates that treatment approaches targeting either EI or ToM have resulted in improvements in social and emotional function in both clinical and non-clinical populations (e.g., EI in medical students; Fletcher, Leadbetter, Curran & O'Sullivan, 2009; ToM in patients with schizophrenia; Bechi et

al., 2012). Further, in young adults, EI, social adjustment, social intimacy (Khodayarifard, Cheshmenooshi, Nejad, & Farahani, 2012), emotion identification and management (Nelis, Quoidbach, Mikolajczak & Hansenne, 2009) and emotion understanding (Pool & Qualter, 2012) were increased following EI training. Most programs related to social-emotional learning involve teaching content knowledge, role play, modelling, and discussion on practical applications (Durlak et al., 2011). For instance, a small sample of primarily female undergraduate students received EI training, consisting of four weekly sessions of two and a half hours duration involving brief lectures, discussions, readings, and role-plays based on Mayer and Salovey's four-branch model (Nelis et al., 2009). The training resulted in significant improvement of emotion identification and management of self and others' emotions, compared to a control group of undergraduate students (Nelis et al., 2009). The improvement was retained at six months follow-up, with no improvement in control group of undergraduate students during the follow-up period. Nelis et al.'s (2009) findings on increased emotion management scores following intervention were replicated by Pool and Qualter (2012) with an 11 week intervention using a similar yet larger sample. In contrast to Nelis et al. (2009), Pool and Qualter (2012) found improvements in emotion understanding, which they attributed to providing a longer intervention period. Considering the accumulating research for clinical and non-clinical groups, preliminary evidence points to the potential usefulness of EI and ToM interventions for improving emotion skills and social outcomes (Bechi et al., 2012; Durlak et al., 2011; Mathews, Zeidner, & Roberts, 2012).

Childhood Maltreatment

Defining and Measuring Childhood Maltreatment

Historically, child maltreatment definitions emerged with case studies in the 1960s and 70s and progressed to the creation of operational definitions of child maltreatment in the 1980s and early 90s (Herrenkohl, 2005). Three main approaches have guided child maltreatment research definitions and measurement: (a) the medical perspective, defined as visible physical injury to a child, (b) the legal perspective, specifying serious quantifiable harm to the child, and (c) the sociological approach, defined by child protection agency involvement (McGee, Wolfe, Yuen, Wilson, & Carnochan, 1995). A fourth approach to the study of child maltreatment has emerged and involves adolescent and adult retrospective self-report measures of childhood abuse and neglect history (Everson et al., 2008; McGee, et al., 1995; Muller, Thornback, & Bedi, 2012; Runtz, 2002). The most commonly used approaches in the child maltreatment literature are sociological (e.g., Barnett, Manly, & Cicchetti, 1993) and self-report approaches, as these describe maltreatment more broadly than legal or medical approaches.

The sociological approach is often examined through accounts of child abuse verified by child protection agency records (Egeland & Sroufe, 1981; Manly, Cicchetti, & Barnett, 1994). However, epidemiological research indicates a likelihood of substantially higher incidence rates of child abuse and neglect than are reported or investigated (Cicchetti & Toth, 2005; Shaffer, Huston, & Edgeland, 2008; Trocmé, Knole, Fallon, & MacLaurin, 2008), limiting the scope of the sociological approach. Rates of officially verified abuse tend to vary depending on SES and type and severity of abuse, with more severe abuse and lower SES over-represented in verified child protection records (Cicchetti & Toth, 2005; Colman & Widom, 2004; Shaffer et al., 2008; Trocmé et al., 2008). Recent records indicate that in Canada, 36% of investigations of reported maltreatment were verified. Of the verified (substantiated) investigations, 34% represented exposure to intimate partner violence, 34% represented neglect, 20% were exposure to physical

abuse, 9% were emotional maltreatment, and 3% were sexual abuse out of 6,044 substantiated investigations (Public Health Agency of Canada, 2010). Important predictors of child maltreatment substantiation by Canadian child protection authorities include severity of harm, police referral, and parent and housing risk factors (Trocmé et al., 2008). Although the use of objectively validated child maltreatment through child protection agency records minimises subjectivity, a review of the literature highlights that this approach may not include the large proportion of child maltreatment cases not reported or substantiated (Cicchetti & Toth, 2005; Colman & Widom, 2004; Public Health Agency of Canada, 2010; Shaffer et al., 2008; Trocmé et al., 2008). Consequently, using a sample of substantiated child maltreatment generated through these means may reflect characteristics related to the likelihood of coming to the attention of the child protection authorities, rather than actual abuse levels across populations.

As an alternative to the sociological approach, some recently developed approaches are using self-report measurements to describe maltreatment experiences, which may facilitate the inclusion of cases missed by official verification procedures. While the use of self-report enables the inclusion of less severe cases of abuse and/or cases of abuse that went unnoticed by authorities, it is not always possible to verify the self-reports of abuse with an outside source. The potential problems of bias and memory inherent in retrospective studies using this method are clear limitations and have been reviewed at length (Cicchetti & Toth, 2005; McGee et al., 1995).

In the 1990s, the existence of repressed or recovered memories, particularly in reference to sexual abuse, was fiercely debated in the courts, the public domain, and in science. Laboratory studies were conducted which demonstrated that it was possible to establish non-existent memories in non-clinical populations such as college students through images, stories,

and subterfuge (Loftus, 1993), raising the possibility of false memory of abuse. Others contend that it is conceivable for people to not remember their abuse for long periods of time, particularly with respect to very severe abuse (Terr, 1991; Williams, 1994). For example, in a prospective investigation of adult recall of officially documented sexual abuse history, 38% of participants ($N = 129$) had no memory of the abuse. Moreover, women with severe abuse, those who were abused by someone close to them, and those who were young when the abuse first occurred had a greater tendency not to recall it (although forgetting occurred across ages, including when abuse happened after age seven) (Williams, 1994). This suggests that forgetting the experience of having been abused as a child is common. In fact 16% of women who did recall the abuse said that there was a time when they did not recall it (Williams, 1994), which corroborates the literature on trauma, dissociation, and impaired memory of childhood (Anda et al., 2006; Terr, 1991). Earlier investigations have documented that between 28% and 59% of adults who were sexually abused did not remember the abuse at some point in time (Briere & Conte, 1993; Herman & Schatzow, 1987). Retrospective studies may significantly underestimate numbers of women who have experienced sexual abuse, particularly when the abuse was committed by someone close to them or when they were very young. It is unclear how recall of abuse applies to other types of abuse.

Although there are clear limitations with the use of self-report, this method may capture more subtle indicators and specific types of abuse that tend to be under-reported to the judicial and child protection system (Everson et al., 2008). In terms of the validity of self-reports of maltreatment, there is some evidence that self-reports may provide a conservative estimate of childhood maltreatment (McGee et al., 1995; Williams, 1994). An example which points to the reliability of retrospective reports is a large epidemiological study, wherein adult responses to

questions on Adverse Childhood Experiences (ACE) were found to be reliable over a 20 month period (Dube, Williamson, Thompson, Felitti, & Anda, 2004). Both self-report and the sociological approaches to maltreatment measurement "provid[e] a window into the experience and impact of maltreatment" (McGee et al., 1995, p. 247). Evidently, there are compromises with each methodological approach for child maltreatment research. The choice of measurement tool to study maltreatment may depend on the research question as well as practical and ethical limitations.

Despite inherent limitations, both sociological and self-report approaches inform current definitions, where childhood maltreatment is commonly divided into four types:

1. Physical abuse: purposeful corporal injury,
2. Sexual abuse including sexual contact between child and caregiver or adult for gratification or financial gain,
3. Neglect: failure to give basic care and supervision, and
4. Emotional maltreatment involving lack of care or failure to meet a child's basic psychological needs (Cicchetti & Toth, 2005).

The US Department of Health and Human Services (2013) further divides neglect into physical and emotional components. While discrete categories of maltreatment have been established, a high degree of co-occurrence exists in maltreatment experiences (Lau et al., 2002; McGee et al., 1995; Pears et al., 2008), indicating a high probability that an individual will experience more than one type. For example, among children who have experienced abuse and neglect, exposure to multiple types of abuse is common with upwards of 78% (Spinazzola et al., 2005) to 90% (McGee et al., 1995) of maltreated children experiencing multiple forms of interpersonal trauma.

Two ways to examine maltreatment are collectively as a broad category or by evaluating the impact of maltreatment at the subtype level. Examining maltreatment as a broad category has revealed common negative outcomes across types of abuse, (Nanni, Uher, & Danese, 2012; Van der Kolk et al., 2005; Wegman & Stetler, 2009) such as neurological differences (Anda et al., 2005) and intimate relationship difficulties (Colman & Widom, 2004). In addition, specific developmental outcomes can also be associated with individual types of abuse (Litrownik et al., 2005; Pears, Kim, & Fisher, 2008; Shaffer et al., 2009), for example childhood neglect is associated with severe academic and cognitive deficits (Hildyard & Wolfe, 2002) such as lower literacy (reading score) and lower abstract reasoning performance in adolescents (Mills et al., 2011). Psychological abuse and neglect have been associated with negative self-concept and self-perception of poor interpersonal skills (Wright, Crawford, & Castillo, 2009) and subjective perception of interpersonal conflicts in friendships, work or school, and romantic relationships (Messman-Moore & Coates, 2007). Among preschool children involved with child protection followed over a six year period, the specific course of their problem behaviour was predicted by type of maltreatment experienced (Woodruff & Lee, 2011). Membership in what was termed the persistent high problem group (12% of the children) was related to having been sexually abused. Membership in the worsening problem behaviour group (4% of the children) was close to nine times more likely to be neglected children than physically abused children in comparison with the low/normal group (Woodruff & Lee, 2011). Moreover, severity ratings for each type of maltreatment rather than overall maltreatment has been shown to be a better predictor of developmental outcomes such as externalising problem behaviour symptoms and adaptive functioning (daily living skills) (Lau et al., 2005; Litrownik et al., 2005). While there are

negative outcomes associated with maltreatment in general, particular impacts have been noted for specific types of maltreatment.

In consideration of this finding and the understanding that different types of information can be obtained depending on measurement strategies (McGee et al., 1995), it is valuable for researchers to investigate both individual subtypes and combined types of maltreatment.

Examining childhood maltreatment is a complex process and adopting only broad or specific approaches can limit the ability to understand the impact. Consequently, multiple approaches are required to adequately capture the experiences and characteristics of diverse individuals who have a history of childhood maltreatment.

Childhood Maltreatment, Attachment, and Social Support

Despite an accumulation of evidence pointing to problems in social and emotional development stemming from childhood maltreatment, the aetiology and developmental course of the processes underlying interpersonal competence in individuals maltreated in childhood is not entirely clear. One approach commonly used to explore the relationship between maltreatment and life or social outcomes is attachment theory (Bailey, Moran, & Pederson, 2007; Minzenberg, Poole & Vinogradov, 2006; Muller et al., 2012). Attachment based approaches (Ainsworth, 1979; Bowlby, 1969) are commonly used in research aiming to understanding normal and abnormal human development throughout the lifespan (Riggs & Kaminski, 2010). The basis of attachment theory is that infants' perception of their caregiver as dependable and responsive, or unreliable and unresponsive, determines the relationship with self and others over time – a phenomenon called attachment organisation. Adaptive or secure early attachment is associated with forming secure romantic partnerships in adulthood (Fraley et al., 2013; Roisman et al., 2005). Attachment theory also posits that individuals with a childhood maltreatment history may

hold an inaccurate idea of what a typical relationship entails and may have a distorted internal working model of relationships learned in childhood that is carried into adolescence and adulthood (Muller et al., 2012). When children learn at an early age through experiences of childhood intra-familial maltreatment that caregivers are unpredictable, unreliable or unresponsive, children may become anxious and/or avoidant in relationships. This leads to the formation of what is called insecure attachment, thought to continue throughout the lifespan and influence rejection and abandonment sensitivity within relationships (Muller et al., 2012). In a meta-analysis on attachment, fewer secure attachments were found in high-risk families (including maltreatment) than low-risk families (Cyr, Euser, Bakermans-Kranenburg, & Van Ijzendoorn, 2010), indicating the impact of the environment on the ability to form adaptive attachments to caregivers. Maltreated children were less securely attached and had more of a type of insecure attachment referred to as disorganised attachment¹ than other children in high-risk families. However, both maltreated children and children exposed to the highest number of socioeconomic risks (five) were equally likely to have disorganised attachment, demonstrating the damaging influence of both maltreatment and multiple risk factors on attachment (Cyr et al., 2010).

From a developmental perspective, early experiences with parents, including childhood maltreatment, affect not only the ability of the child to form secure bonds, but also continues to have long term impact into adulthood on relationship quality and social support, or having relationships that provide psychological and/or material resources in times of distress (Briere et al., 2012; Briere & Jordan, 2009; Fraley & Shaver, 2000). Childhood maltreatment is associated

¹ Disorganised attachment is considered to be related to unpredictable, insensitive parenting and results in variable (disorganised) responses to comfort seeking from the caregiver. Disorganised attachment is associated with childhood aggressive behaviour (Lyons-Ruth, 1996).

with lower levels of social support and increased stress levels (Muller, Gragtmans, & Baker, 2008; Vranceau, Hobfoll, & Johnson, 2007). Moreover, social support acts as a buffer for experiencing symptoms of childhood trauma in adulthood (Evans et al., 2013) and is important for psychological adjustment (Vranceau et al., 2007) and to modify the risk of depression in maltreated children (Kaufman et al., 2006). Supportive relationships provide resources for managing distressing situations and increasing resilience² or ability to recover or adapt, however, clearly these resources may be less available to people maltreated as children (Vranceau et al., 2007). Impaired social cognition emerging from maladaptive parenting appears to impede the development of social support resources (Nietlisbach & Maerker, 2009), and as such the potential impact on social cognition is central to understanding maltreatment in this context.

Maltreatment and Social Cognition

A number of studies have examined the impact of childhood maltreatment on various aspects of emotion processing, an element of social cognition. In a systematic review and meta-analysis, studies were grouped according to age: early childhood, age two to six years, middle childhood, age seven to eleven years, and adolescence and adulthood, age twelve and up (Luke & Banerjee, 2013). Maltreatment status or higher severity of maltreatment was associated with an inferior performance on emotion skills, defined by three groups: emotion recognition, emotion understanding, and emotion knowledge, a composite of emotion recognition and understanding. Stronger effects were found in the more complex tasks involved in emotion understanding than in more basic tasks such as emotion recognition, likely because understanding the cause of

² The concept of resilience when applied to survivors of childhood maltreatment is controversial, as it has been misused to imply that children are not seriously affected by maltreatment. According to Perry (1995) "children are not resilient, children are malleable" (p.285). How intense, persistent and severe the child's response to trauma (e.g., hyperarousal or dissociation) varies dependent on individual and environmental factors: age, personal history, type of trauma, compounding factors, or available support. When support is available (e.g., the child has an adult such as a healthy caregiver available to them to help them process the adverse experience or early intervention), the response to trauma may be lessened (Perry, 1995).

emotion is a more advanced development task than basic emotional recognition and may be vulnerable to the effects of maltreatment (Luke & Banerjee, 2013). Age was a significant moderator, and as expected, a developmental trend was found with strongest effect sizes in children in their early years, when critical social cognitive skills are learned. There were significant differences between children and adolescents/adults but not between children in early vs. middle years. However, only two studies of the 19 studies included in the meta-analysis³ were in the adolescent and adult cluster (i.e., Leist & Dadds, 2009; Pajer, Leininger, & Gardner, 2010) (discussed below), limiting the ability to draw conclusions about older age groups. Additionally, the meta-analysis involved an amalgamation of diverse test stimuli and participants across studies, limiting the ability to generalise results. Despite the above noted limitations, Luke and Banerjee (2013) found an association between childhood maltreatment and impaired emotion skills with medium to large effect sizes.

