Parent Emotion Coaching and Affect Recognition in Theory of Mind in Autism Spectrum Disorder

Audrey L. O'Connor
Seattle Pacific University

Follow this and additional works at: https://digitalcommons.spu.edu/cpy_etd

Part of the Child Psychology Commons, Clinical Psychology Commons, and the Developmental Psychology Commons

Recommended Citation
https://digitalcommons.spu.edu/cpy_etd/60

This Dissertation is brought to you for free and open access by the Psychology, Family, and Community, School of at Digital Commons @ SPU. It has been accepted for inclusion in Clinical Psychology Dissertations by an authorized administrator of Digital Commons @ SPU.
Parent Emotion Coaching and Affect Recognition in Theory of Mind in Autism Spectrum Disorder

Audrey Lee O’Connor

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Clinical Psychology Seattle Pacific University

Approved by: Beverly J. Wilson, Ph.D. Professor of Clinical Psychology Seattle Pacific University Dissertation Chair

Reviewed by: Amy Mezulis, Ph.D. Chair of Clinical Psychology Seattle Pacific University

Megan Goldenshteyn, Ph.D. Clinical Assistant Professor Department of Psychiatry & Behavioral Sciences University of Washington School of Medicine Center on Human Development and Disability Committee Member

Kathleen Tangenberg, Ph.D. Dean, School of Psychology, Family & Community Seattle Pacific University

Lynette Bikos, Ph.D. Professor of Clinical Psychology Seattle Pacific University Committee Member
# Table of Contents

Table of Contents ........................................................................................................... 2
List of Figures ................................................................................................................... 4
List of Tables ................................................................................................................... 5
Abstract ............................................................................................................................ 6

Chapter I ............................................................................................................................... 7
Introduction and Chapter Review ....................................................................................... 7
Autism Spectrum Disorder ................................................................................................. 9
  Overview ......................................................................................................................... 9
  Prevalence ...................................................................................................................... 10
  Etiology ........................................................................................................................ 10
  Developmental Course .................................................................................................. 11
Theory of Mind .................................................................................................................. 12
  Overview ......................................................................................................................... 12
  Development of ToM in TD Children ........................................................................... 13
  Development of ToM in Children with ASD ................................................................. 15
  Additional Factors in ToM ............................................................................................ 16
Assessing Theory of Mind ............................................................................................... 18
Affect Recognition and ToM ............................................................................................ 19
Parent Factors in Affect Recognition ................................................................................. 20
Current Study .................................................................................................................... 21

Chapter II ............................................................................................................................ 23
Method .............................................................................................................................. 23
  Participants .................................................................................................................... 23
  Procedures ..................................................................................................................... 25
  Measures ....................................................................................................................... 26

Chapter III .......................................................................................................................... 31
Results ............................................................................................................................... 31
  Data Entry and Preparation ......................................................................................... 31
  Power Analyses ........................................................................................................... 31
THEORY OF MIND IN CHILDREN WITH ASD

Data Screening ........................................................................................................................................ 32
Assumptions of Multiple Regression ........................................................................................................ 33
Statistical Analyses ..................................................................................................................................... 34
  Preliminary Analyses ............................................................................................................................... 34
  Test of Hypotheses .................................................................................................................................... 36
Ancillary Analyses ....................................................................................................................................... 40
  Theory of Mind .......................................................................................................................................... 41
  Emotion Recognition and Meta-emotion .................................................................................................. 43
  Thematic Analysis ..................................................................................................................................... 44
Chapter IV ..................................................................................................................................................... 48
  Discussion .................................................................................................................................................. 48
    Interpretation of Results ........................................................................................................................ 48
    Strengths and Limitations ....................................................................................................................... 54
    Conclusions and Future Directions ...................................................................................................... 55
References ..................................................................................................................................................... 58
List of Figures

Figure 1. Theoretical model ................................................................. 22
Figure 2. Statistical diagram of moderated mediation.............................. 36
Figure 3. Statistical diagram of mediating effect .................................... 38
Figure 4. Statistical diagram of moderating effect .................................. 39
Figure 5. Total participants and pass/fail at each level of the theory of mind tasks ...... 41
Figure 6. Participants by developmental status and pass/fail on theory of mind tasks .... 42
List of Tables

Table 1. Parent and child demographic characteristics by group .................................. 24
Table 2. Bivariate correlations for study variables .............................................................. 34
Table 3. Descriptive statistics for variables by group ......................................................... 35
Table 4. Hierarchical regression of affect recognition on status ......................................... 37
Table 5. Regression and indirect effect of status on ToM through affect recognition .... 39
Table 6. Conditional indirect effects .................................................................................... 40
Table 7. Mean characteristics of children who passed each ToM task.............................. 43
Table 8. Correlations between affect recognition errors and meta-emotion scores........... 44
Table 9. Thematic groupings of parent meta-emotion responses ........................................ 46
Table 10. Further thematic groupings of parents’ affirmative meta-emotion responses .. 47
Children with autism spectrum disorder (ASD) present with deficits in social communication and social interaction, as well as restricted and repetitive behaviors, interests, and activities. Theory of Mind (ToM) has been identified as a key factor in social development in both typically developing (TD) children and children with ASD. One proposed explanation for the deficits in social development characteristic in ASD is that deficits in ToM, particularly the ability to infer the mental states of self and others, results in impairments in social development. Researchers have found that affect recognition is a precursor in the development of ToM which occurs during early childhood. Researchers have also begun exploring parental factors that may influence affect recognition abilities in TD children and children with ASD. The current study sought to explore the moderating role of parent emotion coaching on the mediating role of affect recognition abilities on ToM in TD and children with ASD. The sample included 17 children ages 3:3 to 6:11 and one of their parents. ToM was measured using a battery of diverse belief and false belief tasks. Affect recognition was measured using the affect recognition subtest of A Developmental Neuropsychological Assessment (Korkman, Kirk & Kemp, 2007). Parent meta-emotion coaching was assessed with a semi-structured meta-emotion interview with the parent (Gottman, Katz, & Hooven, 1996). Results from main analyses did not find significant relations between developmental status and parent meta-emotion, affect recognition abilities, or theory of mind abilities. The moderated mediation model was not supported. Results from ancillary analyses indicated a majority of parents identified their child’s characteristics influenced their meta-emotion philosophies. However, parents of children with ASD were more likely to identify that their child’s characteristics made emotion socialization more difficult. Results indicated affect recognition abilities were positively related to age. Parents’ meta-emotion philosophies about their child’s regulation of emotions were negatively related to children’s overall affect recognition errors. Parent’s meta-emotion philosophies about their child’s regulation of sadness was also negatively related to child sadness recognition errors. Consistent with previous research, results demonstrated a trend of increasing difficulty through the battery of ToM tasks.

*Keywords:* autism spectrum disorder; theory of mind; affect recognition; parent meta-emotion
Chapter I

Introduction and Chapter Review

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by persistent deficits in social interactions and social communication as well as restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association; APA, 2013). Research in the domain of ASD is critical given that its prevalence has risen from 1 in 150 children in 2000 to 1 in 54 in 2016 (Centers for Disease Control and Prevention, 2020). Compared to the general population, individuals with ASD have a higher risk of developing co-morbid mental health disorders including anxiety, depression, and attention deficit hyperactivity disorder (McCauley et al., 2020; Stringer et al., 2020). Individuals with ASD also have worse outcomes in friendships and romantic relationships compared to the general population, including difficulties initiating and maintaining friendships, having less interest in friendships, and shorter duration of friendships (Hancock et al., 2019; Jamil et al., 2017). ASD has a significant behavioral, social, emotional and economic impact on families (Karst & Vaughan Van Hecke, 2012). In addition to the impact of ASD on families, there is also a high societal cost of caring for children with ASD (Lavelle et al., 2014).

Social communication and interaction are integral components of social cognition. Theory of Mind (ToM) has been identified as an important function in social-cognitive development in both typically developing children and children with ASD (Kimhi et al., 2014). Baron-Cohen and colleagues (1985) first proposed the ToM hypothesis to explain a key mechanism in the presentation of impaired social communication and interaction characteristic of ASD. The ToM hypothesis states that the social difficulties present in ASD may result from the inability to attribute mental states to self and others. These mental states include beliefs,
desires, intentions, imagination, and emotions. Many studies on ToM indicate that children with ASD demonstrate deficits in performance on these tasks compared to TD children (Pellicano, 2010). This research provides evidence that mastery of basic ToM tasks occurs in TD children at approximately age four or five years of age (Wellman et al., 2001). Previous research suggests that many factors influence the development of ToM.

Researchers have suggested that emotion perception ability is a key precursor to the development of ToM (Mitchell & Phillips, 2015). Adults and school-aged children with ASD demonstrate facial emotion recognition difficulties in comparison to their TD peers (Eack et al., 2015; Evers et al., 2015; Hudepohl et al., 2015). In addition, compared to TD peers, children with ASD who perform more poorly on a facial emotion recognition task performed more poorly on ToM tasks (Heerey, Keltner, & Capps, 2003; Trevisan & Birmingham, 2016). However, little research has been directed at identifying potential parent contextual factors that influence emotion recognition in children (Castro et al., 2015). A large body of research consistently demonstrates the relation between parent meta-emotion philosophy and emotion regulation in both TD children and children with ASD (Haven et al., 2014; Hooven et al., 1995; Wilson et al., 2014). One study suggested that meta-emotion philosophies (i.e., beliefs and values about emotions) of parents predicted their TD school aged child’s performance on an emotion recognition task (Castro et al., 2015).

In this study, I expanded on the body of literature examining factors in the development of ToM in children with ASD by investigating the roles of affect recognition and parent meta-emotion philosophy in preschool aged children with ASD and TD children. The findings from this study contribute to identifying novel areas of parent intervention to enhance the development of ToM in children with ASD.
Autism Spectrum Disorder

Overview

ASD is a neurodevelopmental disorder that persists throughout the lifespan and is characterized by deficits in social communication and social interaction in addition to restricted or repetitive patterns of behaviors, interests, or activities (APA, 2013). Deficits in social communication are evidenced by deficits in social reciprocity; nonverbal communication; and developing, maintaining, and understanding relationships (APA, 2013). Restricted, repetitive patterns of behaviors, interests, or activities include stereotypies or repetitive motor behaviors, insistence on sameness and inflexibility of routines, abnormally intense and highly restricted interests, and unusual sensory interest or aversion to environmental stimuli (APA, 2013). Individuals with ASD vary widely in the degree of severity of these symptoms, intellectual abilities, and in their functional outcomes across the lifespan (Baio et al., 2018; Lane et al., 2010; Szatmari et al., 2015).

