

Understanding the Emotional Quality of the Parent-Child and Parent Couple Relationships in the  
Context of Child Autism Spectrum Disorder

by

Emily J. Hickey

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The dissertation is approved by the following members of the Final Oral Committee:  
Sigan L. Hartley, Associate Professor, Human Development and Family Studies  
Robert L. Nix, Associate Professor, Human Development and Family Studies  
Lauren M. Papp, Professor, Human Development and Family Studies  
Daniel M. Bolt, Professor, Educational Psychology  
Karla Ausderau, Assistant Professor, Kinesiology

## Abstract

Little research has examined the quality of family relationships in the context of having a child with autism spectrum disorder (ASD). The overarching goal of my dissertation research was to better understand the emotional quality of the parent-child and parent couple relationships in families of children with ASD. Drawing from a sample of 188 families of a child with ASD who were followed over 4 time points, spaced 12 months apart, the three dissertation studies incorporated measures of Warmth and Criticism from Five Minute Speech Samples to measure family emotional relationship quality. The first study examined the association between actor and partner level of parenting stress and depressive symptoms and the emotional quality of the parent-child relationship. Results indicated actor effects for mothers and fathers and a partner effect of level of mother parenting stress on father Warmth. The second study determined how emotional quality across family subsystems (mother-child, father-child, and parent couple) combined to create various subtypes of family emotional climate. Five family emotional quality subtypes were found: *Family Resilient*, *Couple Distressed*, *Mother Distressed with Partner*, *Family Distressed*, and *Mother Distressed – Father Resilient*. Parent level of broader autism phenotype and child behavior problems were associated with subtype membership. The third and final study determined the direction of effects between Warmth and Criticism in the parent-child relationship in mothers and fathers and the child's severity of ASD symptoms and behavior problems. Results indicated bidirectional effects between child functioning and the emotional quality of the mother-child relationship and effects of child functioning on the emotional quality of the father-child relationship. Overall, findings indicate that the mother-child and father-child relationship are both impacted by parent psychological well-being in families of children with ASD; however, the emotional quality of family subsystems differ for mothers and fathers.

Further, positive and negative emotional aspects of the parent-child relationship are impactful, but differently. Finally, at a family level, there is marked variability in emotional quality of family subsystems.

*Keywords:* Family systems, Five minute speech sample, Autism Spectrum Disorder, Parent-child relationship, Parent couple relationship, Emotional quality

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## Chapter 1: Introduction

The overarching goal of my dissertation research is to better understand the family system in the context of having a child with autism spectrum disorder (ASD). Specifically, my research seeks to build on current knowledge about the emotional quality of two dyadic family subsystems – the parent-child relationship and parent couple relationship – in families of children with ASD. Currently, 1 in 59 children in the United States meets diagnostic criteria for ASD (Center for Disease Control and Prevention [CDC], 2018), which is a neurodevelopmental condition involving difficulties in social communication, restricted and repetitive interests and behaviors, and sensory sensitivities (American Psychiatric Association, 2014). About one-third of children with ASD have intellectual disability (CDC, 2018), and one-half to two-thirds of children with ASD demonstrate marked emotional and behavior problems such as anxiety, attention deficits, and difficulty making transitions (Maskey, Warnell, Parr, Le Couteur, & McConachie, 2013; McStay, Dissanayake, Scheeren, Koot, & Begeer, 2014). The prevalence of ASD has been found to be greater in boys than girls with a ratio of 4 to 1. Within the United States, the prevalence of ASD in white, non-Hispanic children is 7% greater than in black children and 22% greater than in Hispanic children (Baio et al., 2018). This racial/ethnic difference in prevalence has been largely attributed to screening and diagnostic barriers and inequalities across racial/ethnic and socio-economic status groups (Durkin et al., 2010; Mandell, Listerud, Levy, & Pinto-Martin, 2002).

Having a child with ASD brings unique joys into the family system, but also unique challenges. Many parents of children with ASD report that their son or daughter is a source of happiness, fulfillment, strength, and family closeness, and has broadened their own growth and sense of life's purpose (Kayfitz, Gragg, & Orr, 2010). On the other hand, parents of children

with ASD report experiencing stigma (i.e., stereotyping, rejection, and exclusion) related to their child with ASD's behavior problems (Kinnear, Link, Ballan, & Fischbach, 2016) and often report isolation from social networks (Woodgate, Ateah, & Secco, 2008) and having to cut down on work hours due to caregiving and intervention needs associated with ASD (McCall & Starr, 2016). Across studies, parents of children with ASD have been found to be at risk for poor psychological well-being. Indeed, mothers and fathers of children with ASD report an elevated level of parenting stress (Estes et al., 2013; Pisula & Porębowicz-Dörsmann, 2017) and depressive symptoms and anxiety (Cohrs & Leslie, 2017; Lai, Goh, Oei, & Sung, 2015). Moreover, growing evidence indicates that parents of children with ASD have more dissatisfying and shorter-term couple relationships (Hartley et al., 2010; Hartley et al., 2017; Saini et al., 2015; Sim, Cordier, Vaz, & Falkmer, 2016) than comparison groups. Within the field of ASD research, there is a critical need to better understand how poor parent psychological well-being, including parenting stress and depressive symptoms, both impacts and is impacted by the emotional quality of the parent-child relationship across time. There is also a need to understand how the emotional quality of the parent-child and parent couple relationship may combine to form subtypes of family emotional climate.