Childhood maltreatment and emotion recognition. Maltreatment status has been found to impact the ability to recognise the emotions of others (Pajer et al., 2010; Pollak, Cicchetti, Hornung, & Reed, 2000; Shenk, Putnam, & Noll, 2013). For example, in a task requiring the individual to identify differences between emotions by matching images of emotional expressions to vignettes, neglected children had the greatest difficulty in identifying emotions and identified fewer differences between emotions. Alternatively, physically abused children were less accurate at recognising emotions such as sadness than non-maltreated children but had no difficulty recognising angry expressions (Pollak et al., 2000), likely because detection of threat may be an adaptive skill for those who have been physically abused. Similarly,

³ Meta-analysis exclusion criteria: Did not compare maltreatment status or severity, non-empirical study, did not report on behavioural outcomes (e.g., emotion recognition task), did not include statistical information to permit calculation of effect size. (Studies that met the other criteria but for which effect size could not be calculated were excluded from the meta-analysis but included in the systematic review.) (Luke & Banerjee, 2013)

Fishbein et al. (2009) found that neglected children but not physically abused children had greater difficulty with recognition of the basic six emotions from static faces. Further, a history of childhood maltreatment has been found to be associated with lower accuracy in fear recognition in female adolescents (Pajer et al., 2010; Shenk et al., 2013). Alternatively, Shenk et al. (2013) found significant impairment in emotion recognition only among maltreated female adolescents. Conversely, intellectual function was not associated with emotion recognition in the non-maltreated participants (Shenk et al., 2013). However, information on the range of IQ scores was not provided in this study, making it difficult to ascertain if severe intellectual difficulties were present, which would undoubtedly make the picture more complicated. In contrast to Pajer et al. (2010) and Shenk et al. (2013), childhood maltreatment (measured as lifetime prevalence of neglect, emotional abuse, and physical abuse combined) has been associated with better recognition accuracy of negative emotions, such as an improvement in the ability to recognise fear and sadness in still photographs (Leist & Dadds, 2009) and specifically physical abuse with greater real time anger recognition accuracy (Shackman & Pollak, 2005). Further, children and adults who experienced maltreatment in childhood displayed hypersensitivity to and increased attention towards pictures of angry faces versus happy and sad faces (Gibb, Schofield, and Coles, 2008; Shackman & Pollak, 2014), which is not surprising given their experiences of maltreatment and the need to be more vigilant for negative emotions in order to stay safe. Overall, childhood maltreatment experiences are associated with poorer or altered emotion recognition abilities that may depend on both type of maltreatment and type of emotion. Neglected children appear to have greater difficulty with emotion recognition than other maltreatment subtypes, likely indicating that a lack of parental interaction and support may be particularly damaging in the development of adaptive emotion recognition skills.

Further support for the finding that maltreated individuals have underlying differences in social cognition has been provided from the imaging literature that examines various brain regions implicated in social interactions. Social cognition has been investigated through functional magnetic resonance imaging (fMRI) studies of brain regions associated with the amygdala and ventrolateral prefrontal cortex⁴ during observation and emotion recognition tasks of fearful and angry facial expressions. Individuals with maltreatment histories demonstrated differing brain activation patterns in response to emotional stimuli compared to those with no maltreatment history (Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006). More specifically, young adults exposed to an adverse family environment in childhood (risky families) had opposite fMRI brain activation patterns compared to those who were not exposed to an adverse environment. When adults from 'risky' families observed fearful and angry faces they showed little left amygdala activation, but when asked to label fearful and angry faces they experienced increased activation of the left amygdala and right ventrolateral prefrontal cortex. Adults from healthy families showed the opposite pattern, in keeping with typical neural emotion regulation. Taking into account the role of the amygdala in threat detection, the authors concluded that threat detection and emotional regulation appears to be altered at the neural level in adults with adverse childhood experiences (Taylor et al., 2006).

Consistent with the finding that differing neural patterns develop for maltreated children (Taylor et al., 2006), an association between childhood maltreatment experiences in adults and significant hyper-responsiveness in the amygdala was demonstrated when adults were asked to label angry and fearful faces (Dannlowski et al., 2012). Additionally, lower hippocampal

⁴ The amygdala is involved with threat detection while the ventrolateral prefrontal cortex regulates responses to threat. In adaptive emotion regulation, the ventrolateral prefrontal cortex is activated and amygdala activation is reduced (Taylor, et al., 2006).

volume was noted in adults with a history of childhood maltreatment (Dannowski et al., 2012). Because the hippocampus is involved with memory formation and is part of the limbic system, this suggests widespread cognitive issues that may impede social cognition. With reference to social cognition specifically, brain imaging studies provide evidence of a structural and functional neurological basis in atypical reactions to displays of fear and anger in people who have experienced maltreatment.

Comparative research, social affiliative behaviour, and maltreatment. A

comparative approach of nonhuman and human animal research on adversity, social affiliative (bonding) behaviour and the mechanisms that support it may increase our understanding of childhood maltreatment and social cognition. Experimental research involving rodents and primates support a causal relationship between early maltreatment and negative neurobiological and behavioural outcomes (Francis, Diorio, Liu, & Meaney, 1999; Maestriperi et al., 2006; Meaney, 2001; Sánchez et al., 2007). Maltreatment has been observed in nonhuman primates and subsequent developmental outcomes are similar to those found in humans (Pollak, 2008). For example, randomly assigned female rhesus macaques raised by their biological mothers and same aged rhesus macaques who were crossfostered (raised by non-biological surrogate mothers) were observed for the first six months of life, followed by between 12 and 24 months, along with the behaviour of their mothers (Maestriperi, McCormack, Lindell, Higley, & Sánchez, 2006). Cerebrospinal fluid (CSF) monoamine metabolite was measured in the infant monkeys. Both crossfostered and non crossfostered monkeys who were highly rejected by their mothers (prevention of contact, pushing infant away) in the first six months showed more solitary play and lower CSF monoamine 5-HIAA concentrations, a breakdown product of serotonin, compared to monkeys who experience low amounts of maternal rejection. Lower 5-HIAA

concentrations were associated with more scratching behaviour at two years, a consistent indication of anxiety in rhesus monkeys. The results suggest that in young monkeys, CSF monoamine metabolite levels contribute to anxiety and social behaviour differences and maternal rejection behaviour in early life affects the development of the monoamine system in the brain, specifically serotonin (Maestriperi et al., 2006). Further, in rodent and primate studies, early life deprivation from maternal care is related to adverse hypothalamus-pituitary-adrenal (HPA) axis function (review: McCrory, Brito, & Viding, 2010) including chronic HPA axis hyper-responsiveness (Koch, McCormack, Sánchez, & Maestriperi, 2014; Sánchez, Ladd, & Plotsky, 2001). In human and nonhuman animals (rats, squirrel monkeys) the HPA axis stress response is reduced through social stimuli such as the presence of a caregiver (Hostinar, Sullivan, & Gunnar, 2014). Together, imaging studies and empirical studies involving human and nonhuman animals point to a relationship between a history of early life maltreatment and altered neurodevelopment, stress response, and social behaviour compared to non-maltreated groups, indicating robust findings for the negative impact of maltreatment on early development, regardless of species.

Social behaviours are regulated by the release of neuropeptides oxytocin and vasopressin, which affect affiliative behaviour (the desire to bond with others) and social cognition (review: Stoesz, Hare, & Snow, 2013). For example, zebra finches are generally life-long pair bonding and live within larger groups, similar to humans, and are useful for observing comparative affiliative behaviour (Goodson, Kelly, & Kingsbury, 2012). After having been administered an oxytocin blocking agent, the preference for same-sex members of the same species decreased (Goodson et al., 2012). In infant mammals, oxytocin and opioid levels are reduced when the infants are separated from caregivers (Stoesz et al., 2013). Effects of separation in neglected

children may become chronic, for example the oxytocin level of children who were neglected in early life did not rise after reunion with their mother, in contrast to non-neglected children raised with their families who were reunited with their mother (Fries, Ziegler, Kurian, Jacoris, & Pollak, 2005). In relation to bonding and social affiliation, maternal oxytocin, level of genetic risk and early caregiving are significantly related to a child's oxytocin level, predicting parent-child and social peer reciprocity three years later (Feldman, Gordon, Influx, Gutbir, & Ebstein, 2013). Paternal genes, hormone level, and caregiving were not directly associated with their child's oxytocin level and reciprocity, but were an indirect influence through a bi-directional association with maternal genes, oxytocin, and caregiving (Feldman et al., 2013). More recently, there is some evidence that brains of fathers (as well as mothers) are malleable and adapt through the experience of being a primary caregiver, a role traditionally held by mothers, in areas of the brain associated with oxytocin (Abraham et al., 2014), pointing to an inter-relationship between hormones, brain patterns, and behaviour.

Findings in nonhuman animals have led to potential intervention approaches to improve social cognition that acknowledge brain-based process impairments and include oxytocin and peer involvement. In humans, administration of intranasal oxytocin has lowered fear, anxiety, and amygdala activation and has increased social cognitive competencies (Stoesz et al., 2013). For example, intranasal administration of oxytocin in human males coupled with social support has reduced HPA stress response (Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003) and has improved components of social cognition (eye contact, social memory, use of social information) in adolescents with autism, although the effects may not be long lasting (Guastella et al., 2010). Another possible intervention for treating the effects of early deprivation that has been tested with primates (Harlow & Suomi, 1971) is the use of healthy peer 'therapists' with children to help

mitigate some of the effects of parental deprivation (Feldman et al., 2013). In Feldman et al.'s (2013) study parental oxytocin was found to interact with the early caregiving environment to influence a child's social reciprocity with their peers. Oxytocin influences affiliative behaviour and is activated by relationships, including peer relationships, in accordance with attachment theory (Feldman et al., 2013). In summary, comparative studies examining adverse early experiences point to the likelihood of a gene by environment interaction that affects neuropeptide production such as oxytocin and subsequent social behaviour. This information may be useful to help foster social competency and beneficial social interactions.

Maltreatment and ToM. Although a number of studies have examined emotion recognition in maltreated individuals (see Luke & Banerjee, 2013), fewer have examined the potential relationship between impaired cognitive ToM (attributions and beliefs) and childhood maltreatment (Benarous et al., 2015). Findings with children generally support the relationship between impaired false belief tasks and childhood maltreatment (Benarous et al., 2015; Cicchetti, Rogosch, Maughan, Toth, & Bruce, 2003; Pears & Fisher, 2005). However, with perspective-taking tasks mixed findings are reported. Some studies support the hypothesis that childhood maltreatment experiences are associated with impaired perspective taking (Burack et al., 2006; Ensink et al., 2015; Pears & Fisher, 2005) whereas other studies do not (Walker & Downey, 1990). For instance, children who were sexually abused had compromised mentalising ability compared to a control group matched for age, gender, and socio-demographic status (Ensink et al., 2015). In terms of the latter, after controlling for age, gender, IQ, and parent psychopathology, Walker and Downey (1990) found no differences between neglected children and controls on a perspective-taking task. However, it is important to note that the control group were the "children of psychiatrically disturbed parents" (Walker & Downey, p. 257) making the

results difficult to interpret in the context of normal development. In another investigation of ToM, maltreated children demonstrated "egocentrism" by assuming that others would tell similar stories despite knowing components have been removed from the story presented to other children, compared to demographically matched peers ($p < .01$) (Barahal, Waterman, & Martin, 1981). The authors concluded that maltreated children maintained egocentric beliefs, although the strength of the relationship diminished somewhat after statistically partialling out IQ ($p < .06$). In a systematic review, Benarous et al. (2015) noted this finding was no longer significant after controlling for IQ, however, it is unclear the precise level of significance that Barahal et al. (1981) used to interpret their results.

An association between maternal influence on ToM development in children and adolescents is supported by numerous researchers (e.g., Fonagy, Redfern, & Charman, 1997; Laranjo, Bernier, Meins, & Carlson, 2014; Ruffman, Slade, & Crowe, 2002; Taumoepeau & Ruffman, 2008). In spite of this, surprisingly few studies have examined the relationship between social cognition and the gender of the parent perpetrator of maltreatment. For example, Burack et al. (2006) found that a sample of children and adolescents maltreated by their mother or by both mother and father (but not father alone) had impaired perspective-taking and egocentrism compared to their non-maltreated peers; maltreatment by father alone was not evaluated or compared. On the other hand, children maltreated by their fathers performed more poorly than those who did not experience maltreatment perpetrated by father on a task of understanding mean and nice social interactions, a naturalistic procedure of emotion interpretation (Ayoub et al., 2006). In summary, the evidence generally indicates that children with a history of abuse have impaired ToM, though there are some contradictory findings that may suggest an opposite conclusion. As noted, the contradictory findings are difficult to interpret given similarities

between maltreated children and a control (i.e., Walker and Downey, 1990) and a lack of statistical information needed to interpret the findings (i.e., Barahal, et al., 1981). Further, comparison of differences between maltreatment subtypes, the impact of maltreating mothers versus fathers, and examination of older ages such as adolescence and adulthood has been limited to this point in time.

Maltreatment and EI. Limited research has examined EI in the context of childhood maltreatment. Cha and Nock (2009) found that ability EI (as measured by the MSCEIT) moderated childhood sexual abuse and suicidal ideation in 12 to 19 year old adolescents with and without suicidal behaviour. That is, for adolescents with low overall EI, sexual abuse history was strongly predictive of suicidal behaviour whereas for adolescents with medium overall EI, childhood sexual abuse history was only weakly predictive of suicidal behaviour. For adolescents with high overall EI, child sexual abuse history was not related to suicidal behaviour suggesting that EI plays a protective role in this context. Associations between trait EI (as measured by the SEIS), ability EI (as measured by the MSCEIT), and environmental factors (family environment and childhood trauma) controlling for temperament have been explored (Gardner, Qualter, & Whiteley, 2011) and indicate that trait EI is moderately correlated with temperament variables (extraversion, orienting sensitivity, and effortful control) and is not significantly associated with family environment or trauma. Consequently, the authors concluded that childhood trauma likely has little relevance for EI as it is currently measured. However, Gardner et al.'s (2011) study is limited by the measure used (SEIS), which is considered a less comprehensive approach to trait EI than the EQ-i 2.0 (Austin et al., 2004). In summary, research on the relationship between EI and a history of maltreatment has been very

limited, with inconsistent findings. Given the preliminary nature of existing research, it is warranted to examine this further with both ability and trait models.

Summary

A history of childhood maltreatment is associated with increased risk factors across the lifespan (see Anda et al., 2006; Nanni et al., 2012). While the negative impact of childhood maltreatment is clear, specific mechanisms that may relate to interpersonal skills and outcomes are not as well documented. Traditional approaches using attachment and social support models offer lenses with which to view childhood maltreatment; moreover emerging frameworks, such as social cognition and its subcomponents, may extend our understanding of specific processes and characteristics affected by maltreatment to add to the existing knowledge base.

While there are a number of studies that examine basic emotion identification with maltreated children, research on more complex aspects of social cognition involving social and emotional processing and research with adults or adolescents with a history of childhood maltreatment is more limited. Brain studies and comparative literature provide preliminary validation for the premise that maltreatment creates risk of social cognitive impairment. Exposure to early life maltreatment across species appears to alter structural and functional neurodevelopment in brain areas and processes related to social behaviour (Maestripieri et al., 2006; McCroy et al., 2010) and neurological response to emotional stimuli (Dannlowski et al., 2012; Taylor et al., 2006). By more closely examining the particular processing impairments related to social-emotional functioning within adults who have experienced childhood maltreatment, important insights to inform assessment and/or treatment throughout the lifespan may be provided.

The Present Study

The literature base has provided strong evidence that childhood maltreatment can lead to a number of long term negative behavioural, neurological, health, and societal consequences (Anda et al., 2006; D'Andrea et al., 2012). It was anticipated that the deleterious long term consequences in multiple domains that have been found to be associated with childhood maltreatment, including interpersonal impairment (Briere et al., 2012; Coleman & Widom, 2004; DiLillo et al., 2009) would extend to the area of social cognition. This premise is supported by comparative studies examining brain areas related to social behaviour (Maestriperi et al., 2006), neurological responses to emotional stimuli in humans (Dannowski et al., 2012; Taylor et al., 2006), and literature demonstrating ToM (Ensink et al., 2016; Pears & Fisher, 2005) and emotion understanding (Luke & Banerjee, 2013; Perlman et al., 2008) impairments in maltreated children. However, there are few empirical studies examining the association between childhood maltreatment experiences and social cognition in adults or adolescents. The present study aimed to extend previous findings in childhood maltreatment and social cognition by examining performance-based social cognition and self-reported social cognitive traits and characteristics in a non-clinical adult population. A question of interest was whether specific subtypes of maltreatment uniquely predict variance in ToM and trait and ability EI in adults.