Based on the highly heterogeneous nature of ASD, the severity of symptoms related to social communication and restricted, repetitive behaviors in ASD are specified according the degree of support required for daily functioning (APA, 2013). The term “ASD” encompasses previous categorical diagnoses of autistic disorder, Asperger’s disorder, and pervasive developmental disorder—not otherwise specified. Researchers have provided evidence that the aforementioned categorical diagnoses are better represented by a behaviorally defined continuum of impairments within the domains of social communication and interaction, and restricted, repetitive patterns of behaviors, interests, or activities causing clinically significant impairments in adaptive functioning (Bölte et al., 2011). Accurately identifying the symptom criteria of ASD
is critical in developing measures that are appropriately sensitive and specific (Frazier et al., 2011).

**Prevalence**

Obtaining accurate prevalence estimates is important to improve early identification and diagnosis of ASD. Early identification and diagnosis inform policies to optimize health spending on intervention resources for individuals with ASD (Frazier et al., 2011). The prevalence of ASD in the United States has risen sharply from 1 in 150 since 2010 (Centers for Disease Control and Prevention, 2018). The latest prevalence estimate of ASD in the United States was 18.5 per 1000 (1 in 54) children aged 8 years in 2016 (Centers for Disease Control and Prevention, 2018). There are several potential factors contributing to the increased prevalence rate including, changes in diagnostic criteria, improved detection and access to diagnostic services, and an actual increase in the frequency of ASD (APA, 2013). Data demonstrated that the prevalence rate of ASD in males is four times greater than in females (at 26.6 per 1000 boys vs. 6.6 per 1000 girls; Baio et al., 2018). However, researchers suggested that this disparity in prevalence between males and females is overstated due to the later age of diagnosis, under detection, and differing pattern of symptom presentation in females (Baio et al., 2018; Begeer et al., 2013; Mandy et al., 2012; Rutherford et al., 2016).

**Etiology**

The body of research examining the etiology of ASD suggests that there is no single clear cause for ASD. Instead, there is data to support the existence of numerous contributing risk factors. Some risk factors relate to environmental considerations whereas others relate to genetic contributions. Additionally, the interaction of environmental risk factors and genetic vulnerabilities may also contribute to risk of developing ASD (Modabbernia et al., 2017). There
are a number of environmental risk factors that contribute to the risk of developing ASD (Gardener et al., 2011). Research suggests that during the first trimester of pregnancy, prenatal exposure to valproate, selective serotonin reuptake inhibitors, and thalidomide significantly increases the risk of ASD (Christensen et al., 2013; Kobayashi et al., 2016; Strömland et al., 1994). Another well documented risk factor in ASD risk in children is advanced biological parent age (Wu et al., 2017). Recently, researchers have also documented an increased risk of ASD with increasingly disparately aged biological parents (Sandin et al., 2016).

In addition to environmental contributions, there are a number of genetic contributions to ASD. In 10-20% of ASD cases, genetic risk contributions include genetic syndromes, chromosomal deletions, chromosomal additions, and de novo copy number variations (Abrahams & Geschwind, 2008). This suggests that the etiology of ASD may be polygenic in nature (Gaugler et al., 2014; Risch et al., 1999). Despite the potential polygenic etiology of ASD, it remains one of the most genetically heritable neurodevelopmental disorders (Hallmayer et al., 2011). A meta-analysis examining ASD twin studies reveals heritability estimates ranging from 64-91% (Tick et al., 2015). Due to the diverse range of contributing risk factors to the etiology of ASD, it is critical to understand the resulting developmental courses and diverse range of functional implications in ASD.

**Developmental Course**

Differences in social attention, communication, and other social symptoms emerge as early as 6 months of age in children who are eventually diagnosed with ASD (Chawarska et al., 2013; Kozlowski et al., 2011). Eighty-five percent of parents and caregivers of children with ASD first reported concerns by age 36 months (Baio et al., 2018; Herlihy et al., 2015). However, less than half of these children had received a comprehensive ASD evaluation by 36 months.
(Baio et al., 2018). Despite the early onset of social differences and the availability of accurate and reliable measures for early diagnosis of ASD at 24 months of age, the average age of diagnosis is at 52 months of age (Baio et al., 2018; Chawarska et al., 2013; Macari et al., 2012). Early diagnosis is critical for access to early intervention to promote greater skill acquisition and reduced future functional impairment (Bradshaw et al., 2015). Children with ASD in the United States often access special education services such as speech/language therapy and occupational therapy throughout preschool, elementary, and secondary school (Wei et al., 2013). Across all ranges of intellectual functioning, individuals with ASD experience an initial increase in adaptive skills during early childhood, which is then followed by a plateau in adolescence (Meyer et al., 2018). Learning adaptive skills is critical given that individuals with ASD have the lowest rates of employment compared to individuals in other disability categories and that a minority of individuals with ASD achieve independent living (Shattuck et al., 2012; Steinhausen et al., 2016).

**Theory of Mind**

**Overview**

Researchers have identified theory of mind as a key normative function in social-cognitive development in TD children and children with ASD (Kimhi et al., 2014). Theory of mind was a term first coined by Premack and Woodruff (1978) to describe the theoretical construct regarding one’s ability to impute mental states to oneself and to others. These mental states include beliefs, feelings, intentions, and goals (Baron-Cohen et al., 1985). Findings from studies indicate that children with ASD often demonstrate deficits in performance on theory of mind tasks compared to TD children (Pellicano, 2010). Researchers have provided evidence that typically developing children begin developing theory of mind at around 18 months of age and
attain theory of mind around 3 to 5 years of age (Korkmaz, 2011). Based on these findings, researchers have hypothesized that theory of mind may be the primary underlying cause of social impairments in ASD (Baron-Cohen et al., 1985). Additionally, ToM appears to be an important predictor of a number of developmental outcomes in both TD children and children with ASD including social withdrawal, peer popularity, and peer rejection (Selcuk et al., 2018; Slaughter et al., 2015).

**Development of ToM in TD Children**

Longitudinal research demonstrates that precursors to demonstrating ToM on explicit tasks develop during infancy as early as 15 months through 48 months (Thoermer et al., 2011). These precursors demonstrate implicit understanding through anticipatory looking behaviors which suggests ToM develops in a continual manner (Thoermer et al., 2011). Findings from previous research suggest that preschool and early childhood (i.e., the first five years of life) are key developmental periods for ToM abilities (Baron-Cohen et al., 1985). The development of ToM appears to be predictable for TD children. By three years of age, children can identify that others have desires, beliefs and understandings that may differ from their own (i.e., diverse desires, diverse true beliefs) but do not comprehend that others may have false beliefs and understandings that differ from their own (i.e., diverse false beliefs; Perner et al., 1987; Wellman et al., 2001). Children can comprehend that others may have false differing beliefs and understandings from their own at four years of age and begin to anticipate actions based on these beliefs and understandings (Wiesmann et al., 2017). Further development of ToM occurs by age 5-6 such that children can understand that others may display emotions different from their own (Duh et al., 2016; Harris et al., 1989).
Previous research asserted that ToM abilities were fully developed in preschool/early childhood, however, emerging research is beginning to demonstrate that ToM abilities continue to develop throughout middle childhood and beyond (Weimer et al., 2017). In one study with a sample of 76 TD children age 6 to 8 ToM tasks, the researchers found a continued progression of ToM performance with increasing age when controlling for verbal ability (Calero et al., 2013). Another study also supports the argument for continued development of ToM beyond preschool. Researchers conducted a study with 230 children between the ages of 8 and 13 years and found that ToM scores increased significantly with age, while controlling for verbal ability and family socioeconomic status (Devine & Hughes, 2012).

Previous studies also provided evidence of a relation between development of ToM and executive functions (Duh et al., 2016; Kimhi et al., 2014; Pellicano, 2010). Executive functions refer to the higher order cognitive functions which contribute towards the development of goal directed behaviors (Kimhi et al., 2014). The planning and cognitive shifting components of executive functions have been found to positively predict ToM performance in both TD children and children with ASD (Kimhi et al., 2014). Longitudinal research provided evidence that executive function predicts ToM performance during the period from 4 to 7 years of age but not during early and middle childhood (Pellicano, 2010; Devine et al., 2016). This highlights the importance of investigating ToM during the preschool years.

The development of ToM abilities has critical implications on the development of social competence, emotion regulation abilities, and social adaptive functioning in early childhood goals (Korucu et al., 2017). A longitudinal study with a sample of 137 participants found moderate positive correlations between ToM performance at age 6 and teacher ratings of social competence at age 10 (Devine et al., 2016). The researchers also found that earlier false belief
ToM tasks that required children to identify their own and others’ false beliefs at age 6 predicted performance on more complex batteries of ToM tasks at age 10 (Devine et al., 2016).

In addition to predicting critical emotion regulation abilities in early childhood, ToM also appears to predict more complex social behaviors. In a meta-analytic study comprised of 76 studies and 6,432 TD children between ages 2 to 12 years, researchers found that children with higher ToM scores received higher scores on measures of prosocial behaviors (Imuta et al., 2016). These higher order social behaviors included helping, cooperating, and comforting (Imuta et al., 2016).

**Development of ToM in Children with ASD**

Compared to their TD peers, children with ASD demonstrate poorer performance on ToM measures and poorer teacher reported social competence in peer interaction (Peterson et al., 2015). Even when intellectual abilities are statistically controlled for, preschool aged TD children outperform children with ASD in both false belief tasks and affective perspective taking tasks that assess for ToM (Kimhi et al., 2014). Researchers found support for a mediating role of ToM in the relation between ASD and social skills deficits in 107 children between the ages of 5 and 13 years of age (Pino et al., 2017). Pino and colleagues (2017) found that children with ASD demonstrated a deficit in both social skills and ToM. Although findings from previous research suggest a strong relation between ToM and executive function skills (Duh et al., 2016; Kimhi et al., 2014; Pellicano, 2010), more recent research suggests that for adolescents with ASD, ToM abilities, but not executive function skills were directly related to social communication symptoms and restricted, repetitive behaviors characteristic of ASD (Jones et al., 2018). Given the high co-morbidity of attention deficit hyperactivity disorder and ASD, Lukito and colleagues (2017) clarified the relations amongst executive function abilities and ToM performance in...
adolescents with ADHD. Lukito and colleagues (2017) found that impairments in ToM abilities were associated with ASD symptoms, whereas executive function abilities were associated with attention deficit hyperactivity disorder symptoms even after controlling for intelligence quotient. These findings support the ToM hypothesis of ASD that, deficits in ToM uniquely predict the social communication and interaction difficulties in ASD (Baron-Cohen et al., 1985). Research examining the developmental progression of ToM performance with TD children and children with ASD provides evidence that children with ASD experience delayed onset in developing ToM abilities and also develop ToM abilities at a slower rate than children with TD (Pino et al., 2017).