Some previous research has found that neglected children tend to have poorer social competence (Maguire et al., 2015) and worse social information processing than non-neglected children (Keil & Price, 2009). Neglect in childhood fails to provide essential experiences and opportunities needed for socio-emotional functioning (Perry, 2002) and has been found to influence neurobiological responses related to social bonding behaviour and emotion regulation (Fries et al., 2005). The current study extends this research by examining a broad, multi-

dimensional measure of social emotional reasoning, ability EI, in adults. It was expected that experiences of neglect will be associated with impaired social cognitive performance. An association between experiences of neglect and impaired social cognitive performance will be observed if participants with higher levels of childhood neglect have both (a) lower ability EI scores and (b) lower ToM scores. (ToM is discussed below.) It was hypothesised that higher levels of childhood neglect will predict lower ability EI scores in adults.

Impairments in perspective taking (ToM) have been found in children through measuring overall maltreatment (Cicchetti et al., 2003; Burack et al., 2006), but there is limited examination of the association between specific subtypes of childhood maltreatment and ToM or associations of maltreatment and ToM in an adult sample. Some previous research has found relations between experiences of neglect and ToM, for example, Pears and Fisher (2005) found impairments in ToM in young children in foster care, the majority of whom experienced neglect. The current study extends the literature by examining the specific impacts of maltreatment subtypes on ToM in an adult sample. It was hypothesised that higher levels of childhood neglect will predict lower ToM scores.

Childhood psychological abuse has been found to be associated with self-reported social impairments in adults, such as low self-concept and self-perception of low interpersonal skills (Wright et al., 2009). Given the literature on psychological abuse it was anticipated that psychological abuse would uniquely impact self-reported social cognitive traits and characteristics (trait EI), but few studies have investigated the association in adults maltreated as children. It was anticipated that self-perceived social cognitive impairment (traits and characteristics) will be associated with psychological abuse if higher levels of psychological

abuse predict lower self-reported trait EI. Thus it was hypothesised that higher levels of psychological abuse will predict lower self-reported trait EI.

Childhood sexual abuse is associated with a broad range of indicators of psychological distress, health, and social difficulties continuing into adulthood (Dube et al., 2005). Previous research has found that for adolescents with low EI, sexual abuse history predicts suicidal ideation (Cha & Nock, 2009). The current study extends this research by examining the association between ability EI and sexual abuse in adults. An association between experiences of childhood sexual abuse and impaired social cognitive performance will be observed if participants who have experienced sexual abuse have both (a) lower ability EI scores and (b) lower ToM scores. (ToM is discussed below.) It was hypothesised that childhood sexual abuse will predict lower ability EI scores.

As mentioned above, previous research has found an association between childhood maltreatment and perspective taking deficits (ToM). This association has been examined with children who have been sexually abused: Ensink et al. (2016) found impaired mentalising ability (ToM) in sexually abused children. There is limited information on ToM in adults who experienced sexual abuse as children. Given previous findings with children, it was hypothesised that childhood sexual abuse will predict lower ToM scores.

Given the inconsistent findings in the literature with respect to physical abuse (Perlman et al., 2008; Shackman & Pollak, 2005), no predictions regarding the direction of association between physical abuse and social cognition were made. Maternal and paternal maltreatment was examined separately as an exploratory analysis but no specific hypotheses were made given that very few empirical studies have examined differential maternal or paternal maltreatment impacts. Data on age, gender, and two markers of socioeconomic status, parental income and

parental education were entered into the analysis to account for potential influence of demographic factors.

Child abuse prevention and early identification remains imperative. However child maltreatment is frequently undetected by child protection authorities (Trocmé et al., 2008). In light of this unfortunate reality, intervention strategies that may ameliorate the interpersonal lives of children, adolescents, and adults with histories of maltreatment should be considered. Knowledge of an individual's specific areas of impairment gained through assessment could be used by clinicians to individualise interventions. A relationship between high levels of neglect and low ability EI, for example, would suggest that failing to provide constructive relational opportunities by parents in childhood affects broad social-emotional processing skills involved with managing, perceiving, understanding, and utilising emotions that are purported to support successful social functioning. There is some evidence that group delivered programs based on, for example, the Mayer and Salovey four branch model of EI have successfully targeted these deficit areas in adults with resulting improvement in social emotional function (Nelis et al., 2009; Pool & Qualter, 2012). If neglect predicts ToM, this suggests that parental neglect is associated with long term difficulty understanding and differentiating another's perspective, a basic component of the ability to predict and interpret others' behaviour (Astington, 2001; Wellman et al., 2001). Preliminary evidence suggests programs used with clinical groups have resulted in improved ToM and interpersonal skills (Bechi et al., 2012) such as Social Cognition and Interaction Training (SCIT) (Combs et al., 2007). Such programs have potential application for adults with a childhood maltreatment history. In the event that psychological abuse predicts lower trait EI alone, this suggests that self-perception of social-cognitive performance is affected. If this is the case, then interventions should focus on affirming strategies such as improving self-

concept and confidence in one's capacity, assertiveness, and stress management through enhancing adaptive approaches to coping with distress (Mikolajczak, Petrides, & Hurry, 2009). In addition to adding to the literature base on the long term effects of childhood maltreatment, findings from the present study could assist in delineating impacts from specific types of trauma to guide clinicians in selecting and tailoring interventions in order to meet client needs.

The current study aims to contribute to understanding the impacts of childhood maltreatment and may guide potential intervention and assessment strategies in mechanisms implicated in enduring interpersonal difficulties associated with maltreatment. If maltreatment experienced in childhood predicts lower social cognitive performance in adulthood as expected, this suggests the possibility that social cognitive deficits seen in previous studies involving maltreated children may endure into young adulthood. Determining associations between specific types of maltreatment and social cognition can provide information about potential mechanisms through which social cognition is learned and how harmful parenting practices may affect these mechanisms.

Method

Participants

Seventy-two undergraduate students (39 women, 33 men) with a mean age of 22 years ($SD = 2.47$; age range: 19-29 years) were recruited through the Introductory Psychology Participant Pool at the University of Manitoba. All participants received partial course credit upon providing written informed consent. The University of Manitoba Psychology/Sociology Research Ethics Board approved the testing protocol (Appendix A: Protocol #P2014: 087).

Materials

Demographic information was collected on participants' age, gender, year in university, ethnicity, family religion, parental income, parental university, and time in foster care in a questionnaire modified from Muller et al. (2012) (Appendix B Demographic Questionnaire). Parental income was coded from 1 (below 24,000 annual income) to 7 (above 90,000 annual income) as per the ranges listed in Appendix B. Parental education was calculated as the highest education level achieved by either mother or father and was coded as 1 (high school) 2 university or college attendance or Bachelor's degree, 3 MA or professional degree e.g., physician, or 4 Doctorate or PhD. The demographic variables age, gender, parental income, and parental education were included in the multiple regression analyses. Maltreatment variables on the ROME (discussed below) entered into the multiple regression analyses include maltreatment subtypes psychological abuse, physical abuse, and neglect separated by maternal or paternal perpetrator. Sexual Abuse was analysed by t-test (discussed below). Overall maltreatment, a combination of the maltreatment subtypes, was included in the correlational analyses only. Social cognitive variables EYES (ToM), MSCEIT total score (ability EI), and EQi-2 total score (trait EI) were entered into the multiple regression analyses.

Record of maltreatment experiences (ROME). The Record of Maltreatment Experiences (ROME; McGee, Wolfe, & Wilson, 1990) is a measure of childhood maltreatment that was developed within a Canadian context. A strength of the ROME (McGee et al., 1990) is the ability to account for frequency and severity levels of maltreatment. The ROME was designed to measure history of parental child abuse and neglect up to the age of 17 years.

The ROME has two forms: (a) a self-report form, which is used to record subjective experience; and (b) an agency form, which is used to collect information from child protection agency records. The two forms have been used to compare adolescent reports of the frequency

and severity of experiences of familial maltreatment with those found in child protection agency records on the same youth. Compared to official sources, adolescents generally under-rated most maltreatment types. Agreement between official sources and adolescents differed by maltreatment type with the most concordance with sexual abuse, least with neglect (McGee et al., 1995). In the present study, only the self-report ROME was administered. The ROME consists of five subscales: (1) Constructive Parenting Practices (reverse coded for Neglect; 24 items), (2) Psychological Abuse (23 items), (3) Physical Abuse (10 items), (4) Exposure to Family Violence (9 items); and (5) Sexual Abuse (14 items) (McGee et al., 1990). The self-report ROME form consists of 80 items from the subscales presented in a random order. Participants rate the frequency of occurrence for each item on a scale from 0 to 3, with *0 = never occurred*, *1 = rarely occurred*, *2 = sometimes or on several occasions occurred*, and *3 = often or very often occurred* (McGee et al., 1990). Respondents rate their experiences involving the Mother, the Father, and Other People separately.

In terms of the subscales on the ROME, McGee et al. (1995) defines Neglect as depriving basic needs. Mild neglect is described as “lapses in parenting” (p. 249) (e.g., failure to spend time with the child); moderate neglect puts the child at risk for atypical development (e.g., failure to provide stimulation); and severe neglect risks physical harm to the child (e.g., failure to provide medical care). Psychological Abuse is defined as communications that could harm development. Mild psychological abuse is described as “indirect communications that represent lapses in adequate parenting” (McGee et al., 1995, p. 249); moderate psychological abuse is described as “indirect communications about a child’s worth” (p. 249) (e.g., role reversal); and severe psychological abuse is seen as “direct attacks on a child’s sense of self or safety” (p. 249) (e.g., humiliation or threats of life-threatening punishment). Sexual Abuse was defined by the

degree of force and penetration. Mild sexual abuse referred to non-contact abuse (e.g., exposure); moderate sexual abuse was contact without penetration or force; and severe sexual abuse was contact with penetration and/or force. Family Violence was defined as witnessing parental/partner physical violence (i.e., domestic violence). Mild family violence was defined as violence with no contact (e.g., hitting an object); moderate family violence was physical contact unlikely to cause serious physical harm (e.g., slapping); and severe family violence was contact with the potential to cause serious physical harm (e.g., beating partner or use of weapons). Physical Abuse was defined by the extent of violence and risk of injury. Mild physical abuse referred to physical discipline (e.g., intensive spanking); moderate physical abuse was contact without a high risk of fatality (e.g., throwing an object at the child); and severe physical abuse was contact that had the potential to be harmful or dangerous to the child (e.g., beating).

McGee et al. (1995) developed and validated the ROME initially with a sample of 160 adolescents with comparison ratings based on child protection agency files by researchers and social workers (McGee et al., 1995). Test-retest reliability coefficients (Pearson r) using those data were demonstrated as acceptable⁵ for all subtests: .70 (psychological maltreatment), .89 (neglect), .90 (physical abuse), .92 (family violence), and .93 (sexual abuse). Internal consistency scores ranged from .81 to .91 (McGee, personal communication, July 1995 as quoted in Muller et al., 2012). In another study involving undergraduate students ($N = 876$), internal consistency coefficients ranged from .72 to .88 across all subscales scores (Muller et al., 2012). Given this information, the psychometrics on the ROME are considered acceptable (Muller et al., 2012).

⁵ Research scales with alpha coefficients ranging from .70 to .95 are generally considered to have acceptable reliability (Bland & Altman, 1997; Devellis, 2003).

ROME scoring. Each item of the ROME represents a severity level of maltreatment: mild (1), moderate (2), or severe (3) (see McGee et al., 1995). For the present study, scores for each item were calculated by multiplying the frequency of occurrence by the item's corresponding severity rating. These scores were summed to produce the subscale scores (i.e., Neglect, Physical Abuse, Psychological Abuse, Exposure to Family Violence, or Sexual Abuse) and an overall maltreatment score for each parent. If an item was left blank, it was scored as zero. Lower scores indicate less maltreatment during childhood, whereas higher scores indicate more experiences of maltreatment during childhood.

McLewin and Muller (2006) reported that of the 956 young adults surveyed using the ROME, 294 (31%) indicated a history of physical abuse. Muller et al. (2012) reported that of 803 young adults, 17% of those surveyed reported a history of psychological abuse at least once a month; 18% reported exposure to family violence 1-3 times a year and 6% reported family violence 1-2 times a month. The mean frequency rating for physical abuse was 1.3 out of an adapted 5-point Likert scale, with higher ratings indicating greater frequency of maltreatment; the mean frequency for psychological abuse was 2.4; neglect and sexual abuse were not included in the analysis (Muller et al., 2012). In a study of 160 adolescents with open child protection cases, 73% reported physical abuse on the ROME, 72% reported family violence, 88% reported sexual abuse, 81% reported emotional abuse, and 59% reported neglect (McGee et al., 1995). The mean severity rating self-reported by adolescents for physical abuse and psychological abuse (emotional maltreatment) was 1.61; the mean severity rating for neglect was 1.29 out of a maximum rating of 3, indicating mild to moderately severe physical and psychological abuse and neglect.

Reading the Mind in the Eyes test revised (EYES). ToM was measured using the 36-item EYES test (Baron-Cohen et al., 2001). The EYES test purports to be a test of advanced ToM for adults as it moves beyond basic emotion recognition (e.g., happy, sad, angry, fearful) to involve being able to attribute more complex emotional states to facial expressions. The EYES test is considered a measure of implicit (social-perceptual) ToM (Sprung, 2010). For each item, individuals attempt to attribute mental states from photographs of humans showing only the eyes, and then select one of four words describing a mental state. A glossary defining all the words in the EYES test is available to participants to refer to when they are unsure of the meaning of the words. One point is awarded for each correct response; the sum of the correct responses yields the total EYES score (Baron-Cohen et al., 2001). The minimum score is 0 and the maximum score is 36. Low scores indicate difficulty inferring mental states from photographs of eyes, whereas high scores indicate proficiency with this task. In consideration of the lack of standardised ToM tests, the EYES was chosen because published psychometrics are available for this measure.

In one study, the mean total EYES score for a sample of undergraduate students was 24.8 out of a total of 36 ($SD = 4.20$), with women ($M = 25.5, SD = 3.5$) scoring significantly higher than men ($M = 24.1, SD = 4.7$) (Vellante et al., 2013), $p < .05$. The maximal weighted internal consistency reliability was .72 with a test-retest internal consistency coefficient of .83, indicating acceptable reliability. Typical participants who scored low on the Empathy Quotient (a 60-item questionnaire designed to measure empathy in adults; Baron-Cohen & Wheelwright, 2004) also scored low on the EYES test (Vellante et al. 2013), demonstrating evidence for construct validity. The psychometrics available for the EYES suggests that the properties of the measure

are acceptable (Vellante et al. 2013), although information from large-scale norming or standardisation is not available.

EI measures. Information regarding participants' EI was collected using two measures. Trait EI was measured by the EQ-i 2.0 (Bar-On, 2002) and ability EI was measured by the MSCEIT (Mayer et al., 2002). Each of these tests is described below, with details provided in Appendix C Table C1, C2.

EQ-i 2.0. The EQ-i 2.0 is a self-report instrument used to measure trait EI in individuals 16 years of age and older (Bar-On, 2002). The EQ-i 2.0 consists of 133 items in which responses are ranked on a 5-point Likert scale (*1 = Very seldom or not true of me; 5 = Very often true of me*) and requires 30 minutes to complete (Bar-On, 2002). Trait EI for this measure is comprised of five scales: Self Perception, Self Expression, Interpersonal, Decision Making, and Stress Management. Responses for each item are entered into a scoring system on the publishers' websites, which produces standard scores for each composite and subscale ($M = 100$, $SD = 15$). The EQ-i 2.0 provides a verification system where each protocol is scored twice. Scores obtained by using this test have an overall internal consistency coefficient of .97, indicating acceptable scale reliability (Bar-On, 2002). The test-retest reliability of the EQ-i 2.0 scores range from .72 for men ($n = 73$) to .80 for women ($n = 279$) after six months (Bar-On, 2004). No significant differences between men and women's scores were found on EQ-i 2.0 (Brackett & Mayer, 2003). The information provided suggests that the psychometrics properties of the EQ-i 2.0 are acceptable (MacCann, Matthews, Zeidner, & Roberts, 2003). The EQ-i 2.0 was selected because it is a normed and standardised measure that is a comprehensive approach to measuring the construct.