Additional Factors in ToM

Researchers have found evidence for numerous other factors that influence the development of ToM. These factors will be discussed here to provide rationale for statistically controlling for those factors. Key factors of gender, language, and executive function in ToM abilities will be discussed here.

Gender differences in ToM performance appear to be persistent across childhood. One study examined ToM in TD children aged 6 to 8 years using old a battery of ToM tasks (Calero, et al., 2013). The researchers found that females across the 6 to 8 age range demonstrated significantly better performance on ToM tasks than males (Calero et al., 2013). Evidence has also been provided regarding gender differences in ToM at the neurological level. The medial prefrontal cortex has been implicated in serving a role in social cognition, particularly ToM (Van Overwalle, 2009). Researchers demonstrated that females demonstrate superior performance to males using transcranial brain stimulation techniques of the medial prefrontal cortex in a sample
of 32 participants (Adenzato et al., 2017). These findings suggest that gender is a variable that should be statistically controlled for in the analyses of the current study.

Language ability has been identified as a key factor in predicting theory of mind in both TD children and children with ASD (Milligan et al., 2007). One meta-analysis based on 104 studies has found moderate to large effect sizes of language on theory of mind ability for TD children, even when controlling for age. In addition, based on longitudinal studies, it appears that early language ability in TD children is a precursor to theory of mind and predicts theory of mind ability in later years (Astington & Jenkins, 1999). Astington and Jenkins (1999) asserted that language and theory of mind may even be fundamentally related and interdependent.

Similar findings have been demonstrated in samples of children with ASD. Paynter and Peterson (2010) examined the influence of language ability, specifically lexical and syntactic ability, on ToM in children ages 5 to 12 with high functioning ASD or Asperger syndrome compared to their age matched TD peers. The researchers assessed these variables using several false belief tasks, a vocabulary test, and a test for receptive grammar. Findings revealed that children with high functioning ASD performed more poorly on the theory of mind tasks compared to their TD peers and peers with Asperger syndrome (Paynter & Peterson, 2010). Furthermore, evidence was found that syntactic ability was more positively related to theory of mind for children with high functioning ASD than lexical ability in language.

Scheeren and colleagues (2013) also identified convergent findings. This study compared theory of mind performance between school aged TD children and children with high functioning ASD (Scheeren et al., 2013). Scheeren and colleagues (2013) used several different theory of mind measures including a false belief, display rule understanding and a sarcasm understanding task and a vocabulary test to assess for language ability. When controlling for age,
it was found that theory of mind was positively related to language ability. This was expected given the highly verbal nature of the theory of mind tasks (tasks involved answering questions based on complex written vignettes). These findings suggest that language should be a variable that is controlled for in the current study.

**Assessing Theory of Mind**

There is a great deal of diversity in methods of theory of mind assessment in terms of task complexity as well as the nature of tasks (i.e., explicit versus implicit assessment). In addition to issues with the lack of clarity around using explicit versus implicit measures of theory of mind, the false belief task has also been under heavy criticism in the realm of social psychology (Bloom & German, 2000). Previous research has provided evidence that individuals with ASD may acquire explicit social cognition skills or knowledge through learning and experience but nonetheless demonstrate deficits in implicit social cognition. This allows adolescents with ASD to perform comparably to their TD peers on explicit social cognition tasks but not implicit social cognition tasks (Callenmark et al., 2014). Tests of ToM may be categorized into explicit or implicit tasks (Low & Perner, 2012). Most classical measures of ToM involve direct explicit measurement of ToM (Low & Perner 2012).

Callenmark et al. (2014) compared adolescents with ASD to TD their peers, matched on sex, age, and vocabulary, on explicit and implicit performance on a social cognition task. Explicit and implicit social cognition performance was assessed with the Dewey Story Test. Callenmark et al. (2014) found that with regards to the explicit component of the task, adolescents with ASD performed comparably to the TD adolescents. However, adolescents with ASD performed more poorly than their TD peers on the implicit component of the task. These findings suggest that different tasks may assess different aspects of social cognition which may
influence either the absence or presence of deficits in social cognition characteristic of ASD. The study by Callenmark et al. (2014) did not directly address performance on explicit and implicit ToM tasks within the domain of social cognition. A study by Begeer et al. (2011) provided evidence supporting differential explicit versus implicit ToM abilities of children with ASD. Begeer et al. (2011) empirically evaluated a manualized ToM skills training treatment applied to pre-adolescent children with ASD. Supporting the suggestion that individuals with ASD can acquire social cognition skills through learning and experience, an improvement on explicit ToM skills related to reasoning about one’s own and others’ mental states was demonstrated. However, Begeer et al. (2011) did not find any significant improvements on skills indicative of implicit ToM such as emotion perception, emotion recognition, self-reported empathic skills and parent reported social behavior. These findings highlight the importance of considering the nature of ToM tasks when evaluating the performance of children with ASD. This also suggests that there may be a learning gap for individuals with ASD in transitioning between explicit ToM skills in early childhood and developing implicit ToM skills in adolescence and beyond. This is critical in navigating an increasingly complex and demanding social environment as individuals with ASD age.

**Affect Recognition and ToM**

Affect recognition refers to the ability to identify information about emotions from the environment (Phillips, 2003). This information may include verbal (e.g., words, intonation) and non-verbal (i.e., facial, body movement) cues. Affect recognition has been described as a cognitive process that is a precursor to ToM in models of social information processing (Beer & Ochsner, 2006; Chakrabarti & Baron-Cohen, 2006). Affect recognition is conceptualized as a low-level process that attends to and decodes social cues from the environment, whereas ToM is
a higher-level process in which the social cues are integrated and interpreted (Chakrabarti & Cohen, 2006). Individuals with ASD demonstrate significantly poorer performance on tasks of affect recognition across all six primary emotions (i.e., fear, surprise, anger, disgust, happiness, and sadness) than TD individuals over the course of development (Lozier et al., 2014). Furthermore, these deficits in performance appear to increase in magnitude over the course of development (Lozier et al., 2014). During the psychological assessment and diagnosis of ASD, both low level static (i.e., measures of affect recognition) and higher level socially dynamic social information processing measures are used (i.e., measures of ToM). Affect recognition may serve as an important mechanism through which ToM deficits in ASD produce social communication and interaction deficits.

**Parent Factors in Affect Recognition**

Affect recognition skills are part of a complex process of socialization of emotions. Parents are a primary agent for TD children’s socialization. The way in which parents react to their TD children’s emotions acts as a strong method of socializing their emotional knowledge and beliefs (Eisenberg et al., 1998). Researchers also found that in addition to parents’ reactions to their children’s emotions, parents’ reactions and thoughts also influence children’s emotion socialization. In research, the term meta-emotion is used to describe parents’ cognitions and feelings regarding their own affect and their child’s affect (Gottman et al., 1996).

In a study with 69 parent child dyads with children between the ages of 8 and 11, parents’ beliefs about children’s emotions and children’s affect recognition skills were assessed. Parent’s beliefs were assessed using a self-report questionnaire and observations during a game designed to elicit emotion-related conversation. Children’s affect recognition skills were also assessed through evaluating the accuracy of identifying their parents’ emotions in a video (Castro et al.,
2015). Parent’s beliefs and behaviors regarding children’s emotions positively predicted children’s affect recognition abilities in this study. Parent beliefs about emotions have also been demonstrated to influence more complex forms of emotion understanding in school-aged children including contextually changing emotions of self and others in vignettes that elicit emotional responses (Garrett-Peters et al., 2016). Previous research has compared meta-emotion in parents of TD children and parents of children with developmental disabilities (Paterson et al., 2012). The findings from this research find that parents of children with developmental disabilities differ from parents of TD children in that they uniquely experienced a dimension regarding feelings of uncertainty or ineffectiveness in emotion socialization of their children. This provides a basis to begin examining potentially novel pathways to interventions that enhance ToM and through this, social interaction and communication skills.

**Current Study**

In the current study, I proposed there would be an indirect effect of developmental status on ToM through affect recognition as moderated by parent meta-emotion (see Figure 1). I hypothesized that children with ASD will have worse affect recognition abilities than TD children (Hypothesis 1). Children with ASD are also hypothesized to have worse ToM skills compared to TD children (Hypothesis 2). I hypothesized that the relationship between status and affect recognition will depend on the level of parent meta-emotion. Higher meta-emotion scores will buffer the effect of developmental status on affect recognition performance (Hypothesis 3). An indirect effect of status on ToM will exist through affect recognition. I hypothesized that having ASD will predict worse ToM performance through worse affect recognition performance (Hypothesis 4). Lastly, I hypothesized an indirect effect of developmental status on ToM
performance through affect recognition performance as moderated by parent meta-emotion (Hypothesis 5).

*Figure 1.* Theoretical model of the current study.
Chapter II

Method

Participants

The current study was conducted as part of a larger on-going study (Study of Autism and Self-Regulation). Children between 3:0 years and 6:11 years of age were recruited. One parent or primary caregiver was also included in the study. Data collection occurred from April 2018 and continued until COVID-19 restrictions occurred in March 2020. Children in the ASD group required documentation of a diagnosis previously rendered by an external provider (e.g., primary care physician or psychologist) of ASD, autism, Asperger’s, or pervasive developmental disorder – not otherwise specified. Exclusion criteria for children in the TD group included having high scores on ASD screening measures, or a sibling with an ASD, autism, Asperger’s, or pervasive developmental disorder – not otherwise specified diagnosis. Exclusion criterion for children in both the TD and ASD group was having a standard score below 85 on the Verbal Cluster within the Early Years core battery of the Differential Ability Scales-II (DAS-II; Elliot, 2007). These exclusion criteria were established by the larger study.