MSCEIT. The MSCEIT is a measure of ability EI that evolved from the Multifactor Emotional Intelligence Scale (MEIS; Mayer, Caruso, & Salovey, 1999), which was designed to measure the ability to reason with emotion-related information (Mayer et al., 2002). The MSCEIT measures overall EI, two domains for EI (i.e., Strategic EI and Experiential EI), and four branches of EI: (a) Understanding Emotion and (b) Managing Emotion [Strategic domain]; (c) Perceiving Emotion, and (d) Facilitating Thoughts [Experiential domain]) (Mayer et al., 2002). The test consists of 141 questions in a multiple-choice response format and requires 30-45 minutes to complete (Mayer et al., 2002). Responses for each item of the MSCEIT are entered into a scoring system on the publishers' websites, which produces standard scores ($M = 100$, $SD = 15$). Low overall EI scores indicate difficulty reasoning with emotion-related information, whereas high scores indicate proficiency with this task. Only the full scale EI score was used in the present study.

The MSCEIT was normed through general consensus of 5,000 people and expert scoring based on a small group of people with expertise on emotions (Mayer et al., 2006). The correlations between consensus and expert scores ranged from .93 to .99 across overall, domain, and branch scores, indicating highly similar results. The norms based on general consensus were used for this study, as they are normed on a larger population, although consensus and expert scoring are nearly identical. The internal consistency for the full-scale global score is .91. The internal consistency for the area scores is as follows: experiential .90, strategic .88. The internal consistency coefficients of the Branch scores were reported as: Perceiving Emotions .91, Facilitating Emotions .79, Understanding Emotions .80, and Managing Emotions .83. The test-retest reliability for the full-scale score over a three week period was reported at $r = .86$ (Brackett & Salovey, 2006), indicating adequate stability. Significant gender differences have been found

on the MSCEIT; characteristically women score higher than men (Brackett & Mayer, 2003). Different norms are available for scoring tests completed by women and men and since gender differences have been identified in previous studies, these norms were used in the present study. The MSCEIT is considered to have acceptable psychometrics (MacCann, Matthews, Zeidner, & Roberts, 2003).

Procedure

The study took place in a quiet laboratory at the University of Manitoba. Participants were tested in a group for some measures but individually for the ROME due to its sensitive nature. The researcher explained the study procedures verbally and additional instructions were provided in text on the tests. Following consent, the participants completed paper-based versions of all the measures – demographic questionnaire, MSCEIT, EQ-i 2.0, EYES, and the ROME – in randomised order. A clinician was available on site in case any participants required emotional support. Graduate students educated in assessment and psychometric theory and undergraduate students trained in the study procedures assisted the researcher in data collection and scoring.

Data Analysis

Data analyses were conducted using SPSS 22. First, correlations between demographic variables, maltreatment, and social cognitive variables were examined using Spearman's Rho with two-tailed significance tests set at $\alpha = .05$ to make a reasonable compromise between type I and type II error (Nickerson, 2000). Next, a set of hierarchical multiple regression analyses was used to examine the association between the maltreatment subtypes and each social cognitive variable, including ToM (measured by the EYES test), trait EI (measured by the EQ-i 2.0), and ability EI (measured by the MSCEIT). The set of analyses was conducted for maternal maltreatment then repeated for paternal maltreatment to understand the respective impact of each

parent. In each hierarchical regression analysis, the demographic variables of age, gender, parental income, and parental education, and the maltreatment variables Neglect, Psychological Abuse, and Physical Abuse subscales were included to determine the significant variables in a step by step entry of the variables in the model. Diagnostic analyses were conducted to develop a model with significant variables and interactions terms only. Significant variables for entry into the diagnostic analyses were selected from the full model based on a) sum of square values, b) R^2 change, and c) p-value in the model⁶. Sensitivity analyses (see Thabane et al., 2013) were conducted by including the individual maltreatment subtypes alone in the hierarchical regression analyses without the demographic variables to determine if findings were robust when fewer variables were included in the analysis. The interactions and diagnostic/sensitivity analyses can be found in Appendix D.

Further analyses were conducted through regression-based path analytic approaches (Hayes, 2009; 2013) to examine potential mediation effects with Bootstrap Bias-corrected confidence intervals (1000 samples) using the PROCESS macro for SPSS (Preacher & Hayes, 2004)⁷.

A series of independent samples *t*-tests were conducted with Bonferroni adjusted alpha levels (set at .05/3) as a preliminary analysis to determine if there were significant differences in the social cognition variables between those who did and did not report experiences of sexual abuse.

⁶ The full model for each of the dependent variables is included in the body of the thesis.

⁷ PROCESS (Preacher & Hayes, 2004) is a computational tool that offers an inferential test for the indirect effect of the independent variable on the outcome variable through the proposed mediator, an alternative to Baron and Kenny's (1986) analytic framework of three conditions necessary to prove mediation.

All participants completed the ROME ($N = 72$). Outliers were identified through the examination of a Box plot and standard deviations as recommended by Aguinis, Gottfredson, and Joo (2013) for single-construct outliers. Across participants, less than 3% of the ROME was incomplete due to missing responses. Four extreme overall scores were very different from the rest of the overall distribution of the ROME; therefore, data from four participants ($SD = 3.4, 3.3, 3.2, 2.8$) were excluded prior to examining the distributions of the ROME subscales. After removal of the four outliers, scores from two ROME scales were non-normally distributed: the Family Violence scale ($Skew_{Mother} = 4.7, Kurtosis_{Mother} = 27.8; Skew_{Father} = 3.5, Kurtosis_{Father} = 14.1$); and the Sexual Abuse scale ($Skew_{Mother} = 7.0, Kurtosis_{Mother} = 52.8; Skew_{Father} = 7.6, Kurtosis_{Father} = 60.3$). The distribution of scores from the family violence subscale ($M_{Mother} = 1.02, SD = 2.59, \text{raw score Range} = 0 - 18.0; M_{Father} = 2.34, SD = 5.06, \text{raw score Range} = 0 - 29.0$) was likely impacted by a high frequency but low severity of incidents. Consequently, scores from the Family Violence scale were not included in the analyses. The distribution of scores from the Sexual Abuse scale was likely impacted by the small number of individuals reporting experiences fitting this category. For this reason, responses reflecting sexual abuse were recoded into categorical variables (i.e., $0 = \text{no abuse}; 1 = \text{abuse}$) as sexual abuse experiences can be reasonably interpreted as fitting into yes or no groups.⁸ People were grouped based on this categorical variable and the social cognition scores were analysed using independent t -tests. In examining the ROME subscales included in the regression analyses

⁸ Dichotomisation of a continuous independent variable is defensible under rare circumstances, such as when the variable is highly skewed, where an answer at the most extreme end of a scale is given by a (continued) sizeable number of participants, and when the distribution can be interpreted as *yes* or *no* groups (MacCallum, Zhang, Preacher, & Rucker, 2002).

(Neglect, Psychological Abuse, Physical Abuse) the residuals were normally distributed (skew and kurtosis $\leq \pm 1.96$) around the predicted scores of the EQ-i 2.0, MSCEIT, and EYES.

While 72 participants completed the testing protocol, after removing outliers, ROME data from 68 participants were included in the analyses. Consequently, the four participants with extreme scores were also removed for all other measures, as they could not be matched with ROME scores. None of the 68 participants remaining in the analyses reported having been in foster care as children; only one of the four participants whose data was not included in the analysis reported a history of foster care. Therefore, foster care was not included as a variable in any of the analyses.

All of the 68 participants in the final sample completed the EYES test. However, two of the 68 participants failed to respond to a significant number of items on the MSCEIT and another failed to complete the EQ-i 2.0, therefore these scores were not included in the respective analyses.

Results

The present study was conducted to examine whether social cognitive impairment and lower self-perception of social cognitive traits and characteristics are observed in adults maltreated as children when accounting for age, gender, and socioeconomic status indicators parental income and parental education. The first set of predictions was that experiences of neglect will be associated with impaired social cognitive performance, observed if participants with higher levels of childhood neglect have both (a) lower ability EI scores and (b) lower ToM scores. It was therefore hypothesised that higher levels of childhood neglect will predict lower ability EI scores in adults. It was also hypothesised that higher levels of childhood neglect will predict lower ToM scores in adults. The second set of predictions was that social cognitive

impairment will be observed in adults sexually abused as children if experiences of childhood sexual abuse predict (a) lower ability EI scores and (b) lower ToM scores. It was hypothesised that childhood sexual abuse will predict lower ability EI scores in adults. It was also hypothesised that childhood sexual abuse will predict lower ToM scores in adults. The third set of predictions was that self-perceived social cognitive impairment (social cognitive traits and characteristics) will be associated with psychological abuse if higher levels of psychological abuse predict lower self-reported trait EI.

First, descriptive statistics are presented with a t-test comparison of published norms with the present sample, followed by correlations of the independent and dependent variables. The hypotheses were addressed through multiple regression analysis. Finally, given the low number of participants who reported childhood sexual abuse, this variable was dichotomised and t-tests were conducted as a preliminary investigation (discussed later in further detail). For correlations and regression, maltreatment subtypes were separated by mother or father perpetrator.

Descriptive Analysis

Table 1

Characteristics of the Sample (N = 68)

Variables	n	%
Self-identified ethnicity		
Caucasian or European	22	32%
Filipino or Filipino-Canadian	7	10%
Mixed ethnicity	6	9%
Asian	5	7%
Black	5	7%
African, African-Canadian, or specific country in Africa	4	6%
Indian or East or North Indian	3	4%
Aboriginal	2	3%
Pakistani	2	3%
Chinese	2	3%
Did not identify or the only representatives of a group/ethnicity	10	14%
Year at university		
First year (end)	21	31%
Second year	18	26%
Third year	15	22%
Final year (Bachelors)	13	19%
Masters program	1	1%
Parent education		
Parents completed undergraduate and/or graduate school		62%

Note. The above percentages may not sum to exactly 100 due to rounding.

Table 1 presented the detailed characteristics of the sample. The final sample included data obtained from 33 women and 35 men ($M_{age} = 22$ years, $SD = 2.47$). The median parental income was \$63,000-\$71,000. The median parental education was that at least one parent completed a Bachelor degree. For 19% of participants, neither parent attended university, for 18% at least one parent attended some university or community college, for 28% at least one parent completed a Bachelor degree, for 29% at least one parent had completed a Master's degree

or a professional degree (e.g., engineer), and for 5% of participants at least one parent completed a Doctorate degree. Participants were asked to self-identify their ethnicity.

Table 2

Percentage of the Sample (N = 68) Experiencing Mild to Severe Maltreatment Sometimes, on Several Occasions, Often or Very Often Compared to Other Undergraduate Samples

Type of maltreatment	Present Sample	Data from Two Canadian Undergraduate Student Samples (male and female) ^a
	Percentage	Percentage
Neglect	79	49 - 61 ^b
Psychological Abuse	71	30 – 42
Physical Abuse	34	16 – 24
Sexual Abuse	10	12 – 23
Family Violence	37	-

Note. ^a Prevalence rates of Childhood Trauma Questionnaire (CTQ) subscales adapted from "Factor structure and reliability of the Childhood Trauma Questionnaire in a Canadian undergraduate student sample" by S.C. Paivio and K.M. Cramer / *Child Abuse & Neglect* 28 (2004) 889–904. Used with permission. On the CTQ, only scores above low (mild) severity on each maltreatment subscale were considered maltreatment whereas on the ROME, the frequency tally of maltreatment included low severity items. ^b Physical and emotional neglect were combined to facilitate comparison with the ROME.

As presented by percentage in Table 2, of participants who reported an item with a maltreatment frequency level of two (sometimes/on several occasions) or a higher frequency on each subscale, 54 participants reported Neglect, 48 reported Psychological Abuse, 23 reported

Physical Abuse, and 25 reported Family Violence. Seven participants reported experiencing sexual abuse as children (see Table 2).

Table 3

Descriptive Statistics of the Scores Obtained using the Record of Maltreatment Experiences (ROME).^a

	Mother			Father		
	<i>M</i>	<i>SD</i>	Range (min-max)	<i>M</i>	<i>SD</i>	Range (min-max)
Overall Maltreatment (<i>n</i> = 68)	2.32	1.76	0 - 3.50	2.31	1.68	0 - 3.95
Neglect	.70	.59	0 - 1.42	.94	.80	0 - 2.04
Psychological Abuse	.85	.78	0 - 3.48	.78	.72	0 - 3.30
Physical Abuse	.69	.85	0 - 3.10	.52	.78	0 - 3.80
Sexual Abuse	.08	.34	0 - .35	.07	.37	0 - .37

Note. Overall Maltreatment is the combination of all subscale scores (i.e., Neglect, Psychological Abuse, Physical Abuse, Sexual abuse). Scores represent frequency weighted by severity and divided by the total number of scale items. ^aMcGee, Wolfe, & Wilson, 1990.

Table 3 presented the mean ROME frequency weighted by severity scores, standard deviations, and range of the scores. Forty-five percent of participants reported experiencing three or more types of maltreatment by their parents at a frequency level of two or greater out a

maximum of three. Neglect ($M_{Frequency} = .58$, $SD = .39$) and Psychological Abuse ($M_{Frequency} = .40$, $SD = .38$) were more frequently reported than Physical Abuse ($M_{Frequency} = .28$, $SD = .36$). Note that cut-off scores indicating critical severity levels are not available for the ROME given that it is difficult to determine what level causes stress for the individual. The current study used standard procedures for scoring the ROME. Previously reported means on the ROME for adults were based on modified scoring procedures (e.g. Muller et al., 2012), limiting direct comparisons.

Table 4

Descriptive Statistics of the Social Cognition Scales in Comparison to Published Norms

	Present Sample			Published Norms			<i>t</i>	Df	<i>p</i>
	<i>M</i>	<i>SD</i>	Range (min-max)	<i>M</i>	<i>SD</i>				
Trait EI (EQ-i 2.0) (<i>n</i> = 67)	96.8	11.7	70 -121	100 ^b	15	2.25	66	.03	
Ability EI (MSCEIT) (<i>n</i> = 66)	93.6	15.9	54 – 130	100 ^c	15	3.29	65	.002	
ToM (EYES) (<i>n</i> = 68)	24.3	4.9	12 – 33	24.8 ^a	4.2	.88	67	.38	

Note. ^a Vellante et al., (2013); ^b Bar-On (2006); ^c Mayer, Salovey, & Caruso, 2002.

As can be seen in Table 4, the EQ-i 2.0, EYES test and MSCEIT were used to examine social cognitive performance (EYES, MSCEIT) and self-reported characteristics (EQ-i 2.0) of the sample. To determine if there were significant differences between the participant's performance and self-reported characteristics on social cognitive variables and published means, one-sample *t*-tests were conducted with alpha levels of .05. The mean EQ-i 2.0 (trait EI) and

MSCEIT (ability EI) scores from participants in the current study were statistically lower than the published means, but within the normal range. The mean EYES (ToM) score was not significantly lower than the mean reported by Vellante et al. (2013).

Correlations between maltreatment subtypes and social cognition variables

Table 5

Spearman Correlations between Maltreatment Subtypes Perpetrated by Mother or Father and Trait EI, Ability EI, and ToM

	Trait EI (EQ-i 2.0) (n = 67)	Ability EI (MSCEIT) (n = 66)	ToM (EYES) (n = 68)
Maternal neglect	-.09	-.35**	-.37**
Paternal neglect	-.14	-.23	-.45**
Maternal psychological abuse	-.35**	-.20	.10
Paternal psychological abuse	-.26*	.20	-.03
Maternal physical abuse	-.39**	-.15	.008
Paternal physical abuse	-.19	.25*	.09
Maternal sexual abuse	-.08	-.38**	-.35**
Paternal sexual abuse	-.04	-.31*	-.28
Overall maltreatment‡	-.34**	-.15	-.18

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001);

EQ-i 2.0 = Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002^a); Mayer Salovey Caruso

Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002). ‡ Overall

maltreatment indicates all maternal and paternal maltreatment types combined. $r_s = *p < .05$,

** $p < .01$.

Table 5 illustrates the correlations between maltreatment subtypes Neglect, Psychological Abuse, Physical Abuse, and Sexual Abuse separated by maternal and paternal perpetrator. As can be seen, higher levels of maternal Neglect, maternal Sexual Abuse, and paternal Sexual Abuse were significantly associated with lower ability EI (lower MSCEIT scores). Higher levels of paternal Physical Abuse was significantly correlated with higher ability EI – a pattern of association that was in the opposite direction as expected. For ToM, higher levels of maternal and paternal Neglect and maternal Sexual Abuse were correlated with lower ToM (EYES scores). Participants who reported higher levels of Psychological Abuse (regardless of the parent) and maternal Physical Abuse had lower trait EI. Overall maltreatment, the sum of all maltreatment types, was significantly associated with Trait EI alone.