The current sample included $N = 17$ parent child dyads (ASD, $n = 6$; TD, $n = 11$). Children ranged in age from 3:3 to 6:11 and a majority of children were male. The primarily male sample of children who participated in this study is representative of the disproportionate representation of males with ASD in the general population (Loomes, Hull, & Mandy, 2017) but not representative of the general TD sample (U.S. Census, 2018). Most parents who participated in the study were female. The demographic characteristics between TD and ASD groups did not differ significantly except for verbal ability. Demographic characteristics of the sample population reveal participants were generally more well educated and had a higher household
income than compared to data of the U.S. population (U.S. Census, 2018). In addition, African American/Black, American Indian/Alaska Native, and Hispanic/Latinx were not adequately represented in the sample for the current study. Additional demographic information for parents and children is presented by group (ASD vs. TD) in Table 1.

Table 1.

<table>
<thead>
<tr>
<th>Parent and Child Demographic Characteristics by Group</th>
<th>ASD</th>
<th>TD</th>
<th>t/χ²</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>6</td>
<td>11</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Average Age in Months (SD)</td>
<td>66.17 (11.97)</td>
<td>52.27 (13.79)</td>
<td>-2.072</td>
<td>57.18 (14.51)</td>
</tr>
<tr>
<td>Age Range in Months</td>
<td>49-83</td>
<td>39-81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex, n (% male)</td>
<td>4 (66.67)</td>
<td>7 (63.63)</td>
<td>.901</td>
<td>11 (64.71)</td>
</tr>
<tr>
<td>Average Verbal Ability (SD)</td>
<td>101.33 (8.59)</td>
<td>118.18 (14.37)</td>
<td>2.607*</td>
<td></td>
</tr>
<tr>
<td>Verbal Ability Range</td>
<td>93-112</td>
<td>102-149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Race, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian/White</td>
<td>4 (66.67)</td>
<td>9 (81.82)</td>
<td></td>
<td>13 (76.47)</td>
</tr>
<tr>
<td>African American/Black</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td>0 (0)</td>
</tr>
<tr>
<td>Hispanic/Latinx</td>
<td>1 (16.67)</td>
<td>0 (0%)</td>
<td></td>
<td>1 (7.69)</td>
</tr>
<tr>
<td>Asia /Pacific Islander</td>
<td>0 (0%)</td>
<td>1 (9.09)</td>
<td></td>
<td>1 (7.69)</td>
</tr>
<tr>
<td>Multiracial/Other</td>
<td>1 (16.67)</td>
<td>1 (9.09)</td>
<td></td>
<td>2 (11.67)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parent Characteristics</th>
<th>ASD</th>
<th>TD</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, n (% female)</td>
<td>0 (0)</td>
<td>3 (27.27)</td>
<td>.159</td>
<td>3 (17.65)</td>
</tr>
<tr>
<td>Relationship Status, n (%)</td>
<td></td>
<td></td>
<td>.446</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>6 (100)</td>
<td>10 (90.90)</td>
<td></td>
<td>16 (94.12)</td>
</tr>
<tr>
<td>Never Married/Single</td>
<td>0 (0)</td>
<td>1 (9.09)</td>
<td></td>
<td>1 (5.88)</td>
</tr>
<tr>
<td>Reported Household Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Income, $ (SD)</td>
<td>152,700 (85,914)</td>
<td>150,500 (117,045)</td>
<td>.034</td>
<td>152,071 (90,954)</td>
</tr>
<tr>
<td>Missing Data, n (%)</td>
<td>1 (16.67)</td>
<td>2 (18.18)</td>
<td></td>
<td>3 (17.65)</td>
</tr>
<tr>
<td>Education Level, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some College Coursework</td>
<td>1 (16.67)</td>
<td>0 (0)</td>
<td></td>
<td>1 (7.69)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>2 (33.33)</td>
<td>2 (18.18)</td>
<td></td>
<td>4 (23.52)</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>2 (33.33)</td>
<td>7 (63.63)</td>
<td></td>
<td>9 (52.94)</td>
</tr>
<tr>
<td>Some Professional Coursework</td>
<td>1 (16.67)</td>
<td>0 (0)</td>
<td></td>
<td>1 (7.69)</td>
</tr>
<tr>
<td>Professional Degree</td>
<td>0 (0%)</td>
<td>2 (18.18%)</td>
<td></td>
<td>2 (11.67%)</td>
</tr>
</tbody>
</table>

Note. *p<0.05
Procedures

**Recruitment.** Participants were recruited locally through schools, hospitals, ASD treatment clinics, our social media page, posting boards, and ASD focused events. Participants were provided general information about the study via phone or email prior to scheduling an enrollment visit. During the enrollment visit, the child participant was verified that they met enrollment criteria, and a university visit was scheduled.

**Enrollment visit.** The enrollment occurred at a location of the family’s choosing (i.e., family home, library, or Study of Autism and Self-Regulation laboratory). Parent consent and child assent were obtained at the beginning of the enrollment visit. Children were administered a battery of measures including the verbal ability measure and the affect recognition measure. Parents responded on a demographics and health history questionnaire about their family that is part of a battery of questionnaires included in the larger study. The enrollment visit took approximately 70-120 minutes. Once it was verified that the child met the eligibility criteria for verbal ability, families were scheduled for the university visit.

**University visit.** The university visits took approximately 120-240 minutes and were conducted at the Study of Autism and Self-Regulation laboratory. During the university visit, children were administered another battery of measures as part of the larger study, while parents participated in the meta-emotion interview. Families were given $50 in cash and a $5 coffee card for their participation in the study at the conclusion of the university visit. Children also received stickers, edible reinforcers, and a small toy for their participation in the study. This study was conducted in accordance with the procedures approved by the university Institutional Review Board.
Measures

**Verbal ability.** Verbal ability was measured using the Verbal Comprehension and Naming Vocabulary subtests from the Verbal Cluster of the Early Years Battery (ages 2:6-6:11) of the DAS-II. These subtests assess receptive and expressive language abilities, respectively. Correct responses were scored as “1,” and incorrect responses were scored “0”. The sum of the scores from the responses of a given item set were converted into an ability score, and then converted into T scores. The T scores of the Verbal Comprehension and Naming Vocabulary subtests were then summed and converted to a standard score. Participants were only eligible for the larger study if they obtained a standard score of 85 or greater. Verbal ability served as a control variable in later analyses.

The standardization sample of the DAS-II comprised of 3,480 individuals from the United States between the ages of 2:6 and 17:11 years of age. The internal consistency for the Verbal Cluster were found to be good, with coefficients between .86 and .93 (Elliot, 2007). The DAS-II has strong correlations with other measures of cognitive ability including the Weschler Intelligence Scales for Children Fourth Edition and the Wechsler Preschool and Primary Scale of Intelligence Fourth Edition which demonstrates concurrent validity (Elliot, 2007).

**Theory of mind (ToM).** Participants’ ToM abilities were assessed using three different tasks. The first task assessed for recognition of diverse beliefs in others. The participant was shown a doll and a picture of a house and bushes. The participant was told that the cat is hiding in the house or the bushes and doll wants her cat. The participant was asked where they would look for the cat. The participant was told that the doll thinks the cat is in the location opposite to the child’s choice. The participant was asked where the doll would look for her cat. One point
was allotted for responding that the doll would look for her cat in the opposite location of what the participant stated.

The second task assesses for recognition of self and others’ false beliefs. The participant was shown a tube labelled as chocolate. The participant was asked what they think is in the tube. The participant was then shown that the contents of the tube is crayons. The participant was asked what is inside the tube to confirm the participant comprehends the reality of the contents in the tube (crayons). The participant was also asked about what they initially thought was in the tube to ensure that the child accurately remembers their initial response (chocolate). The participant was told that a girl comes along and has not seen inside the tube and was asked what the girl will think is inside the tube (one point is assigned for responding “chocolate”). If the participant failed either the memory control or the reality test questions, the participant received a score of 0. If the participant correctly responds to the memory control and the reality control test questions in addition to the question about what the girl thinks in the tube, then a score of 1 was assigned. The last question asks, how would the girl feel, if an emotion congruent response is provided (e.g., mad, sad, disappointed), the participant received an additional point.

The last task administered assesses for others’ false beliefs in a situation of a changed location. The participant was shown two dolls named Sally and Anne. The participant was asked to correctly identify each of the dolls by name. Sally has a favorite teddy bear that the participants observe is placed into a basket for safekeeping before Sally leaves to go and play. While Sally was playing, the participants observed Anne move the teddy bear into a box. The participants were asked where Sally will look for the bear when she returns (a score of 1 is assigned for responses that indicate Sally would look for the teddy bear in the basket). To ensure accurate perception of reality and memory, the participants were also asked where the bear is
actually located and where it was located initially. The participants received a score of 0 if they do not answer these questions correctly (even though they may have correctly answered the question regarding where Sally would look for the bear). The last question asks, how would Sally feel, if an emotion congruent response is provided (e.g., mad, sad, disappointed), the participant received an additional point. The sum of scores from all three tasks (ranging from 0-5) comprised each participant’s overall ToM score. Batteries of ToM tasks have been shown to have very high internal consistency ($\alpha = .98$) for assessing both TD children and children with ASD (Hutchins, Prelock, & Bonazinga, 2012). Batteries of ToM measures also demonstrate criterion validity in that increases in scores are significantly correlated with increases in age (as it is well studied that the development of ToM occurs in early childhood and continues beyond late childhood; Hutchins et al., 2012).

**Affect recognition.** The ability to recognize facial expressions was measured using the Affect Recognition subtest of A Developmental Neuropsychological Assessment (NEPSY-II; Korkman, Kirk & Kemp, 2007). This subtest assesses the ability to recognize happy, sad, angry, fear, disgust, and neutral facial expressions from photographs of children’s faces in three different tasks. In one task, the participant was required to identify if two photographs depict faces with the same affect. In the next task, the participant selects two photographs of faces with the same affect from a selection of three to four photographs. In the last task, the participant selects one of four photographs of faces that matches the affect of a single photograph presented at the top of the page. Correct responses were scored as “1” and incorrect scores are scored as “0”. Scores are summed and then converted into a scaled score based on age norms. Errors were also counted by emotion (i.e., sad, angry, disgust, happy, neutral, fear).
The nationally representative (based on the 2003 U.S. Census) standardization sample of the NEPSY-II comprised of 1,200 children ages 3:0 to 16:0 years. The internal consistency coefficients for children aged 3 to 6 years ranged from .64 to .80 for the affect recognition subtest. The affect recognition subtest has very low correlations with measures of intellectual functioning from the WISC-IV which provides evidence for discriminant validity.

**Parent meta-emotion.** Parent meta-emotion across all seven dimensions was assessed for using a semi-structured interview designed by Gottman, Katz, and Hooven (1996). This interview was audio recorded and took approximately 1 hour to complete with the parent of the child participant. Parents verbally responded to the same set of questions for three emotions (i.e., sadness, fear, and anger) in their children. Parent’s verbal responses were ranked by coders according to the following Likert-type scale: strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1, or don’t know = 0. An example of an item coded is “parent teaches rules for appropriate expression to the child.” Seven dimensions were assessed (a) parent’s awareness of their own emotion; (b) parent’s acceptance of their own emotion; (c) parent’s regulation of their own emotion; (d) parent’s awareness of their child’s emotion; (e) parent’s acceptance of their child’s emotion; (f) parent’s coaching of their child’s emotion; and (g) parent’s regulation of their child’s emotion. The number of items for each dimension ranged from 9-12 items. Total meta-emotion score and dimension scores across all three emotions were calculated using Gottman and colleague’s scoring Version A protocol. Higher scores indicated better emotion awareness, acceptance, regulation, or coaching by parents. At the end of the meta-emotion interview, parents were asked if their child’s characteristics influence their meta-emotion philosophies. The responses to the final question do not factor into the overall scores.
The audio recordings were coded by a primary coder according to the meta-emotion coding system as outlined by Gottman and colleagues (1996). Reliability coding was conducted every five participants with a secondary coder to ensure a minimum agreement of 0.80 (Landis & Koch, 1977). Coder 1 and 2 met average interrater reliability of 0.84 across the reliability cases. This was comparable to original interrater reliabilities reported by Gottman and colleagues (1996) which ranged from 0.61 to 0.88 across the seven dimensions (i.e., parent awareness, parent acceptance, parent regulation of emotion, and awareness, acceptance, coaching, and regulation of their child’s emotion) comprising the total meta-emotion score.
Chapter III

Results

Data Entry and Preparation

Data were collected and entered into SPSS version 26.0 and analyzed using the PROCESS macro add-on (Hayes, 2012). Demographic variables entered were: (a) child verbal ability (continuous variable, entered as standard score); (b) child gender (dichotomous variable, female=0, male=1); (c) child chronological age (continuous variable, entered in months); (d) child race (categorical variable, White/Caucasian = 1, Black/African American = 2, Hispanic/Latinx = 3, Native American/Alaskan Native = 4, Asian/Pacific Islander = 5, Multiracial = 6); (e) parent relationship status (categorical variable, legally married/living with spouse = 1, separated = 2, divorced = 3, widowed = 4, never married/single = 5, unmarried/living with partner = 6; (f) parent education (categorical variable, less than high school degree = 1, high school degree = 2, some college coursework = 3, bachelor’s degree = 4, some master’s = 5, master’s degree = 6, some professional schooling beyond master’s = 7, completed professional degree = 8); (g) parent gender (dichotomous variable, female = 0, male = 1); (h) household income (continuous variable, entered in dollars). The independent variable, developmental status, was entered as a dichotomous variable (TD = 0, ASD = 1). The mediator, affect recognition, and moderator, parent meta-emotion, and dependent variable, ToM, were entered as continuous variables.

Power Analyses

A priori analysis of power was conducted using G*Power (Faul et al., 2009), a statistical calculator software. The following six predictors were included in the power analysis: child’s developmental status, parent meta-emotion, child affect recognition, child gender, child age, and
verbal ability. Child gender, age, and verbal ability were control variables in this analysis. A Cohen’s effect size of 0.2 was entered into the calculator, as was consistent with large effect sizes from previous research (Rødgaard et al., 2019). The alpha level was entered as 0.05 and the power level as 0.80. Based on the criteria entered in the calculator, a sample size of 59 was required to achieve adequate power. The final sample used in the study was comprised of 17 participants, which is below the sample size required to achieve adequate power (0.80). Due to the small sample size, ancillary analyses that were more appropriate for small sample sizes are included for this study following the planned analyses.

**Data Screening**

Prior to data analysis, data were screened for missingness and outliers. All data related to the independent, control, moderating, mediating, and dependent variables were determined to be complete. All demographic data were complete except for household salary (three parents opted out of responding to the household salary question). The data was screened for outliers through visual inspection of boxplots and verified by calculating Cooks Distance values. Inspection of boxplots and Cooks Distance greater than 1 revealed one outlier in the ASD group (Cooks Distance = 3.85) on total parent meta-emotion scores. The outlier was examined at an item level basis and both revealed consistently low scores across items on all three dimensions. This outlier was determined to be a score reflecting variability in the sample population and was included. No cases were identified as outliers on boxplots and no cases had a Cooks Distance greater than 1 (Field, 2013) on affect recognition scores. Per recommendations by Hayes (2013), bootstrapping was used as method due to its resistance to outliers.
Assumptions of Multiple Regression

To conduct multiple regression analyses, the assumptions of linearity, homoscedasticity, independence, normality, and multicollinearity must be examined for each continuous variable to ensure that they are not violated. Developmental status was a dichotomous variable, so the assumptions were analyzed by group, TD = 0 and ASD = 1.

**Linearity.** The assumption of linearity requires that a linear (and not a quadratic or cubic) relationship exists between predictor variables and the dependent variable. Data were graphed as scatterplots with best fitting lines and visually inspected by group, all data appeared linear. The residuals and predicted values of the data points of the outcome variable were graphed in a scatter plot and inspected. The data points were confirmed to be randomly and evenly dispersed around zero. The assumption of linearity was met.

**Homoscedasticity.** To verify that the data met the assumption of homoscedasticity, the variance of the residuals must be constant across all values of the independent variable (Field, 2013). To ensure this, the data were visually examined and appeared evenly dispersed around the regression line without outliers on the graph of the partial plots. The assumption of homoscedasticity was met.

**Independence.** The assumption of independence requires residuals to be independent of one another. The Durbin-Watson test was employed to test the dependence between residuals, where values less than one or greater than three suggest residual dependence (Field, 2013). The Durbin-Watson value for the TD (Durbin-Watson value = 1.88) and ASD (Durbin-Watson value = 1.06) group fell between 1 and 3 which suggests residual independence, thus meeting the independence assumption.
**Normality.** The assumption that there is the normal distribution of data was analyzed using visual examination of histograms and P-P plots. The histograms of residuals appeared to be distributed in a bell-shaped curve and the z-scores fell closely along the diagonal line on P-P plots. This indicated normal distribution of the data and thus, the assumption of normality was met.

**Multicollinearity.** Predictors should not be strongly correlated with one another as it increases the difficulty to assess the influence of the predictor variables on the dependent variable (Field, 2013). Multicollinearity was examined during preliminary correlational analyses (see Table 2). No predictors were strongly correlated (i.e., $r = .80$), therefore no multicollinearity was present.

**Statistical Analyses**

**Preliminary Analyses**

Preliminary analyses of correlations between variables were conducted to identify potential covariates related to the variables of interest (see Table 2). Covariates previously identified by research included child verbal ability, child age, and child gender (Adenzato et al., 2017; Calero et al., 2014; Paynter & Peterson, 2010). These previously identified covariates were not correlated with the variables of interest and were not included as covariates in subsequent analyses. In examining Pearson’s bivariate correlations for the other study variables, child’s age was significantly correlated with children’s affect recognition scaled scores ($r = .79, p < 0.01$). Child age was controlled for in subsequent analyses.

<table>
<thead>
<tr>
<th>Table 2. Bivariate Correlations for Study Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>1. Status</td>
</tr>
<tr>
<td>2. Age</td>
</tr>
<tr>
<td>3. Child Gender</td>
</tr>
</tbody>
</table>
THEORY OF MIND IN CHILDREN WITH ASD

4. Verbal Ability - .56* .03 .05
5. Affect Recognition - .26 .79** -.08 .16
6. ToM Score - .25 .32 -.28 .37 .39
7. Parent MEI Score - .22 -.19 -.31 -.18 -.13 -.18
8. Household Income -.01 .13 -.20 -.26 -.06 .07 -.35
9. Parent Gender - .34 -.19 .02 1.64 -.01 .13 -.14 -.01

Note. N = 17; Verbal Ability = Differential Ability Scale, Second Edition Verbal Ability standard score; Affect Recognition = A Developmental NEuroPSYchological Assessment, Second Edition Affect Recognition scaled score; ToM Score = Theory of Mind total score. *p < .05, **p < .01

Descriptive analyses (i.e., means, standard deviations, range, t-tests, and effect sizes) of the variables affect recognition, ToM, and MEI are presented in Table 3. No significant group differences (TD vs. ASD) were found for these variables. Children and their parents from the ASD and TD groups did not differ significantly in demographic characteristics except for average verbal ability (see Table 1). TD children had significantly higher average verbal ability than children with ASD (t = 2.607, p = 0.02). The effect size (d = 1.42) was large. This difference that children with ASD tend to score more poorly on measures of verbal ability, is well documented in research (Kwok et al., 2014).

Table 3.
Descriptive Statistics for Variables by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>ASD (n = 6)</th>
<th>Status</th>
<th>TD (n = 11)</th>
<th>t</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Range (min, max)</td>
<td>Mean (SD)</td>
<td>Range (min, max)</td>
<td></td>
</tr>
<tr>
<td>ARS</td>
<td>14.83 (1.86)</td>
<td>11, 19</td>
<td>12.64 (4.61)</td>
<td>6, 20</td>
<td>-1.03</td>
</tr>
<tr>
<td>ToM</td>
<td>2.33 (1.75)</td>
<td>1, 5</td>
<td>3.18 (1.66)</td>
<td>1, 5</td>
<td>.99</td>
</tr>
<tr>
<td>MEI</td>
<td>867.51 (67.19)</td>
<td>751.20, 950.42</td>
<td>892.54 (48.54)</td>
<td>781.13, 954.02</td>
<td>.86</td>
</tr>
</tbody>
</table>

Note. ARS = A Developmental NEuroPSYchological Assessment, Second Edition Affect Recognition scaled score; ToM = Theory of Mind total score; MEI = Parent MEI total score. *p < .05
Test of Hypotheses

The PROCESS macro Model 7 in SPSS was used to conduct data analysis (Hayes, 2012; see Figure 2.). The associations between developmental status, parent emotion coaching, affect recognition, and ToM were examined in a piece meal manner.