Prediction of Social Cognitive Outcomes

Regression coefficients, sum of squares for the regression, R^2 change, and the squared semi-partial correlations for the predictors are presented for the analysis in Table 6 (below) and for each of the subsequent analyses.

Childhood neglect will predict lower ability EI.

Table 6

Regression coefficients for association of Gender, Age, Parental Income, Parental Education, and Maternal Neglect, Psychological Abuse, and Physical Abuse with Ability EI.

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	p	CI	sr ²
		SSR	F	p					
1	Gender	64.10	.25	.62	.004	-1.10	.62	-9.85 – 5.91	.004
2	Age	303.03	.59	.56	.01	-.85	.34	-2.61 – .91	.01
3	Parental income	407.32	.52	.67	.006	-.60	.53	-2.48 – 1.29	.006
4	Parental education	2013.84	2.12	.09	.10	4.20	.01	.97 – 7.42	.10
5	Neglect	5761.37	6.43	.001	.23	-.55	.001	-.80 – -.31	.23
6	Psychological abuse	5787.29	5.31	.001	.002	-.04	.71	-.23 – .16	.002
7	Physical abuse	5787.88	4.47	.001	.000	-.59	.96	-.02 – .56	.006

Note. Mayer Salovey Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002). [†]Unstandardised coefficient

As seen in Table 6, for maternal maltreatment the hierarchical multiple regression revealed, with each predictor entered one at a time, that when Parental Education was added to the equation there was a large increase in sum of squares due to the regression (SSR= 2013.84); there was also significant change in R^2 ($R^2 = .12$, $p = .01$). When Neglect was added to the equation, sum of squares due to the regression increased significantly (SSR= 5761.37) and there was also significant change in R^2 ($R^2 = .35$, $p < .001$).

The sensitivity analysis including only the maltreatment variables was consistent with the above analysis; out of the maltreatment variables, only maternal Neglect predicted ability EI (See Appendix D Table D5.) A second analysis model was conducted with Parental Education, maternal Neglect, and the maltreatment interaction terms. None of the interaction terms were significant. (See Appendix D Table D6.) The results showed a significant negative association between maternal Neglect and ability EI scores, indicating that lower levels of maternal Neglect predicts higher ability EI. In summary, of the maltreatment types involving participants' mothers, only Neglect predicted ability EI. Of the demographic variables, Parental Education was also a significant predictor. Overall, greater frequency and severity of maternal neglect was associated with decreased ability EI and greater level of Parental Education was associated with higher ability EI.

To test if the effect of maternal Neglect on later ability EI depends on Parental Education, moderation analysis was performed using the PROCESS macro (Preacher & Hayes, 2004). To simplify the moderation analysis, Parental Education was dichotomised into a No Parental University Education condition, indicating that neither mother nor father had attended university, and a Parental University Education condition, indication that either mother or father had attended university. The overall model, $F(3,62) = 7.54, p = .0002, R^2 = .27$, was significant. There was no significant interaction between Parental Education and Maternal Neglect, $b = .25, t(62) = .95, p = .35, (CI = -.2713 - .7622), R^2 \text{ change} = .01$. Mother Neglect was a significant predictor of ability EI performance (MSCEIT), $b = -0.67, t(62) = -3.16, p = .002, (CI = -1.10 - -.25)$, with higher levels of Neglect predicting lower ability EI. Parental Education was not a significant predictor, $b = 2.40, t(62) = .37, p = .71, (CI = -10.64 - 15.43)$. For the No Parental University Education condition there was a significant relationship between Maternal Neglect

and ability EI, $b = -.67$, $t(62) = -3.16$, $p = .002$, (CI= -1.10 – -.25), with higher levels of neglect predicting lower ability EI. For the Parental University Education condition, there was also a significant relationship between Maternal Neglect and ability EI, $b = -.43$, $t(62) = -2.90$, $p = .005$ (CI= -.72 – -.13, with higher levels of Neglect predicting lower ability EI. Therefore, there was a significant effect of Maternal Neglect at both levels of Parental Education and no significant moderation effect.

Table 7

Regression coefficients for association of Gender, Age, Parental Income, Parental Education, Paternal Neglect, Psychological Abuse, and Physical Abuse with Ability EI

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	p	CI	sr ²
		SSR	F	p					
1	Gender	45.45	.18	.68	.003	-1.67	.64	-9.70 – 6.31	.000 3
2	Age	283.37	.55	.58	.02	-.85	.34	-2.62 – .92	.04
3	Parental income	387.60	.50	.70	.01	-.60	.53	-2.50 – 1.30	.02
4	Parental education	2100.59	2.20	.08	.10	4.36	.01	1.11 – 7.61	.000 06
5	Neglect	3432.06	3.12	.01	.08	-.24	.02	-.44 – -.05	.04
6	Psychological abuse	4393.20	3.54	.01	.06	.23	.04	.02 – .45	.05
7	Physical abuse	4483.06	3.06	.01	.01	.21	.52	-.43 – .84	.000 3

Note. Mayer Salovey Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002). †Unstandardised coefficient

As seen in Table 7, for paternal maltreatment consistent with maternal maltreatment, when Parental Education was added to the ability EI model, sum of squares due to the regression increased (SSR= 2100.59) and there was also a significant change in R^2 ($R^2 = .35, p < .001$). In the case of paternal maltreatment, two types of maltreatment had significant increases in sum of squares and R^2 : Neglect (SSR= 3432.06) ($R^2 = .21, p = .02$) and Psychological Abuse (SSR= 4393.20) ($R^2 = .27, p = .04$).

The sensitivity analysis of including only maltreatment variables was consistent with the above analysis. (See Appendix D Table D7.) A second analysis model was conducted with paternal Neglect, Psychological Abuse, and the maltreatment interaction terms. None of the interaction terms were significant. (See Appendix D Table D8.) Similar to maternal maltreatment, the results of the final regression model showed a significant negative association between paternal Neglect and ability EI scores and a significant positive association between Parental Education and ability EI scores. In contrast to maternal maltreatment, there was a significant positive association between Psychological Abuse and ability EI scores. To investigate why the regression weight for psychological abuse was in the opposite direction as expected, a regression analysis was conducted first entering Parental Education, followed by Psychological Abuse, then Neglect, then Physical abuse. When Psychological Abuse was added to the model with Parental Education, only Parental Education was significant. In contrast, when Neglect was added to the model with Parental Education and Psychological Abuse, Psychological Abuse and Neglect were both significant. When Physical Abuse was added to the

model with Parental Education, Psychological Abuse, and Neglect, Neglect remained the only significant variable. (See Appendix D Table D9.)

Thus, greater frequency and severity of Paternal Neglect was associated with decreased ability EI. A greater level of Parental Education was associated with higher ability EI. Conversely, Paternal Psychological Abuse was positively associated with ability EI, a pattern of association that was in the opposite direction as expected. This association between Psychological Abuse and ability EI was not significant when Psychological Abuse was added to the model with Parental Education prior to Neglect.

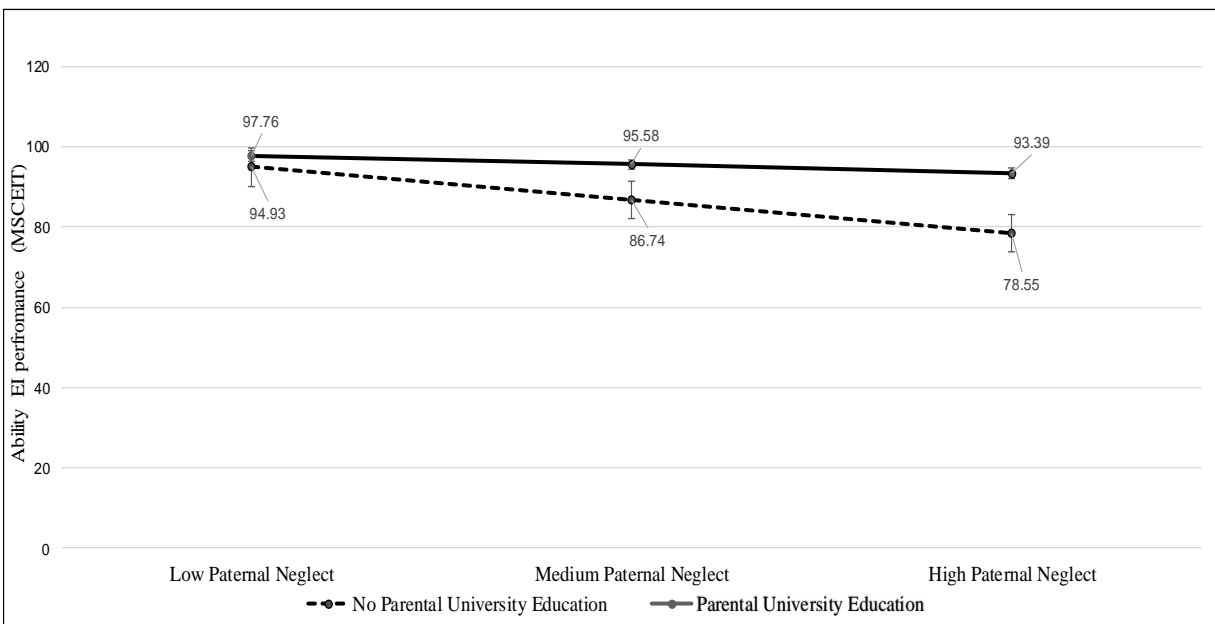


Figure 1. Father Neglect and Ability EI as a Function of Parental Education. For the No Parental University Education condition, the relation between Paternal Neglect and ability EI performance was significant, Mayer Salovey Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002); standardised mean = 100. The Parental University Education condition was not significant. The interaction term was not significant. Error bars indicate 1 standard error. Medium Paternal Neglect is the mean value of Paternal Neglect, Low Paternal Neglect is 1 standard deviation below the mean, and High Paternal Neglect is 1 standard

deviation above the mean. Parental Education is the reported highest education level of mother or father.

To test if the effect of Paternal Neglect on ability EI depends on the level of Parental Education, moderation analysis was performed using the PROCESS macro (Preacher & Hayes, 2007). The overall model, $F(3,61)=3.72, p = .02, R^2 = .15$, was significant. The interaction between Parental Education and Paternal Neglect was not significant, $b = .31, t(61) = 1.51, p = .13$. Parental Education was not a significant predictor of ability EI performance (MSCEIT), $b = 1.77, t(61) = 0.27, p = .79$. Paternal Neglect was a significant predictor, $b = -0.42, t(61) = -2.54, p = .01$. As shown in Figure 1, for the No Parental University Education condition there was a significant relationship between Paternal Neglect and ability EI performance (MSCEIT), $b = -0.42, t(61) = -2.54, p = .01$ (CI= $-.7581 - -.0908$). In contrast, for the Parental University condition, there was no significant relationship between Paternal Neglect and ability EI performance (MSCEIT), $b = -0.11, t(61) = -0.9403, p = .35$ (CI= $-.3542 - .1276$). In summary, there was a conditional effect of Paternal Neglect at each level of Parental Education, however Parental Education did not moderate the relation between Father Neglect and ability EI (MSCEIT).

Childhood neglect will predict lower ToM.

Table 8

Regression coefficients for association of Gender, Age, Parental income, Parental Education, Maternal Neglect, Psychological abuse, and Physical abuse with ToM

Model	Variable	ToM (EYES)			R ² change	B [†]	p	CI	sr ²
		SSR	F	p					
1	Gender	20.76	.872	.35	.013	1.11	.35	-1.26 – 3.47	.01
2	Age	83.75	1.81	.17	.04	.43	.10	-.09 – .95	.04
3	Parental income	94.00	1.34	.27	.006	-.19	.51	-.75 – .38	.006
4	Parental education	142.79	1.56	.20	.03	.73	.15	-.27 – 1.7	.03
5	Neglect	290.55	2.77	.03	.09	-.11	.01	-.19 – -.03	.09
6	Psychological abuse	317.17	2.53	.03	.02	.04	.26	-.03 – .10	.02
7	Physical abuse	333.73	2.27	.04	.01	-.28	.28	-.28 – .11	.005

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001);

[†]Unstandardised coefficient.

As seen in Table 8, for maternal maltreatment, the sum of squares regression increased significantly when Neglect was added (SSR= 290.55, $F(3, 58) = 2.77$, $p = .03$) and resulted in the largest change in R^2 ($R^2 = .18$, $p = .01$). The sensitivity analysis including only the maltreatment variables was consistent with the above analysis. An interaction model was conducted with maternal Neglect and the maltreatment interaction terms. There were no significant interactions. (See Appendix D Table D11.) In summary, of the maltreatment types

involving participants' mothers, higher frequency and severity of maternal Neglect predicted lower ToM and there were no interaction effects.

Table 9

Regression coefficients for association of Gender, Age, Parental income, Parental Education, Paternal Neglect, Psychological abuse, and Physical abuse with ToM

F	Variable	ToM (EYES)			R ² change	B [†]	p	CI	sr ²
		SSR	F	p					
1	Gender	19.13	.79	.38	.01	1.07	.38	-1.33 – 3.47	.01
2	Age	82.05	1.74	.18	.04	.43	.11	-.10 – .96	.04
3	Parental income	92.26	1.30	.28	.01	-.19	.51	-.75 – .38	.006
4	Parental education	139.93	1.50	.21	.03	.73	.16	-.29 – 1.74	.03
5	Neglect	247.80	2.26	.06	.10	-.07	.03	-.13 – -.01	.07
6	Psychological abuse	253.00	1.90	.10	.003	.02	.63	-.05 – .09	.003
7	Physical abuse	260.50	1.65	.14	.01	.10	.57	-.15 – .27	.005

Note. EYES = Reading the Mind in the Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) [†]Unstandardised coefficient

As seen in Table 9, for paternal maltreatment, consistent with maternal maltreatment, adding Neglect to the analysis resulted in the largest increase in sum of squares due to the regression (SSR= 247.80). There was a significant change in R² (R² = .16, p = .03), however the overall F was not significant, F(6, 60) = 2.26, p = .06. Paternal Neglect was the only significant

predictor. The sensitivity analysis including only the maltreatment variables was consistent with the above analysis. An interaction model was conducted with paternal Neglect and the maltreatment interaction terms. None of the interactions were significant. (See Appendix D Table D6.) In summary, higher frequency and severity of paternal Neglect predicted lower ToM, and there were no interaction effects.

Social Cognition and Sexual Abuse. The results for social cognition and Sexual Abuse should be considered preliminary and interpreted with caution given the small number of participants who reported sexual abuse.

Childhood sexual abuse will predict lower ability EI. The mean MSCEIT score for participants who reported experiencing childhood Sexual Abuse ($M = 76.13$, $SD = 4.2$) was significantly lower than that of participants who did not report experiencing childhood Sexual Abuse ($M = 95.68$, $SD = 15.22$), $t(64) = 3.29$, $p = .002$, $d' = -1.75$.

Childhood sexual abuse will predict lower ToM scores in adults. The mean EYES score from participants who reported childhood Sexual Abuse ($M = 19.29$, $SD = 4.2$) was significantly lower than that of participants who did not ($M = 24.85$, $SD = 10.67$), $t(66) = 3.03$, $p = .003$, $d' = -.69$. T tests were also calculated with trait EI (EQi-2.0) to determine if a history of Sexual Abuse was uniquely associated with ability EI and ToM but not trait EI. As expected, the mean EQ-i 2.0 score from participants who reported a history of childhood Sexual Abuse ($M = 94.29$, $SD = 4.2$) was not significantly different than that of participants who did not ($M = 97.08$, $SD = 11.82$), $t(65) = .597$, $p = .55$.

Psychological abuse will predict lower self-reported trait EI.

Table 10

Regression coefficients for association of Gender, Age, Parental Income, Parental Education, and Maternal Neglect, Psychological Abuse, and Physical Abuse with trait EI

M		Trait EI (EQ-i 2.0) ^a			R ² change	B [†]	p	CI	sr ²
Model	Variable	SSR	F	p					
1	Gender	13.62	.10	.75	.01	-.90	.75	-6.64 – 4.83	.002
2	Age	346.51	1.28	.28	.04	-.10	.12	-2.26 – .27	.04
3	Parental income	497.04	1.23	.31	.02	.71	.30	-.63 – 2.06	.02
4	Parental education	504.30	.92	.46	.001	-.28	.82	-2.73 – 2.17	.0008
5	Neglect	664.34	.97	.44	.02	-.50	.28	-.32 – .10	.02
6	Psychological abuse	1740.34	2.40	.04	.12	-.11	.004	-.40 – -.08	.12
7	Physical abuse	1753.81	2.04	.065	.001	-.80	.71	-.08 – .24	.002

Note. ^aBar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002). [†]Unstandardised coefficient.