![Diagram](image)

Figure 2. Statistical diagram of the moderating effect of parent emotion coaching on the mediation relationship of affect recognition between status and theory of mind.

The first hypothesis stated children in the ASD group would have lower affect recognition scores than children in the TD group. This hypothesis was tested using hierarchical linear regression. Child age was correlated with affect recognition scores and was entered as a control variable in the first step. Child age significantly predicted affect recognition scores and accounted for 63% of the variance in the model, indicating that as the age of the child increased, affect recognition scores also increased. In the second step, developmental status was entered as
the independent variable with affect recognition as the dependent variable. Developmental status did not significantly predict children’s affect recognition scores, accounting for an additional 2% of the variance in the model. The hypothesis was not supported, developmental status did not predict affect recognition scores while controlling for child age. \( F(2, 15) = 12.76, p = 0.42, R^2 = 0.65, \beta = -0.15 \). See Table 4 for regression coefficients.

Table 4.  
Hierarchical Regression: Affect Recognition Regressed on Developmental Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>( \beta )</th>
<th>( R^2 )</th>
<th>( F )</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.23</td>
<td>0.05</td>
<td>0.79</td>
<td>0.63</td>
<td>25.37*</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td>0.65</td>
<td>12.76</td>
<td>0.02</td>
</tr>
<tr>
<td>Status</td>
<td>-1.27</td>
<td>1.54</td>
<td>-0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N = 17. Age = Child’s Age in Months; Status = Developmental Status (TD = 0, ASD = 1).  
*p < .05

The second hypothesis stated developmental status would have a negative relationship with ToM scores (children with ASD would have worse ToM performance than children with TD). This hypothesis was tested using regression. No control variables were identified for ToM scores in the bivariate correlation analyses (see Table 2), therefore, no control variables were entered. The hypothesis was not supported, developmental status did not predict ToM scores, \( F(1, 15) = 0.98, p = 0.34, \beta = -0.25, R^2 = 0.06 \).

The third hypothesis stated higher parent meta-emotion scores would buffer the effect of developmental status on affect recognition scores (see Figure 3). This was assessed using the PROCESS macro, model 7 in SPSS (Hayes, 2013). ToM was entered as the dependent variable, affect recognition was entered as the mediator, and developmental status was entered as the independent variable. Parent meta-emotion was entered as the moderator. Child age was entered as a covariate. Bootstrapping using 5,000 samples was used to estimate the confident intervals.
for the interaction effect. The hypothesis was not supported, the interaction was not significant, parent meta-emotion scores did not buffer the effect of developmental status on affect recognition scores while controlling for child age, $B = 0.0008$, $SE = 0.03$, $CI_{95} = -0.06$ to $0.06$, $R^2 = 0.65$, $\Delta R^2 = 0.00$. See Table 5 for regression coefficients.

![Diagram](image)

**Figure 3.** Statistical diagram of the moderating effect of parent meta-emotion on the relationship between developmental status and affect recognition.

The fourth hypothesis stated the indirect effect of developmental status on ToM scores would occur through affect recognition scores (see Figure 4). PROCESS macro, model 4 was used to test this hypothesis as model 7 does not give the total effect. The hypothesis was not supported, there was no significant indirect effect of developmental status on ToM scores through affect recognition, $B = -0.60$, $CI_{95} = -1.58$ to $0.36$, $R^2 = 0.17$. See table 5 for regression coefficients.
The fifth hypothesis stated the indirect effect of developmental status on ToM scores, through affect recognition scores would be moderated by parent-meta emotion on the ‘a path’ (see Figure 4). This hypothesis was not supported, the conditional indirect effect was not significant, indicated by the bootstrapped confidence intervals crossing zero and the index of moderated mediation ($B = 0.00$, CI$_{95}$ = -0.01 to 0.01).
Table 6.
**Conditional Indirect Effects of Developmental Status on Theory of Mind through Affect Recognition, by Parent Meta-Emotion**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Outcome</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>ARS</td>
<td>-2.03</td>
<td>24.32</td>
<td>-0.08</td>
<td>0.93</td>
<td>-55.04</td>
<td>50.98</td>
</tr>
<tr>
<td>MEI</td>
<td>ARS</td>
<td>-0.006</td>
<td>0.02</td>
<td>-0.03</td>
<td>0.98</td>
<td>-0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Status x MEI</td>
<td>ARS</td>
<td>0.0008</td>
<td>0.03</td>
<td>0.03</td>
<td>0.98</td>
<td>-0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Age</td>
<td>ARS</td>
<td>0.25</td>
<td>0.06</td>
<td>4.21</td>
<td>0.001</td>
<td>0.12*</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Status</td>
<td>-0.60</td>
<td>0.48</td>
<td>-1.26</td>
<td>0.23</td>
<td>-1.64</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>ARS</td>
<td>0.003</td>
<td>0.08</td>
<td>0.04</td>
<td>0.97</td>
<td>-0.17</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0.02</td>
<td>0.03</td>
<td>0.90</td>
<td>0.38</td>
<td>-0.03</td>
<td>0.08</td>
</tr>
</tbody>
</table>

**Conditional Indirect Effects of Parent Meta-Emotion on the Relation of Status to Theory of Mind**

<table>
<thead>
<tr>
<th>MEI</th>
<th>Effect</th>
<th>Boot SE</th>
<th>BootLLCI</th>
<th>BootULCI</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARS</td>
<td>818.10</td>
<td>-0.004</td>
<td>2.24</td>
<td>-0.95</td>
<td>1.28</td>
</tr>
<tr>
<td>ARS</td>
<td>888.94</td>
<td>-0.004</td>
<td>1.30</td>
<td>-0.55</td>
<td>0.57</td>
</tr>
<tr>
<td>ARS</td>
<td>938.72</td>
<td>-0.004</td>
<td>3.72</td>
<td>-0.85</td>
<td>0.56</td>
</tr>
</tbody>
</table>

**Index of Moderated Mediation**

|             | 0.05  | -0.01 | 0.01  | 0.00  |

**Note.** N = 17. ARS = A Developmental NEuroPSYchological Assessment, Second Edition Affect Recognition scaled score; Age = Child’s Age in Months; Status = Developmental Status (TD = 0, ASD = 1); ToM = Theory of Mind total score; MEI = Parent MEI total score. *indicates significant confidence intervals

**Ancillary Analyses**

In response to the small sample size obtained in this study, ancillary analyses using methods more appropriate for small sample sizes were included. Methods of analyses suitable for small sample sizes including t-tests, Chi square tests, and thematic analyses were used to further understand the data. Although the initial analyses did not reveal significant relations between developmental status and affect recognition scores or mean ToM scores, ancillary analyses were used to identify any group differences in ToM responses, affect recognition errors, and parent meta-emotion at the dimension level. In addition, ancillary analyses were used to clarify the relation between parent-meta emotion at the dimension level and affect recognition errors.
Theory of Mind

First, children’s ToM abilities were further evaluated by task (see Figure 5). All children who participated in the study passed the diverse beliefs task. Of the 17 children who passed the diverse beliefs task, only 10 children passed the self and other false beliefs task. Within the 10 children who passed the self and other false beliefs task, only seven children responded with an emotion congruent response. Of the 10 children who passed the self and other false beliefs task, seven children passed the changed location false beliefs task. Within the seven children who passed the changed location false beliefs task, six children responded with an emotion congruent response.

Figure 5. Diagram of total participants and pass/fail at each level of the theory of mind tasks.

When children’s ToM abilities were further evaluated by task and grouped by developmental status (see Figure 6), similar patterns emerged. For children in the TD group, all children passed the diverse beliefs task, but fewer children passed the changed location false beliefs task, than the self and other false beliefs task. For the five children in the TD group who passed both the self and other false beliefs and changed location false belief task, the average age
was 57.8 months. Additionally, three of these five children were above the age of 48 months which has been identified as the average age of understanding diverse false beliefs. Four of these five children also passed the emotion congruence question. Using visual inspection, no patterns about verbal ability and affect recognition scores were identified for those who passed all three ToM tasks.

For children in the ASD group, all six children passed the diverse beliefs task but only two participants were able to pass the self and other false beliefs task and the changed location false beliefs task. The two children with ASD who were able to pass both the self and other false beliefs and changed location false belief task were above the age of 48 months ($M = 78$) and were the oldest children in the ASD group. They also had the highest verbal ability scores (i.e., scores of 107 and 108) and the highest affect recognition scores in the ASD group (i.e., scores of 19 and 16), and were only two in the ASD group to pass the emotion congruence question.

**Figure 6.** Diagram of participants pass/fail at each level of the theory of mind tasks organized by developmental status (TD vs. ASD).
### Table 7. Mean Characteristics of Children who Passed Each ToM Task

<table>
<thead>
<tr>
<th>Task</th>
<th>Developmental Status</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age (months)</td>
<td>TD Verbal Ability</td>
<td>ARS</td>
</tr>
<tr>
<td>Diverse Beliefs Task</td>
<td>52.27</td>
<td>118.18</td>
<td>14.83</td>
</tr>
<tr>
<td>Self and Other False Beliefs Task</td>
<td>78.00</td>
<td>107.50</td>
<td>17.50</td>
</tr>
<tr>
<td>Changed Location False Beliefs Task</td>
<td>78.00</td>
<td>107.50</td>
<td>17.50</td>
</tr>
</tbody>
</table>

*Note. ARS = A Developmental NEuroPSYchological Assessment, Second Edition Affect Recognition scaled score; Verbal Ability=Differential Ability Scales, Second Edition Verbal Ability standard score.*

#### Emotion Recognition and Meta-emotion

First, affect recognition abilities were further investigated by testing for group differences in affect recognition errors by status using independent t-tests. No significant differences in affect recognition errors were found between TD children and children with ASD. Next, developmental status group differences in parent meta-emotion at the dimension level were examined using independent t-tests. No significant differences between parents of TD or ASD children were found across the seven-dimension scores of parent meta-emotion.