For maternal maltreatment, as presented in Table 10, the hierarchical multiple regression revealed (when each predictor was entered one at a time) that adding Psychological Abuse to the analysis resulted in the largest increase in sum of squares due to the regression (SSR= 1740.34) and a significant change in R² (R² = .19, p = .004). The overall F test was significant, F(6, 60) =

2.4, $p = .04$ and the results of the regression showed a significant negative association between maternal Psychological Abuse and EQ-i 2.0 scores.

A sensitivity analysis was conducted including only the maltreatment variables (excluding the demographic variables) to determine the robustness of findings. The sensitivity analysis was consistent with the regression analysis including the demographic variables and the results of the regression showed a significant negative association between maternal Psychological Abuse and EQ-i 2.0 scores. (See Appendix D Table D1.) A second analysis model was conducted with maternal Psychological Abuse and maltreatment interaction terms to evaluate whether the interaction terms contributed significantly to the model. When the interaction term Neglect x Psychological Abuse x Physical Abuse was entered into the model, there was a large increase in sum of squares due to the regression ($SSR = 1765.53$). There was a significant change in R^2 ($R^2 = .20, p = .03$) and the model fit was significant, $F(4, 62) = 3.79, p = .008$. (See Appendix D Table D2.) In summary, of the individual maltreatment types involving participants' mothers, only Psychological Abuse predicted EQ-i 2.0 scores, thus greater frequency and severity of maternal psychological abuse was associated with decreased trait EI. An interaction of neglect, psychological abuse, and physical abuse was also significantly associated with decreased trait EI.

Table 11

Regression coefficients for association of Gender, Age, Parental Income, Parental Education, and Paternal Neglect, Psychological Abuse, and Physical Abuse with Trait EI

Model	Variable	Trait EI (EQ-i 2.0 ^a)							
		SSR	F	<i>p</i>	R ² change	B [†]	<i>p</i>	CI	<i>sr</i> ²
1	Gender	2.14	.02	.90	0	-.36	.90	-6.09 – 5.37	.0003
2	Age	332.88	1.26	.29	.04	-.99	.12	-2.25 – .26	.04
3	Parental income	483.56	1.22	.31	.02	.71	.29	-.62 – 2.04	.02
4	Parental education	484.16	.90	.47	0	-.08	.95	-2.52 – 2.34	.00006
5	Neglect	796.05	1.21	.31	.04	-.12	.13	-.27 – .04	.04
6	Psychological abuse	1256.82	1.67	.15	.05	-.16	.06	-.33 – .01	.05
7	Physical abuse	1259.49	1.41	.22	0	-.04	.89	-.53 – .46	.0003

Note. ^a Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002). [†]Unstandardised coefficient.

For paternal maltreatment, as seen in Table 11, adding Psychological Abuse to the trait EI model resulted in the largest increase in sum of squares due to the regression (SSR= 1259.49). However, neither the change in R^2 ($R^2 = .05$, $p = .06$) nor the model fit were significant, $F(6, 59) = 1.67$, $p = .15$. The sensitivity analysis including only maltreatment variables was consistent with the above analysis; none of the variables were significant in either analysis. (See Appendix D Table D3.) When a second analysis model was conducted with paternal Neglect, Psychological Abuse and the maltreatment interaction terms, none of the interactions were

significant (See Appendix D Table D4.) Thus, none of the maltreatment types or interactions involving participants' fathers were significant predictors of trait EI. This stands in contrast to what was observed with the analysis for maltreatment involving mothers.

Discussion

The broad goal of this study was to understand how childhood maltreatment impacts social cognition by examining social and emotional processing and characteristics in adults (19-29 years of age) who were maltreated as children. As anticipated, childhood maltreatment was associated with social cognitive impairments in adulthood. There were no gender differences on performance measures of social cognition (ToM or ability EI) or on self-reported trait EI.

Unique relationships were demonstrated amongst maltreatment subtypes and different social cognitive outcomes (i.e., trait EI, ability EI, ToM), providing potentially important information for both research and clinical applications. The findings suggest that significant social cognitive deficits can be predicted in adulthood by self-reported maltreatment frequency and severity. The implications of these findings are discussed below.

Effects of Neglect on Social Cognition

Neglect is a common, yet under-reported form of maltreatment that has profound and unique impacts on development, affecting upwards of 49% to 61% of Canadian undergraduate students. Neglected children are more solitary and have less positive social experiences than other abused children (Hildyard & Wolfe, 2002) and have generally poor social competence (Maguire et al., 2015). Consistent with the expected association of neglect and impaired social cognitive performance for university students maltreated as children, neglect predicted lower ToM and ability EI scores.

Benarous et al. (2015) proposed that particular maltreatment subtypes may affect children's competence in ToM, although assertions are limited by lack of specificity for subtypes. The finding that neglect predicts social cognitive impairment as measured by ToM is consistent with existing research on neglect and social cognition. Supporting the possibility of associations between specific maltreatment subtypes and ToM, neglected children, but not physically abused children, have been found to have greater difficulty with identifying emotions (Fishbein et al., 2009; Price & Glad, 2003). Similarly, children who experienced neglect had significantly greater difficulty in emotion identification than non-maltreated children or children who experienced other abuse types (e.g., physical abuse) (Pollak et al., 2000). Further, children in foster care, the majority of whom had experienced neglect, showed significant impairments in ToM and emotion understanding compared to a control group of same-age, low-income non-maltreated children living with their biological families (Pears & Fisher, 2005). The findings are also consistent with related studies on social information processing, where children in care who experienced neglect and were reunited with their biological parents had greater social-information processing impairment than non-maltreated children from the same neighbourhood (Keil & Price, 2009). In summary, the existing literature with children and the present study with adults provide evidence that neglect may be highly relevant to the development of ToM and that the impact of neglect may continue into adulthood.

The results of the current study also suggest that neglect may be an important factor in the capacity to reason with emotion-related information as measured by ability EI. Although few studies have specifically examined ability EI and maltreatment (see Cha & Nock, 2009; Gardner et al. 2011), the results of the current study are consistent with findings demonstrating social understanding impairment in children with a history of maltreatment (Burack et al., 2006;

Edwards et al., 2005; Luke & Banerjee, 2013). While Gardner et al. (2011) found a contrasting result in a university student population this may be explained by differing methodological approaches. More specifically, Gardner and colleagues used a median split to divide maltreatment types into low and high groups and thus, did not account for continuity of abuse severity. Consequently, the risk of loss of power or spurious results may be increased when two or more independent variables that represent a continuous variable are dichotomised in this fashion (MacCallum et al., 2002), which may partially explain the differences across these studies.

Present study findings on the association between neglect and impaired social cognition are in keeping with findings from non-human animal experiments of maternal deprivation, HPA axis dysregulation, and social behaviour (Koch et al., 2014; McCrory et al., 2010). The HPA axis (central stress response system) is formed during early development through experiences with caregivers (Perry, 2009). For example rodents cross-fostered with mothers who exhibited high and low nursing and grooming behaviour demonstrated the same behaviour as their cross-fostered mother when caring for their own rat pups, behaviour that was opposite to that of their genetic mother's (Francis et al., 1999). Rats who had been raised with high nursing and grooming mothers had less stress reactivity and lower fear responses. Therefore the authors concluded there was a non-genetic intergenerational transmission of maternal behaviour (Francis et al., 1999), pointing to the importance of behaviours modeled by parents to the future behaviour of offspring.

In summary, in the context of the evidence from studies with children and comparative literature with non-human animals, the present study with adults provides support that neglect may negatively impact social cognitive performance in both reasoning with emotion-related

information and understanding another's perspective over time. These findings are further supported by the results of experimental research on deprivation with non-human animals (McCrory et al., 2010). The present study extends knowledge on potential long-term effects of neglect on skills important to successful interpersonal relationships.

Effects of Psychological Abuse on Social Cognition

In the current study, a significant relationship was found between maternal psychological abuse and lower trait EI, the self-perception of one's own interpersonal and intrapersonal skills and characteristics. This was anticipated given the demonstrated association between EI, social adjustment, and intimacy (Bar-On & Parker, 2000; Khodoyarifard et al., 2012; Zeidner et al., 2012) as well as findings concerning the detrimental impact of childhood maltreatment on intimate relationships (e.g., Colman & Widom, 2004; DiLillo et al., 2009). Psychological abuse has been associated with poor self-regard, perception of inadequate relational skills (Wright et al. 2009), and perception of interpersonal conflicts in adults across multiple types of relationship (Messman-Moore & Coates, 2007), considered to reflect lower trait EI (Zeidner et al., 2012). In contrast, Gardner et al. (2011) did not find a significant association between childhood maltreatment and trait EI in adults. As mentioned previously in reference to ability EI, methodological limitations may explain differences in results across the current study and Gardner et al.'s (2011) findings. Further, Gardner et al. (2011) measured trait EI using the SEIS, a predecessor of the Bar-On EQ-i 2.0, the instrument used in the present study. The SEIS has been criticised for examining only a portion of the trait EI domain (Brackett & Mayer, 2003; Perez, Petrides, & Furnham, 2000; Saklofske et al., 2003), and indeed Gardner et al., (2011) highlight this limitation, given that correlations between SEIS and EQ-i 2.0 scales are very low to moderate (Austin et al., 2004). In the measurement of trait EI, for example, the SEIS may not

encompass all aspects of the construct, specifically self-perception of personal and interpersonal problem solving, reality testing, and flexibility. Therefore, it is likely that the discrepant results can be partially attributed to the difference in the measurement instruments.

In the regression analysis, paternal psychological abuse was positively associated with ability EI, a finding that is surprising and in the opposite direction than expected. However, further analyses established that paternal psychological abuse only predicted ability EI when neglect was added to the model, whereas when psychological abuse was entered with parent education, psychological abuse was not a significant predictor. It is likely that psychological abuse acted as a suppressor variable in the analysis supported by McGee et al.'s (1997) findings;⁹ in this case psychological abuse improves prediction of ability EI by the independent variable neglect but does not appear to be important for directly predicting ability EI in this sample. In a previous study with adolescents, psychological abuse was the strongest predictor among maltreatment subtypes of self-reported adjustment and *potentiated* the influence of other maltreatment subtypes (e.g., physical abuse) that were not apparent when psychological abuse was not included in the analysis (McGee, Wolfe, & Wilson, 1997). In addition, an interaction between maternal psychological abuse and the other maltreatment types measured (neglect and physical abuse) predicted trait EI, suggesting a more complicated combined history of abuse is associated with poorer self-perception. Further research may be helpful in clarifying the association between psychological abuse, neglect, and ability EI.

Effects of Physical Abuse on Social Cognition

⁹ A suppressor variable suppresses irrelevant variance (error) in predicting the dependent variable and therefore augments or potentiates the impact of other predictors (Tabachnik & Fidell, 2007).

Physical abuse did not predict any aspect of social cognitive impairments in the present study. The literature base is mixed with respect to associations between physical abuse and social cognition. Previous studies have generally not found physical abuse to be associated with impaired basic emotion processing (Fishbein et al., 2009; Price & Glad, 2003), in fact, physically abused children have been found to be more accurate at recognising anger than other maltreated children and as accurate as typical children (Pollak et al., 2000; Shackman & Pollak, 2005). Beyond basic emotion processing, Perlman et al. (2008) found that although physically abused young children could recognise negative emotions from faces (i.e., sadness and anger) as accurately as a comparison group of typical children, they had more difficulty determining probable emotional reactions to cartoon images representing a negative event. In particular, physically abused children predicted that both positive and negative events could result in negative emotions whereas typical children generally predicted that only negative events resulted in negative emotions. The authors concluded that abused children might have difficulty explaining situations that anger or sadden people due to having a history of unpredictable life experiences linked with negative emotional reactions. Whereas some researchers have not found impairment in the basic emotion skills of physically abused children (Shackman & Pollak, 2005), others have found differences in how physically abused children interpret associations between emotions and events compared to other children (Perlman et al., 2008), an aspect of understanding emotions not examined in this study. These diverse findings appear to reflect an intricate relationship between physical abuse and different types of emotion processing.

It is also possible that the lack of a negative association between physical abuse and reasoning with and about emotions reflects a need for children to pay close attention to the emotions of others for safety reasons and therefore may be adaptive at times in abusive

environments. Further support for the findings in the present study can be found in neurologically based research that suggests maltreated children, including physical abused children, may be hypervigilant to threat as seen by hyper-responsiveness in parts of the amygdala and prefrontal cortex (Dannowski et al., 2012; Taylor et al., 2006). The immediacy of the threat of physical abuse would require particular vigilance in the attempt to avoid harm. While not directly assessed in this study, it could be that the experience of physical abuse may force vigilance to emotional displays and their predicted consequences. If this is the case, then it is not surprising that ToM and ability EI appear sufficiently developed in relation to physical abuse, as it may act as a protection from harm.

In a sample of adults recruited through the internet, childhood maltreatment was associated with impaired ToM, but not face processing (expression or identity) (Germine, Dunn, McLaughlin, & Smoller, 2015). By analysing the frequency of reported abuse on each individual item of the maltreatment subscales (e.g., physical injury), Germine et al. (2015) found that physical abuse was associated with ToM deficits, a divergent finding from the present study. In contrast to Germine et al. (2015) the current study included both frequency and severity of maltreatment and did not analyse individual subscale items, making it difficult to compare the findings. Further, the potential for sampling bias, as well as standardisation and ethical concerns have been noted in terms of using the internet to conduct psychological research (Nosek, Banaji, & Greenwal, 2002), which may have affected the results. Together the findings indicate general associations between maltreatment and impairment in advanced social cognitive performance measures in adults.

It is important to note that in terms of self-reported social cognitive traits and characteristics, physical abuse was a significant predictor of trait EI only when psychological

abuse and neglect were taken into account. Again, this is similar to findings by McGee et al. (1997) that psychological abuse potentiated the influence between physical abuse and a measure of subjective adjustment. However in the current study, in contrast to McGee et al. (1997), adding the interaction term physical abuse, neglect, and psychological abuse did not improve prediction of psychological abuse alone. This finding suggests that although psychological abuse was the strongest predictor of trait EI and physical abuse alone was not a significant predictor, a combined contribution of physical abuse, neglect and psychological abuse also merits attention when examining effects of maltreatment on trait EI.

The literature and results of the present study suggest important distinctions between the deleterious effects of physical abuse and neglect. Given the diversity of ToM tasks and measures (Sprung, 2010), more comprehensive approaches to measurement may help clarify these distinctions. The mixed findings point to the need for more research in the area of physical abuse to identify risk factors and further understand the complexities of contributions to poor social cognitive outcomes.

Effects of Maternal and Paternal Maltreatment on Social Cognition

The current study is unique from the majority of published studies as maternal and paternal maltreatment were analysed separately to determine the impact of parental role on social cognition. Regardless of parental role, Ability EI and ToM were predicted by childhood neglect suggesting that it may have a negative impact on the ability to reason with and about emotions. (See section Other Factors Affecting Social Cognition below for further details.)

Among the few studies on childhood maltreatment that do identify parental role, Ayoub et al. (2006) found that maltreated children whose fathers were the perpetrator had worse performance on emotion interpretation in a structured story-telling task than those with non-

father perpetrators, which may reflect similarities with the current study on the impact of paternal maltreatment on ability EI. In the present study, both maternal and paternal neglect predicted ToM. Similarly, Burack et al., (2006) found children and adolescents who were maltreated by their mother or both parents (but not just by fathers) had poorer social perspective taking skills and more egocentrism than a demographically matched control group; maltreatment by father alone was not evaluated by Burack et al., (2006). With respect to maternal maltreatment, Edwards, Shipman, and Brown (2005) found that a sample of children with neglectful mothers had lower social understanding than non-neglected children. These findings suggest that both maternal and paternal neglect may be detrimental to the development of mentalising ability and emotional capacities.