Second, the relations between affect recognition errors and parent meta-emotion by dimension were examined using correlations (see Table 8). Affect recognition errors for sadness were significantly related to parent meta-emotion dimension of child regulation of sadness ($r = -0.632, p = 0.007$). Affect recognition errors for fear and anger were not significantly related to parent meta-emotion dimensions for fear and anger, respectively. Total affect recognition errors were significantly related to child regulation across all emotions ($r = -0.516, p = 0.034$).
Table 8.  
Correlations Between Affect Recognition Errors and Meta-Emotion Scores

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pawa</td>
<td>Pacc</td>
<td>Preg</td>
<td>Cawa</td>
</tr>
<tr>
<td>AR Sad Errors</td>
<td>-.17</td>
<td>-.20</td>
<td>-.36</td>
<td>-.18</td>
</tr>
<tr>
<td>AR Fear Errors</td>
<td>-.21</td>
<td>.21</td>
<td>.20</td>
<td>.29</td>
</tr>
<tr>
<td>AR Anger Errors</td>
<td>-.19</td>
<td>-.20</td>
<td>.20</td>
<td>-.20</td>
</tr>
</tbody>
</table>

Note. N = 17; AR Errors = number of recognizing sadness on Developmental NeuroPSYchological Assessment, Second Edition (by emotion: sadness, fear, anger, and total); Pawa = parent awareness; Pacc = parent acceptance; Preg = parent regulation; Cawa = awareness of child; Cacc = acceptance of child; Ccoa = coaching of child; and Creg = regulation of child (by emotion: sadness, fear, anger, and overall).

Thematic Analysis

Due to the small sample size of the current study, thematic analysis was used to explore any potential differences between parents of TD children and parents of children with ASD based on the final question asked during the meta-emotion interview. The final question asked if parents believed their child’s characteristics influenced their meta-emotion philosophies. One parent was not asked the final question during the interview so the sample size for the thematic analysis was comprised of 16 participants (6 ASD and 10 TD).

Thematic analysis is a method used to identify, organize, and explore patterns of meaning called ‘themes’ in data (Braun & Clarke, 2006). Thematic analysis is a qualitative approach that is flexible in nature and can provide rich and complex insights into data (Braun & Clarke). The method of thematic analysis was theoretical (i.e., driven by interest in identifying whether differences in meta-emotion philosophies existed between parents of TD children and parents of...
children with ASD) and conducted based on the steps outlined by Braun and Clarke. The phases outlined included: 1) familiarization with the data including transcription of verbal data, 2) generation of initial codes, 3) searching for themes, and 4) reviewing themes.

In this study, responses were listened to and transcribed from audio clips. Then responses were read and re-read for codes regarding child characteristics influencing meta-emotion philosophies. Responses were coded into two groups, the first group contained responses which affirmed that their child had characteristics that affected their meta-emotion philosophies, and the second group contained responses which denied that their child had characteristics that affected their meta-emotion philosophies. Affirmative responses were coded as such when parents either explicitly stated affirmation (e.g., “yes”) and/or if they described the characteristics of their child that influenced their meta-emotion philosophy. Responses that denied that their child’s characteristics influenced their meta-emotion philosophy included explicitly stated denials (e.g., “no”) or explicitly stated denials in the presence of descriptions of their child’s unique characteristics. The transcript extracts for the coded data were collated in a large table and read together to ensure the categorizations accurately reflected the meanings in the whole responses. During the re-reading, one parent of a TD child identified being unsure if their child’s characteristics influenced their meta-emotion philosophy and described some characteristics of their child. This response did not fit into the previously identified codes based on the themes of affirmative or denying responses.

During thematic analysis, another sub-theme was identified, that when affirming that their child’s characteristics influenced their meta-emotion, parents varied in their evaluation of their child’s characteristics. Therefore, affirmative responses were further organized into three themes. The first group comprised parents who affirmed that their child’s characteristics
influenced their meta-emotion philosophy and viewed the characteristics as being related to difficulties (examples of responses in this group included mentions of increased difficulties helping their child regulate their emotions). The second group comprised parents who affirmed that their child’s characteristics influenced their meta-emotion philosophy but had a neutral evaluation of these characteristics. For example, some parents endorsed that their child’s characteristics influence their meta-emotion philosophies but had neutral evaluations of those characteristics or balanced both negative and positive evaluations of those characteristics. The last group comprised of parents who affirmed that their child’s characteristics influenced their meta-emotion philosophy and viewed the characteristics as being related to more ease in socializing their child about emotions. For example, some parents commented about their child being empathetic and easily self-regulating. These responses were then categorized further by developmental status (see Tables 9 and 10).

Table 9. Thematic Grouping of Parents’ Responses

<table>
<thead>
<tr>
<th>Developmental Status</th>
<th>TD (n=10)</th>
<th>ASD (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>No/Unsure</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. N=16; Yes=responses affirming that child characteristics influence parent’s meta-emotion philosophies; No/Unsure=responses denying or unsure that child characteristics influence parents’ meta-emotions.

Data regarding child’s developmental status (0=TD, 1=ASD) and parent response (0=no/unsure, 1=affirmative response) were entered into SPSS. A 2x2 Chi-square analysis was used to examine the relation between developmental status and parent response. Differences in parent response was not related to developmental status, $\chi^2 = 0.027, p = 0.87, \phi=0.041$. A 2x3 Chi-square analysis of the affirmative responses depending on developmental status was not appropriate due to the small sample size, violating the assumption that 20% of expected
frequencies in cells should be five or greater in Chi-square analysis with tables greater than 2x2 (Green & Salkind, 2016).

Based on the results from the previous ancillary analyses, no differences were expected between the TD and ASD groups. However, in examining parents’ responses by words used, parents in the two groups appeared to use different kinds of words used to describe their children. Examples of phrases used to describe children’s characteristics by parents in the TD group included: “emotionally regulated,” “empathetic,” “easygoing,” “assertive,” “compliant and lovely,” and “endearing.” Phrases parents in the ASD group used to describe their children included: “less expressive,” “non-verbal,” “hard to figure out,” “needing to be in control,” “need extra support.”

Table 10. *Further Thematic Grouping of Only Affirmative Responses Parents’ Developmental Status*

<table>
<thead>
<tr>
<th>Developmental Status</th>
<th>TD (n=10)</th>
<th>ASD (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (more difficulties)</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Yes (neutral)</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Yes (ease)</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note. N=13; Yes=responses affirming that child characteristics influence parent’s meta-emotion philosophies; No=responses denying or unsure that child characteristics influence parents’ meta-emotions.*
Chapter IV
Discussion

The current study was designed to investigate the relations between parents’ thoughts, beliefs, and interactions with their own emotions and their child’s emotions (i.e., parent metaemotion), children’s affect recognition abilities, and ToM abilities in children with ASD and TD children. This was conducted in a piece-meal manner to examine if differences existed based on the child’s developmental status. The final sample comprised of six children with ASD and 11 typically developing children and one of their parents. The initial planned analyses of moderated mediation were underpowered due to the small sample size. As a result, ancillary analyses were conducted with methods of analyses more appropriate for small sample sizes to further examine the data. Discussion of results from analyses and ancillary analyses are provided in the following sections. Strengths and limitations of the current study and future directions for research will also be reviewed.

Interpretation of Results

Autism and affect recognition abilities. Results from the current study demonstrated that there was no relation between developmental status and scaled scores on the affect recognition task while controlling for child age. Results from ancillary analyses also found no significant difference in average number of affect recognition errors made between children in the TD and ASD groups. Therefore, the hypothesis that children with ASD would have worse affect recognition abilities was not supported. This hypothesis is not consistent with previous research finding differences in affect recognition performance (Lozier et al., 2014). A possible explanation for finding no significant differences between groups is due to the sample being comprised of children in the ASD group with average verbal abilities. This explanation is
supported by results from research demonstrating no differences in affect recognition scores on the NEPSY-II task for children with ASD with average or above average intellectual quotients (Barron-Linnankoski et al., 2015). Results indicated that age was a significant predictor of affect recognition scores, as the age of the child increased by one month, affect recognition scores increased by 0.79 scaled score. The average age of children who participated in the study was 57.18 months (SD = 14.51), which suggests that potential differences between younger TD children and children and ASD (especially children with ASD and accompanying intellectual impairment) were not represented in the data. Although no differences in affect recognition abilities were found for children with ASD compared to TD children in the current study, it may still be possible that children with ASD have worse affect recognition abilities than children with TD in the broader population.

**Autism and ToM abilities.** Results from the primary analyses demonstrated no statistically significant difference between mean ToM scores of children in the ASD and TD group. The hypothesis that children in the ASD group would have lower ToM scores than children in the TD group was not supported. Results also showed affect recognition scores were not correlated with ToM scores. Additionally, expected covariates of child age, verbal ability, and gender were not correlated with ToM abilities. These statistically non-significant findings are likely a result of the analyses being underpowered due to the small sample size.

However, interesting trends emerged during the ancillary analyses of the data collected. During these analyses, ToM performance by task (i.e., diverse beliefs task, self and other false beliefs task, and changed location false beliefs task) was examined. Results demonstrated a trend of increasing difficulty across the three tasks (i.e., fewer children passing each subsequent task, 17 children, 10 children, and 7 children). This finding is consistent with previous research
identifying a stepwise developmental progression through diverse desires, diverse true beliefs, false beliefs, to achieving understanding diverse emotions across the preschool years for TD children (Duh et al., 2016; Perner et al., 1987; Weismann et al., 2017; Wellman et al., 2001). Results also demonstrated that all children in the current study passed the first diverse beliefs task. This is consistent with previous research that TD children achieve understanding of diverse true beliefs by 3 years of age, given that all children in the current study were between 3 years and 3 months of age and 6 years and 11 months of age (Perner et al., 1987; Wellman et al., 2001). Fewer children passed the last two ToM tasks which is also consistent with the average age of participants in the study being nearly 6 years of age. This is supported by previous research identifying that TD children begin to understand differing false beliefs and differing emotions between age 4 and 6 years (Duh et al., 2016; Wiesmann et al., 2017). However, given the cross-sectional methodology used of this study, conclusions about delays in onset or normative development over time of ToM abilities could not be drawn.