As mentioned previously, in the current study, experiencing maternal psychological abuse alone, as well as in combination with neglect and physical abuse appeared to be important in the prediction of self-reported emotional characteristics and capacities (trait EI). In contrast, in the present sample of university students, paternal maltreatment did not predict self-reported trait EI. This suggests a possible specificity of maternal maltreatment on predicting trait EI that may relate to the effect of maltreatment perpetrated by the primary caregiver, a role traditionally performed by the mother (Abraham et al., 2014). In an adaptive early childhood environment the primary caregiver provides opportunities for neural development and for learning to self-regulate and relate with others (Perry, 2009). A potential alternative explanation is that a more elaborate relationship between mother and father exists than was examined here. For example, maternal oxytocin, level of genetic risk, and early caregiving were significantly related to a child's oxytocin level, predicting parent-child and social peer reciprocity three years later (Feldman et al., 2013). While the same paternal factors did not directly predict affiliative behaviour, they

were found to have a bidirectional indirect influence through the mother (Feldman et al., 2013). Feldman et al.'s (2013) findings also point to caregiver differences related to parental role; this is an area that merits further study.

The literature on typical social cognitive development has predominantly focussed on early maternal influence on ToM (Fonagy et al., 1997; Larenjo et al., 2014; Ruffman et al., 2002; Taumoepeau & Ruffman, 2008). For instance, 'mind-mindedness' or appropriate or fitting comments by mothers on the desires, cognitions, and emotions of their two year old children was positively related to the development of ToM measured by false belief and perspective taking tasks when the children were age four (Larenjo et al., 2014). Similarly, mothers' levels of situationally appropriate comments on emotions, desires, and thoughts to neurotypical children at 24 months predicted children's social understanding at 33 months (Taumoepeau & Ruffman, 2008), indicating that maternal communications contribute to development. With respect to maltreatment, it is likely that adaptive interactions between parent and child are absent, minimal, or inconsistent, providing limited opportunities for modelling or learning accurate ToM skills. Although only mothers have been commonly studied in relation to predicting social understanding, it is possible that the findings may apply to any primary caregiver regardless of role. Future research could explore the dimensions of the parental role of the perpetrator.

Effects of Sexual Abuse on Social Cognition

The present study found that the small group of participants ($n = 7$) who reported childhood sexual abuse showed substantial and significantly lower ToM scores on the EYES test than participants who did not report sexual abuse, pointing to potential challenges in perspective taking ability in adults with a childhood history of being sexually abused. Consistent with current findings with adults, children who were sexually abused had impaired mentalising ability

compared to a demographically matched community control group (Ensink et al., 2015).

Similarly, the small group of participants in the current study who reported sexual abuse had substantial and significantly lower ability EI (MSCEIT) scores than participants who did not report sexual abuse. In fact, the mean score on the MSCEIT of participants who reported sexual abuse suggested clinical impairment for these individuals.

Childhood sexual abuse was significantly associated with lower ability EI in adolescents in the first step of a hierarchical regression with centred variables (Cha & Nock, 2009). The main focus of the study, moderation models, indicated that ability EI moderated the relationship between sexual abuse and suicidal ideation and, when EI was low, predicted suicidal behaviour, whereas when EI was high, acted as a protective factor (Cha & Nock, 2009). This suggests that although overall childhood sexual abuse was associated with lower ability EI there appears to be individual differences in ability EI within this group. The findings of the present study and previous studies suggest that childhood sexual abuse has a detrimental effect on social cognition and that this relationship appears to continue into adolescence and adulthood. However, for the present study, only a small sample of individuals reported childhood sexual abuse therefore a larger sample would be needed to adequately assess the impact of this type of abuse on social cognition. The findings related to sexual abuse must be interpreted with caution, yet may point to the need for further research with this population.

Other Factors Affecting Social Cognition

In both maternal and paternal models, parental education predicted ability EI, similar to the well known relationship between socioeconomic inequalities and human development impairments (Hayden & Mash, 2015). However, in the present study, parental education was not a predictor of ToM or trait EI. It is surprising that parental education was important for ability

EI yet not for ToM. This may be indicative of differences in the specific area assessed as the measurement of ability EI is much broader and more inclusive than ToM. The significance of the role of parental education with respect to ability EI but not ToM in the present study warrants further study and examination as having a higher socioeconomic status (SES) has been found to be associated with higher performance on ToM tests in children, thought to relate to an association between SES and higher frequency of conversational interaction (Shatz et al., 2003). An association between verbal ability and the MSCEIT measure of ability EI has also been found (Zeidner et al., 2008). SES is an important predictor of language ability (Hackman & Farah, 2009) and is related to the amount of stimulation provided by parents in the home environment. This has been demonstrated to affect brain development including cognition and emotional development (Hackman, Farah, & Meaney, 2010). However, the relationship between SES and brain development is multifaceted and can be impacted by numerous other factors including stress related to low SES (Hackman et al., 2010). Regardless of the mechanism, parents' formal education (a marker of SES) was found to be an important predictor of ability EI in the present study, however the literature indicates an extensive and convoluted relationship between SES and brain development and parental care (Hackman et al., 2010).

In terms of parental role, the findings of the present study indicate that the relative importance of parental education appears to vary somewhat for father vs. mother models of ability EI. When examining the respective roles of maltreatment and parental attendance and non-attendance at university in relation to ability EI, there was a conditional effect only for paternal neglect on ability EI and only for participants who reported that their parents had not attended university (see Figure 1). For these participants (N=13), their ability EI scores were in the range of notable clinical impairment. However, in the analysis parental education failed to

moderate the relation between paternal neglect and ability EI. The moderation analysis was likely underpowered due to an imbalance of group size, since just over 80% of participants reported that their parents had attended university, which may have affected the moderation results.

Consistent with the differential findings in the paternal vs. maternal moderation analyses, in the maternal model of ability EI, the proportion of variance accounted for in the regression by maternal neglect was over double the proportion of variance related to parent education, whereas in the paternal model, parental education and paternal neglect accounted for a modest and approximately equal proportion of the variance. A possible reason for these differences may be due to the relationship between parental maltreatment and parental role such as who is the primary caregiver, which was not measured in the present study. Future studies should examine the influence of the role of primary caregiver and maltreatment on mother and father models of ability EI.

Limitations and Future Directions

An ethnically diverse undergraduate university student population of 68 students with approximately equal numbers of men and women participated in this study. However, this study did not directly measure IQ, language proficiency, or cultural differences. Cultural differences beyond language proficiency, such as culturally specific communication practices, may have impacted the study as minor variations have been found in social cognitive performance between cultures (Mayer et al., 2002). Unsurprising in a university sample, the participants in the current study described a higher median family education level than the national average: close to two thirds of participants (62%) reported that at least one of their parents have at minimum a Bachelor's degree compared to the national average of 23% (Statistics Canada, 2011; National

Household Survey). These higher parental education levels may indicate that the group in this study has increased access to supports and services compared to the general population. Despite a sizeable number of students reporting having experienced maltreatment, the students have managed to cope in such a way as to pursue a post-secondary education, demonstrating some aspects of resiliency. However, it is unclear what other factors, such as social support, may be influencing coping with maltreatment but were not measured in the present study. For instance, the presence of a social stimulus is associated with reduced HPA axis arousal in human and nonhuman animals (Hostinar et al., 2014). In children, social support has been found to modify the risk of depression even in children with both genetic and environmental (maltreatment) risk factors (Kaufman et al., 2006). Future studies could investigate the role of social support in the social cognition of individuals with a history of childhood maltreatment. Further, research on maltreatment and social and emotional development has emphasised the role of attachment or the parent-child emotional bond. The goal of the present study was to explore whether having experienced child abuse and neglectful behaviour by their parents predicted social processes and emotional development. Participants' attachment to their parents was not directly examined. Given the relationship between childhood maltreatment and higher rates of insecure attachment (Cyr et al., 2010), researchers could consider examining attachment (e.g., romantic attachment), and/or social support, childhood maltreatment, and social cognition to better understand the relationships between these variables and possible effects of moderator variables on individual outcome differences. Consequently, findings are limited by the above design features and researchers may consider these variables in future investigations of social cognition.

The current study provided preliminary evidence of the relationship between a history of sexual abuse and impaired social cognition in adulthood, limited by the small number of

participants reporting this experience. Given that only 10% of the participants reported sexual abuse, a larger sample size of participants may provide more information about the relationships between sexual abuse and social cognition. Given that rates of maltreatment including sexual abuse are higher when identified by prospective (longitudinal) vs. retrospective report, this may be an underestimate (Shaffer, Huston, & Egeland, 2008).

Several measurement limitations related to childhood maltreatment may have impacted the study. This study was necessarily limited by a quasi-experimental design and the ability to draw causal conclusions is of course constrained by the correlational nature of the research. The maltreatment measure selected did not allow for comparisons between maltreated and non-maltreated groups, however a strength of the current study was the use of a continuous measure of maltreatment frequency and severity. The study also did not control for the effects of non-parental maltreatment or the environment outside the family therefore results cannot be applied to trauma that is not perpetrated by parental figures, and the potential impact on results of the above external factors is unknown.

In situations where children are exposed to ethno-political violence, parenting style and behaviour and parental adjustment and distress moderate children's levels of aggressive behaviour and post-traumatic stress symptoms (Dubow, Huesmann, & Boxer, 2009). Exposure to both political violence and the above family risk factors present a cumulative risk for higher rates of pathological behaviour in children (Dubow et al., 2009). In addition, ethno-political violence may impact levels of family violence and child maltreatment. For example, Palestinian adolescents whose family was exposed to politically related violence and distress had higher levels of family violence, specifically parental maltreatment and witnessing interparental violence in the home (Haj-Yahia & Abdo-Kaloti, 2003). This also suggests that, not

surprisingly, ethno-political violence may be implicated in maladaptive parenting, including maltreatment of children, making it difficult to separate the effects of intra-familial trauma from non-familial trauma. Further, external pressures (e.g., poverty, war) may interact with the family environment magnifying the effect of maltreatment, a potential effect not measured in the present study but worthy of future consideration. However, Haj-Yahia & Abdo-Kaloti's (2003) findings indicate the continued importance of the family (and intra-familial maltreatment) to children's development even under extreme circumstances such as a civil war.

Second, childhood maltreatment was measured through retrospective self-report. Although the use of self-report has the advantage of relative anonymity and allows the inclusion of less severe cases of abuse and/or cases of abuse that went unnoticed by child protection authorities, it is not possible to verify or substantiate the reports of abuse with an outside source. As such, this study only captures what adults report about their maltreatment experiences. However, what is reported using more objective measures may be influenced by what predicts the verification of childhood maltreatment. Important predictors of child maltreatment verification by Canadian child protection authorities include severity of harm, police referral, and parent and housing risk factors (Trocmé et al., 2008), suggesting more subtle indicators of abuse may go unreported. Comparisons of prospective and retrospective self-reported maltreatment cases suggest that adolescents and adults significantly under-report cases of abuse with respect to self-report measures (McGee et al., 1995; Shaffer et al., 2008; Williams, 1994). Another consideration is the ethical and practical considerations in conducting prospective studies outside of the child protection system on childhood maltreatment due to ethical and legal obligations to notify child protection authorities if suspected child abuse has occurred as well as study feasibility constraints. Although there are clear limitations with the use

of self-report, it is likely that specific types of abuse tend to be under-reported, both to authorities and outside of the judicial and child protection system. Given these factors, the present study may capture aspects on the continuum of abuse not always addressed through the child protection system, such as psychological abuse and neglect. It is important to note that in the current study in general a higher frequency of participants reported maltreatment compared with other Canadian undergraduate samples (e.g., Paivio & Cramer, 2004), as reported in Table 2. It is possible that this discrepancy between studies is due to a unique sample of participants in the present study, but is more likely related to measurement differences. On the CTQ, a measurement of childhood maltreatment used by Paivio and Cramer (2004), only scores above low severity on each subscale were considered maltreatment whereas since maltreatment threshold scores are unavailable for the ROME, low severity scores were included in the frequency tally of each subscale reported in Table 2. . Therefore, examining ROME frequency scores separately does not assess severity of maltreatment—as the measure is intended to be used—and may thereby over-represent the occurrence of maltreatment.

Third, the current study did not examine the developmental timing of when maltreatment occurred. Neurobiological evidence supports the existence of sensitive periods when the development of specific brain areas in childhood and adolescence is particularly vulnerable to child abuse (Teicher, Andersen, S. L., Polcari, Anderson, C. M., & Navalta, 2002; Teicher & Samson, 2016). The precise relationship between developmental timing of childhood maltreatment and social cognition has not been clearly defined, but based on findings on the development of ToM in neurotypical young children (Fonagy et al., 1997; Larenjo et al., 2014; Ruffman et al., 2002; Taumoepeau & Ruffman, 2008) it would be expected that earlier maltreatment would be associated with greater impairment in adulthood social cognition. Future

studies involving adults, childhood maltreatment, and social cognition should examine developmental timing, as studies with maltreated children have demonstrated that earlier maltreatment (toddler age) has greater impacts on perspective taking than maltreatment that began during a later developmental stage (middle childhood, adolescence) (Ayoub et al., 2006).

Finally, external validity was sacrificed in order to preserve internal validity through the use of normed measures in a laboratory setting. This study is underpinned by the assumptions that social cognition relates to social adjustment (e.g., Crick & Dodge, 1994) and that results extrapolated from social cognition tests and inventories can be generalised to a real world environment (Brackett et al., 2006; Sprung, 2010). Factors that impact people's perceptions in everyday life may be more nuanced than what is captured by the measures. For example, the EYES test is a static measure of the attribution of mental states that can be administered as a pencil and paper test. Similar to other laboratory tests of ToM, this may not reflect peoples' everyday experiences in performing attributions of mental states. With the EYES test people are allotted more time to view the eyes in isolation, but are not provided other information normally available in a social situation such as nonverbal cues shown by the rest of the face, body, or verbal cues (e.g., speech, voice tone). Future studies could consider addressing this limitation, for example through the use of non-static images such as films as has been examined in populations with autism (Golan, O., Baron-Cohen, Hill, & Golan, Y., 2006; Roeyers, Buysse, Ponnet, & Pichal, 2001).

Implications and Conclusions

The current study expands the knowledge base about the long-term impacts of childhood maltreatment by suggesting that specific types of childhood maltreatment are associated with notable and enduring social cognitive impairments continuing into adulthood. This study offers

insight into the social cognitive development of adults whose childhood maltreatment experiences were not identified by child protection authorities. While individuals included in the analysis were not identified by the authorities or placed in care, many reported neglect and psychological abuse, which was negatively associated with social cognition. In the current study, higher levels of neglect and psychological abuse were endorsed compared to other maltreatment types, in keeping with findings that neglect and psychological abuse are often overlooked forms of maltreatment and are perhaps more likely to be captured through self-report. It is recommended that mental health and education professionals consider neglect and psychological abuse as possible causal factors of emotional or behavioural difficulties to promote early identification and intervention (MaGuire et al., 2015). Clearly, prevention and early identification in cases of child abuse is key to avoid negative developmental consequences including social cognition. Designing treatment programs for children, youth, and adults who have already experienced maltreatment is also important since childhood maltreatment continues to be under-recognised.

Findings in nonhuman animals may broadly guide potential intervention approaches that acknowledge brain-based process impairments and include oxytocin (Feldman et al., 2013; Stoesz et al., 2013), social support (Heinrichs et al., 2003), and/or peer involvement (Harlow & Suomi, 1971). Given the role of oxytocin in the desire to bond with others (Feldman et al., 2013) and Heinrichs et al.'s (2003) findings, an intervention involving oxytocin and peer support with children may be a potentially beneficial early intervention strategy that could be evaluated for use with families and health care professionals. It is unclear whether there are upper age limits or a critical period for the use of a peer intervention for children.

Another overarching factor to consider when designing interventions for individuals who have a history of childhood maltreatment is to first establish safety, security, and ensure stabilisation (Herman, 1997). Consideration of adaptations to social cognitive interventions for people with a history of childhood maltreatment might include tailoring interventions to reflect a spectrum of experiences (e.g., severe abuse vs. hidden impacts), and a multifaceted approach to encompass individual and co-occurring abuse types. Knowledge about specific social cognitive processing deficits may facilitate the development and selection of tailored interventions for social and emotional skills and the ability to understand others' perspectives (Sprung, 2010).