Then, ToM performance for each task was examined by developmental status (i.e., TD vs. ASD). The performance of TD children across the three tasks followed a similar pattern of fewer and fewer children passing each subsequent task. For children with ASD, although all five children passed the first task, only two children passed the self and other false beliefs and changed location false belief task. Most interestingly, the two children with ASD who passed the last two tasks were the oldest children, had the highest verbal ability scores, and the highest affect recognition scores in the ASD group. Such a pattern was not evident with the TD group. This provides preliminary evidence of potential relations among developmental status, affect recognition, ToM, verbal ability, and age which is consistent with prior research identifying
poorer ToM performance for children with ASD with increased ToM performance predicted by greater verbal ability and age (Calero et al., 2013; Devine & Hughes, 2012; Pino et al., 2017).

**Autism and parent meta-emotion.** The initial hypothesis that higher scores on parent meta-emotion would buffer against the effect of developmental status on affect recognition scores, while controlling for child age, was not supported. Also, no significant differences in parent meta-emotion overall scores or by dimension scores were found between parents of children with TD and with ASD. These findings are inconsistent with prior research suggesting that parents of children with developmental disabilities have differing experiences of emotion socialization compared to parents of TD children (Paterson et al., 2012).

Further, when ancillary analyses were conducted to examine parent meta-emotion qualitatively at the response level, differences were identified between responses by parents of children with TD and parents of children with ASD. Overall, a majority (81%) of parents of TD children and children with ASD provided responses that affirmed their child’s characteristics influenced their meta-emotion philosophies. The number of parents who either affirmed that their child’s characteristics influenced their meta-emotion philosophies or denied/were unsure that their child’s characteristics influenced their meta-emotion philosophies did not differ by developmental status. Most interestingly, when affirmative responses were further examined, parents of TD children were more likely to identify that their child’s characteristics influenced their meta-emotion philosophies in a neutral manner or made their experiences of emotion socialization easier. In contrast, parents of children with ASD who had affirmative responses, were more likely to describe their child’s characteristics as making emotion socialization more difficult. Additionally, the language that parents of children with ASD used to describe their children’s characteristics (e.g., “less expressive,” “non-verbal,” “hard to figure out”) differed
from the language that parents of TD children used (e.g., “empathetic,” “easygoing,” “compliant and lovely”). This thematic analysis of the response level data from the parent meta-emotion interview supports previous research that parents of children with developmental disabilities have a different experience of emotion socialization than parents of children with TD (Paterson et al., 2012). Further longitudinal research should be conducted about parent meta-emotion to account for factors including potentially evolving parent meta-emotion philosophies since becoming a parent or becoming a parent of a child with a disability. In examining type of language used by parents to describe their children with ASD, further research should more closely examine the potential relation between parent meta-emotion philosophies and parent stress. Overall, findings from this study provide support for continued research of parents’ meta-emotion philosophies and their influence on emotion socialization for children with and without ASD.

**Parent meta-emotion and affect recognition abilities.** Although no significant relation between overall parent meta-emotion and affect recognition scores was identified through the main analyses, ancillary analyses provided more information about these relations. Ancillary analyses provided evidence of the relation between parent meta-emotion and errors made in the affect recognition. Overall affect recognition errors were significantly and negatively related to overall child regulation parent meta-emotion dimension scores. These findings indicate that more adaptive parent meta-emotion philosophies about how their child regulates their emotions, parents’ roles in helping their children regulate emotions predicted fewer mistakes on affect recognition. This is consistent with previous research identifying that parents’ meta-emotion positively predicted TD children’s affect recognition skills (Castro et al., 2015).
When parent meta-emotion was examined at the dimension level (e.g., child awareness, child regulation, parent awareness etc.) by emotion (i.e., sadness, anger, fear) and affect recognition errors by emotion (i.e., sadness, fear, anger) significant relations were identified. Specifically, a significant negative relation was found between errors on sadness on the affect recognition task and parent meta-emotion score on the child regulation dimension for sadness. However, no significant relations were found between fear or anger errors and the parent meta-emotion dimension of child regulation for fear or anger respectively. Initially, I hypothesized relations between emotion specific parent meta-emotion scores and corresponding affect recognition errors across all three emotions. This is interesting given that much of previous research have consistently found emotion specific affect recognition deficits across many negative emotions including anger, disgust, sadness and fear in children with ASD with below average verbal intelligence quotients (Lozier et al., 2014; Wingenbach, et al., 2016). However, only one previous study found sadness recognition specific deficits in adolescents with ASD with above average verbal intelligence quotients (Wallace et al., 2012). Considering that the sample in the current study was comprised of those with average verbal abilities, this may provide support that children with ASD and average verbal abilities may have differing affect recognition abilities for sadness over other emotions. Further, meta-analyses of research on prevalence of depression in individuals with high functioning ASD suggest they may experience higher prevalence rates than the general population (Wigham et al., 2017). Some research even suggests a negative relationship between ToM and self-esteem and depressive symptoms (McCauley et al., 2017). This highlights the importance of further research to elucidate these emotion specific relations between parent meta-emotion, affect recognition abilities, and ToM abilities.
Strengths and Limitations

This study had several strengths, specifically with methodology used. A strength in this study was allowing both fathers and mothers to participate in the study which improves on previous methodology which tended to focus on mothers’ meta-emotion. This study also utilized measures and methodology that allowed for both qualitative and quantitative methodology to provide a richer picture of children’s skills and relations with parent meta-emotion philosophy.

There are several notable limitations to the current study. Sample restriction was evident in the current sample of children. This sample was restricted in terms of children’s verbal ability due to the inclusion criteria of the larger study (i.e., average or above DAS-II verbal ability score). Results showed the mean verbal ability standard score was 112. This is important to consider due to the predictive role of verbal abilities in ToM performance for TD pre-school aged children and children with ASD (Milligan et al., 2007). This suggests the study sample was comprised of children with above average ToM abilities.

This sample was also restricted in terms of age. In post-hoc analysis of the data, 65% of the children who enrolled in the study were above the age of 4 years. As previously reviewed, by age 4, children with TD achieve differentiation of false differing beliefs and understandings in others and begin to anticipate actions of others (Wiesmann et al, 2017). This suggests the current study had a larger proportion of children who already had achieved this skill and, therefore, I was not able to capture the variation in younger children in the process of developing this skill. This may also explain why the expected covariate of child age was not significant in predicting ToM.

Another limitation to the current study is the small sample size, leading to underpowered primary analyses. Lack of power increases the risk of type II error, particularly when smaller effect sizes are found (e.g., relation between status and affect recognition, $R^2 = 0.02$, indirect
effect of status on ToM through affect recognition $R^2 = 0.17$). Larger samples would increase power in detecting these effects.

To account for these factors, future recruitment should be focused on a larger, more representative sample of child age and verbal ability. Researchers may also consider including 2-year-old children in future studies to further elucidate the onset of development of ToM abilities, particularly for the diverse beliefs task. Ideally, future studies should use longitudinal methodology and a larger, more comprehensive battery of ToM tasks that includes more advanced ToM tasks (e.g., affective perspective taking tasks). These tasks are suitable for older pre-school aged children and children with higher verbal abilities. This is important because previous research suggests continued ToM development past the preschool years (Calero et al., 2013; Devin & Hughes, 2012).

**Conclusions and Future Directions**

Future research should further elucidate whether parents’ awareness of their emotions and the emotions of their children captured by semi-structured meta-emotion interview is related to objective measures of parents’ emotion recognition abilities. This is especially important because recent research provides evidence that parents of children with ASD have worse emotion recognition abilities of sadness, disgust, and fear on direct objective measures compared to parents of TD children (Hu et al., 2018). Further, Hu et al. (2018) found that emotion recognition abilities in parents of children with ASD was negatively related to the severity of restricted, repetitive, and stereotyped patterns of behavior for their children.

Although the current study included memory and understanding checks in the ToM battery, recent studies strongly suggest executive functions are a factor in predicting ToM performance for TD children and children with ASD (Duh et al., 2016; Sivaratnam et al., 2018).
This is especially important given that executive functions have been implicated specifically as a factor in the early development of ToM during the preschool aged years but not in later childhood (Devine et al., 2016; Pellicano, 2010). Further, it is important to control for the role of executive function in ToM development when assessing children with ASD, because research suggests these executive function deficits are associated with attention deficit hyperactivity disorder symptoms rather than the core characteristics of ASD (Jones et al., 2018). Future studies may also improve on the methodology by including an explicit measure of working memory as a control variable. Future research may also consider using a larger battery of ToM tasks to capture a wider range of abilities present in preschool aged children with ASD. Given that previous research on ToM abilities in children with ASD have used a wide variety of ToM tasks and batteries (Rødgaard et al., 2019), comparing results from different studies is challenging. To increase comparability of results, future studies may consider using a ToM battery that has norms for TD children and children with ASD, such as the ToM battery in the NEPSY-II measure (Korkman et al., 2007).

In summary, although the primary analyses were not significant, the ancillary analyses found significant relations and relevant patterns. The current study found a significant positive relation between parents’ meta-emotion philosophies about their child’s emotion regulation and affect recognition accuracy, trends suggestive of differences in ToM abilities in children with ASD, and patterns indicating differences in the experiences of parents in emotion socialization of children with ASD from parents with TD children. This research provides important groundwork and rationale for continued research to elucidate the relations among ASD, parent meta-emotion philosophies, affect recognition abilities, and ToM abilities. Further examination of these
relations may potentially provide crucial avenues for intervention through parent involvement as well as direct child intervention and provide support for additional research in this area.
References


http://doi.org/10.1177/1362361313492393


https://www.cdc.gov/mmwr/volumes/69/ss/ss6904a1.htm?s_cid=ss6904a1_w


http://doi.org/10.1001/jama.2013.2270

http://doi.org/10.1177/0883073815580645


Kobayashi, T., Matsuyama, T., Takeuchi, M., & Ito, S. (2016). Autism spectrum disorder and prenatal exposure to selective serotonin reuptake inhibitors: A systematic review and

https://doi.org/10.1016/j.reprotox.2016.07.016


http://doi.org/10.1177/0734282913511051


Rutherford, M., McKenzie, K., Johnson, T., Catchpole, C., O’Hare, A., McClure, I., ... & Murray, A. (2016). Gender ratio in a clinical population sample, age of diagnosis and