Findings from the current study can be applied through interventions to ameliorate the specific impacts of childhood maltreatment in relation to social cognition for those who have already experienced it. Interventions that teach specific social cognitive skills could be adapted and evaluated for use by mental health clinicians for adults with a history of childhood maltreatment, although the development of potential interventions is at the preliminary stage and current findings require replication. A number of prior studies with other populations have identified improvement in social cognition after intervention. Among these studies, several have evaluated social and emotional processing interventions with children and adults that could be applied to people neglected in early life with impaired EI. For example, social information processing training that teaches interpreting and managing social and emotional cues in the environment and choosing suitable responses has been successfully used with children with a resulting decrease in aggression and increase in social skills and social information processing skills (Fraser et al., 2005). In terms of adults, a recent study highlighted the potential of EI-based interventions to improve not only EI but also quality of life for adults with autism (North, Montgomery, & Stoesz, 2014), interventions that could be adapted for use with other clinical

populations. Other studies have evaluated improving ToM and social functioning; this approach has potential applications with people who have experienced childhood neglect and have impairments in ToM: Work by Bechi et al. (2012) has evaluated through meta-analysis ways in which ToM can be ameliorated within a clinical group. The meta-analysis found that ToM, facial affect recognition, and community functioning were significantly improved following intervention (Bechi, et al., 2012) pointing to the possibility of improving aspects of ToM along with related adaptive functioning. ToM has also been shown to improve in neurotypical adolescent populations who received an acting training intervention for a year (Goldstein & Winner, 2012). Preliminary findings suggest that the above interventions may also apply to people who have experienced childhood sexual abuse as well as neglect. Given the low number of participants who reported childhood sexual abuse, firm conclusions regarding interventions for this population cannot be made but merit future consideration. Although evaluation of interventions have been limited to date, self-reported trait EI in relation to psychological abuse and interactions between neglect, psychological and physical abuse indicate that interventions supporting self-concept and confidence in one's capacity, assertiveness, and stress management may be beneficial, evidenced by findings that adaptive coping mediates the relation between trait EI and self-harming behaviour (Mikolajczak et al., 2009). The development and evaluation of social cognitive processing interventions has the potential to benefit the future relationships and social functioning of individuals with maltreatment histories. It is essential that future research evaluate these possibilities.

As hypothesised, childhood maltreatment was associated with social cognitive impairment in EI and ToM in university students. Specific types of maltreatment appeared to impact the development of various aspects of social cognition (i.e., trait EI, ability EI, ToM).

Examining maltreatment as a global construct may mask subtle impairments in adults maltreated as children. By investigating the impacts of childhood maltreatment in adults the current study has extended the research on social and emotional information processing by exploring the nuances of maltreatment type and relationship to parental role in maltreatment, which is important not only for future research, but in terms of clinical implications for individuals.

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Appendix A



**Research Ethics
and Compliance**

Office of the Vice-President (Research and International)

APPROVAL CERTIFICATE

Human Ethics
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March 2, 2015

(Advisor J. Montgomery)

TO: Flint Schwartz
Principal Investigator

FROM: Psychology/Sociology Research Ethics Board (PSREB)

Re: Protocol #P2014:087
"Social cognition and Childhood Trauma: Emotional Intelligence and Theory of Mind in post-secondary students who have experienced intra-familial childhood maltreatment"

Please be advised that your above-referenced protocol has received human ethics approval by the **Psychology/Sociology Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). It is the researcher's responsibility to comply with any copyright requirements. **This approval is valid for one year only.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: <http://umanitoba.ca/research/ors/mrt-faq.html#pr0>)
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba Ethics of Research Involving Humans.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) in order to be in compliance with Tri-Council Guidelines.

Appendix B

Demographic information questionnaire

What year in university are you currently?

How old are you?

What is your gender?

How would you describe yourself ethnically?

What sort of family religious background do you have?

What is your parent's income (Please circle)

0-\$24,000

\$25,000-\$43,000

\$44,000-\$62,000

\$63,000-\$71,000

\$72,000-\$80,000

\$81,000-\$89,000

\$90,000+

What level of university did your parents attend?

Mother

Father

Have you ever been in foster care?

Appendix C

Table C1.

A Hierarchal View of Emotional Intelligence Abilities as Measured by the MSCEIT^a

Area	Branch	Task	Task Description
1: Experiential EI	Branch 1: Perception of emotion	Task 1: Faces	Identify emotions from photographs of faces
		Task 2: Pictures	Identify emotions from photographs of faces and artistic representations.
	Branch 2: Use of Emotion	Task 3: Sensation	Choose emotion to match tactile, taste, and colour sensations.
		Task 4: Facilitation	How moods enhance thinking, reasoning, and other cognitive processes.
2: Strategic EI	Branch 3: Understanding of emotion	Task 5: Blends	Determine which emotions blend together to form a more complex feeling.
		Task 6: Changes	The progress and change of emotions from one state to another.
	Branch 4: Regulation of emotion	Task 7: Emotion Management	Choose alternative actions to achieve a certain outcome, in emotion-laden situations where individuals must regulate their feelings.
		Task 8: Relationship Management	Evaluate how effective different actions would be in achieving an emotion-laden outcome involving other people.

Note. Adapted from Brackett, Lopes, Ivcevic, Mayer, & Salovey (2004). Integrating emotion and cognition: The role of emotional intelligence. In D. Dai & R. Sternburg (Eds.), *Motivation, emotion, and cognition: Integrating perspectives on intellectual functioning* (p. 179). Mahwah, NJ: Erlbaum. Used with permission. ^aMayer Salovey Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002).

Table C2.*Emotional Quotient Inventory scales.*

Total Trait Emotional Intelligence (EQ-i 2.0)^a				
Self-Perception	Self-Expression	Interpersonal	Decision Making	Stress Management
Self-Regard	Emotional Expression	Interpersonal Relationships	Problem Solving	Flexibility
Self-Actualization	Assertiveness	Empathy	Reality Testing	Stress Tolerance
Emotional Self-Awareness	Independence	Social Responsibility	Impulse Control	Optimism

Note. Adapted from Bar-On, R., & Handley, R. (2003). *BarOn EQ-360 technical manual*.

Toronto, Canada: Multi Health Systems. Used with permission. ^a Bar-On Emotional Intelligence Quotient 2.0 (EQ-I 2.0; Bar-On, 2002).

Diagnostic/Sensitivity Analyses of Interactions

Sensitivity analyses were conducted with the maltreatment subtypes alone. Diagnostic analyses were conducted to develop a model with significant variables and interactions terms using hierarchical multiple regression with step by step entry. Significant variables were selected from the full model based on a) sum of square values, b) R^2 change, and c) p-value in the model. (See Results section for full model.) The interaction models and sensitivity analyses can be found below.

Table D1

Regression coefficients for association of Maternal Neglect, Psychological Abuse, and Physical Abuse with trait EI.

Model	Variable	Trait EI (EQ-i 2.0)						
		Sum of Squares regression	F	sig.	R^2 change	B [†]	sig	CI
1	Neglect	115.49	.85	.36	.01	-.09	.36	-.29 – .10
2	Psychological abuse	1196.07	4.91	.01	.12	-.02	.004	-.38 – -.08
3	Physical abuse	1230.39	3.33	.03	.004	-.12	.60	-.57 – .33

Note. EQ-i 2.0 = Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002).

[†]Unstandardised regression coefficient.

Table D2.

Regression coefficients for association of Maternal Psychological Abuse and interaction terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with trait EI.

Model	Variable	Trait EI (EQ-i 2.0)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Psychological abuse	1190.02	9.92	.002	.13	-.23	.002	-.38 – -.09
2	Neglect x Psychological abuse	1210.93	5.00	.01	.002	.002	.68	-.01 – .01
3	Psychological abuse x Physical abuse	1215.26	3.28	.03	0	.001	.85	-.01 – .01
	Neglect x Physical abuse	1215.27	2.42	.06	0	-.01	.26	-.02 – .02
4	Neglect x Psychological abuse x Physical abuse	1913.71	3.29	.01	.08	.001	.03	.00 – .002

Note. EQ-i 2.0 = Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002);

[†]Unstandardised regression coefficient.

Table D3.

Regression coefficients for association of Paternal Neglect, Psychological Abuse, and Physical Abuse with Trait EI.

Model	Variable	Trait EI (EQ-i 2.0)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Neglect	239.19	1.82	.18	.03	-.10	.18	-.25 – .05
2	Psychological abuse	653.64	2.57	.09	.05	-.15	.08	-.32 – .02
3	Physical abuse	679.07	1.76	.17	.003	-.10	.66	-.57 – .36

Note. EQ-i 2.0 = Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002)

[†]Unstandardised regression coefficient.

Table D4.

Regression coefficients for association of Paternal Psychological Abuse and interaction terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with trait EI.

Model	Variable	Trait EI (EQ-i 2.0)						
		Sum of Squares regression	F value	sig.	R ² change	B [†]	sig	CI
1	Neglect	2.39.20	1.82	.18	.03	-.10	.18	-.23 – .07
2	Psychological abuse	653.64	2.60	.09	.05	-.15	.08	-.32 – .02
3	Neglect x Psychological abuse	738.66	1.93	.14	.01	.005	.42	-.01 – .02
4	Psychological abuse x Physical abuse	753.87	1.45	.23	.002	.002	.73	-.01 – .01
5	Neglect x Physical abuse	862.99	172.60	.27	.01	.01	.36	-.01 – .04
6	Neglect x Psychological abuse x Physical abuse	1097.35	1.43	.22	.03	.001	.18	.000 – .002

Note. EQ-i 2.0 = Bar-On Emotional Intelligence Quotient 2.0 (Bar-On, 2002).

[†]Unstandardised regression coefficient.

Table D5.

Regression coefficients for association of Maternal Neglect, Psychological Abuse, and Physical Abuse with Ability EI.

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Neglect	3729.42	18.68	<.001	.23	-.53	<.001	-.77 – -.28
2	Psychological abuse	3868.81	9.64	<.001	.008	-.08	.41	-.28 – .12
3	Physical abuse	3961.06	6.52	.001	.006	.20	.68	-.38 – .77

Note. Mayer Salovey Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer,

Salovey, & Caruso, 2002). [†]Unstandardised regression coefficient.

Table D6.

Regression coefficients for association of Parental Education, Maternal Neglect and Interaction Terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with Ability EI.

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	sig.	CI
		Sum of Squares regression	F value	sig.				
1	Parental education	1367.91	5.78	.02	.08	3.75	.02	.64 – 6.87
2	Neglect	4389.42	11.41	<.001	.18	-.48	<.001	-.73 – -.24
3	Neglect x Psychologica l abuse	4427.41	7.57	<.001	.002	-.002	.66	-.02 – .01
4	Psychologica l abuse x Physical abuse	4450.27	5.63	.001	.001	-.002	.74	-.02 – .01
5	Neglect x Physical abuse	4533.50	4.54	.001	.005	-.008	.52	-.04 – .02
6	Neglect x Psychologica l abuse x Physical abuse	4570.65	3.77	.003	.002	0	.67	-.001 – .002

Note. Mayer Salovey Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer, Salovey,

& Caruso, 2002). [†]Unstandardised regression coefficient.

Table D7.

Regression coefficients for association of Paternal Neglect, Psychological Abuse, and Physical Abuse with Ability EI.

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Neglect	1182.90	4.90	.03	.07	-.22	.03	-.42 – -.02
2	Psychological abuse	2411.33	5.35	.007	.08	.26	.02	.04 – .49
3	Physical abuse	2549.79	3.75	.02	.008	.24	.44	-.38 – .86

Note. Mayer Salovey Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer,

Salovey, & Caruso, 2002). [†]Unstandardised regression coefficient.

Table D8.

Regression coefficients for association of Parental Education, Paternal Neglect and Interaction

Terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with Ability EI.

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Parental education	1484.26	6.27	.02	.09	3.94	.02	.80 – 7.08
2	Neglect	2497.31	5.57	.01	.06	-.21	.04	-.40 – -.01
3	Psychological abuse	3646.03	5.82	.001	.07	.26	.02	.04 – .47
4	Neglect x Psychological abuse	4367.13	5.45	.001	.04	.01	.06	-.001 – .03
5	Psychological abuse x Physical abuse	4510.07	4.48	.002	.01	.01	.40	-.007 – .02
6	Neglect x Physical abuse	4749.16	3.94	.002	.02	-.02	.28	-.05 – .01
7	Neglect x Psychological abuse x Physical abuse	5001.70	3.58	.003	.02	.27	.16	-.001 – .002

Note. Mayer Salovey Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer, Salovey, & Caruso, 2002). [†]Unstandardised regression coefficient.

Table D9.

Regression coefficients for association of Parent Education, Paternal Psychological Abuse, and Neglect with Ability EI

Model	Variable	Ability EI (MSCEIT)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F valu e	sig.				
1	Parental Education	1484.26	6.27	.02	.09	3.94	.02	.80 – 7.08
2	Parental Education	2278.09	5.00	.01	.05	3.88	.02	.79 – 6.96
	Psychological abuse					.21	.07	-.02 – .43
3	Parental Education	3646.03	5.82	.001	.08	3.60	.02	.64 – 6.60
	Psychological abuse					.26	.02	.04 – .47
	Neglect					-.24	.01	-.43 – -.05
4	Parental Education				.01	3.75	.01	.78 – 6.73
	Psychological abuse					.16	.27	-.13 – .44
	Neglect					-.23	.02	-.42 – -.04
	Physical Abuse					.32	.30	-.28 – .91

Note: Mayer Salovey Caruso Emotional Intelligence Test 2.0 (MSCEIT; Mayer,

Salovey, & Caruso, 2002). [†]Unstandardised regression coefficient.

Table D10.

Regression coefficients for association of Maternal Neglect, Psychological Abuse, and Physical Abuse with ToM.

Model	Variable	ToM (EYES)						
		Sum of Squares regression	F value	sig.	R ² change	B [†]	sig	95% CI
1	Neglect	193.61	9.14	.004	.12	-.12	.004	-.20 – -.04
2	Psychological abuse	221.22	5.25	.008	.02	.04	.26	-.03 – .10
3	Physical abuse	229.16	3.59	.02	.005	-.06	.54	-.24 – .13

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) [†]Unstandardised regression coefficient.

Table D11.

Regression coefficients for association of Maternal Neglect and Interaction Terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with ToM.

Model	Variable	ToM (EYES)			R ² change	B [†]	sig	CI
		Sum of Squares regression	F value	sig.				
1	Neglect	193.61	9.10	.004	.12	-.12	.004	-.20 – -.04
2	Neglect x Psychological abuse	198.00	4.62	.01	.003	.001	.65	-.002 – .004
3	Psychological abuse x Physical abuse	203.83	3.13	.03	.004	-.001	.61	-.005 – .003
4	Neglect x Physical abuse	222.19	2.56	.05	.01	-.004	.36	-.01 – .005
5	Neglect x Psychological abuse x Physical abuse	286.00	2.72	.03	.04	0	.09	-.001 – 0

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb,

2001); [†]Unstandardised regression coefficient.

Table D12.

Regression coefficients for association of Paternal Neglect, Psychological Abuse, and Physical Abuse with ToM.

Model	Variable	ToM (EYES)						
		Sum of Squares regression	F value	sig.	R ² change	B [†]	sig	CI
1	Neglect	142.82	6.42	.01	.09	-.08	.01	-.14 – -.02
2	Psychological abuse	147.22	3.27	.05	.003	.02	.66	-.06 – .09
3	Physical abuse	159.73	2.35	.08	.008	.07	.46	-.12 – .27

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). [†]Unstandardised regression coefficient.

Table D13.

Regression coefficients for association of Paternal Neglect and Interaction Terms Neglect x Psychological Abuse, Neglect x Physical Abuse, Psychological Abuse x Physical Abuse, and Neglect x Psychological Abuse x Physical Abuse with ToM.

Model	Variable	ToM (EYES)						
		Sum of Squares regression	F value	sig.	R ² chang e	B [†]	sig	CI
1	Neglect	142.82	6.42	.01	.09	-.08	.01	-.16– -.02
2	Neglect x Psychologica l abuse	148.65	3.30	.04	.004	.001	.61	– .002– .003
3	Psychologica l abuse x Physical abuse	149.24	2.18	.10	0	0	.87	– .003– .003
4	Neglect x Physical abuse	151.89	1.64	.18	.002	-.002	.74	–.01 – .008
5	Neglect x Psychologica l abuse x Physical abuse	157.12	1.34	.26	.003	0	.64	– .001– 0

Note. EYES = Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb,

2001) [†]Unstandardised regression coefficient.