My three paper dissertation examines these questions via the construct of expressed emotion (Brown, Birley, & Wing, 1972; Vaughn & Leff, 1976), assessed through the Five Minute Speech Sample (FMSS; Magaña, 1986). In the FMSS, individuals are asked to speak about a family member and their relationship together for five minutes. Emotion expressed in the speech sample is then coded (according to Magaña, 1986) and has been shown to reflect actual behaviors and emotions in observed family interactions (e.g., McCarty, Lau, Valeri, & Weisz, 2004; Weston, Hawes, & Pasalich, 2017). Previous studies using the FMSS to examine

the emotional quality of family relationships in the context of child ASD have been limited to studies of the mother-child relationship (Baker, Smith, Greenberg, Seltzer, & Taylor, 2011; Smith, Greenberg, Seltzer, & Hong, 2008). One way in which my dissertation builds on these previous studies is by taking a family-wide approach and using the FMSS to assess the emotional quality of the father-child relationship in addition to that of the mother-child relationship. Moreover, we used the FMSS to assess the emotional quality of the parent couple relationship, from the perspective of both mothers and fathers of children with ASD.

The first paper focuses on understanding the impact of parent stress and depression (both one's own and one's partner's) on the emotional quality of parent-child relationship in families of children with ASD. As previously mentioned, parents of children with ASD have been found to report an elevated level of parenting stress (Lai, Goh, Oei, & Sung, 2015; Pisula & Porębowicz-Dörsmann, 2017; Valicenti-McDermott et al., 2015) and depressive symptoms (Cohrs & Leslie, 2017; Hartley et al., 2012; Ingersoll & Hambrick, 2011). In the general population, a high level of parenting stress (Puff & Renk, 2014) and depressive symptoms (Kiernan & Huerta, 2008; Wilson & Durbin, 2010) have been linked to maladaptive emotional quality in the parent-child relationship. Moreover, having a partner with a high level of depressive symptoms has also been found to impact one's own parent-child interactions in research on the general population (Dufouil, Alperovitch, & EVA Study Group, 2000; Goodman & Shippey, 2002). To date, there is a paucity of research on the impact of one's own or one's partner's level of parenting stress and depressive symptoms on the emotional quality of the parent-child relationship in families with children with ASD. The current study employed an Actor-Partner Interdependence Model (APIM) to examine the impact of parenting stress and

depression (both one's own and one's partner's) on the emotional quality of parent-child relationships via the FMSS in families of children with ASD.

The second paper examined subtypes of family emotional climate, based on the emotional quality of parent-child and parent couple relationships, and the factors that predict membership into these subtypes in families of children with ASD. Building from the family systems theory, which posits that the emotional quality of the parent-child and parent couple relationship are intertwined (Belsky, 1981), we used latent class analysis (LCA) to examine subtypes of family emotional quality. The *spillover hypothesis* asserts that stress, affect, conflict, and behaviors originating in one subsystem (e.g., the parent-child relationship) carry over into other subsystems (e.g., the parent couple relationship), or vice versa (Almeida, Wethington, & Chandler, 1999). Thus, based on the *spillover hypothesis*, we predicted that a subset of families of children with ASD would exhibit poor emotional quality in both the parent-child and parent couple relationships across mothers and fathers. In contrast, the *divergence hypothesis* suggests that individuals compensate for an unsatisfying relationship in one subsystem (e.g., the parent-child relationship) by devoting additional time and energy into another subsystem (e.g., the parent couple relationship), or vice versa (Belsky, Youngblade, Rovine, & Volling, 1991; Erel & Burman, 1995). Thus, based on the *divergent hypotheses* we predicted that another subset of families of children with ASD would exhibit poor emotional quality in one dyadic relationship but not the other and that this may differ across mothers and fathers within a family. We then examined the association between family subtype membership and family socio-demographics (i.e., child age, gender, and ID status, parent couple relationship length, family size, and household income) and predictor variables (i.e., child severity of ASD symptoms and behavior

problems, mother level of broader autism phenotype (BAP), father level of BAP, and having an additional child[ren] with a neurodevelopmental disability or psychological disorder).

The third paper provides a family-wide examination of the bidirectional associations between the positive (i.e., warmth) and negative (i.e. criticism) aspects of the emotional quality of the parent-child relationship in mothers and fathers of children with ASD and the child's ASD symptoms and behavior problems across 3 time points, spaced 12 months apart. Longitudinal research on the general population has shown that the emotional quality of the parent-child relationship is linked in transactional, bidirectional ways with child cognitive, psychological, and emotional development (Borkowski, Ramey, & Bristol-Powers, 2001; Kiff, Lengua, & Zalewski, 2011; Lipscomb et al., 2011). Only a handful of cross-sectional studies have examined the emotional quality of the parent-child relationship in relation to child functioning in families of children with ASD or other types of neurodevelopmental conditions (Abbeduto, 2004; Greenberg, et al., 2004; Orsmond et al., 2006; Pruchno, 2003), and the few longitudinal studies examining this association solely involved mothers (Baker et al., 2011; Ciciolla, Gerstein, & Crnic, 2014; Smith et al., 2008). The present study employed cross-lagged models using structural equation modeling to examine the potential bidirectional associations between the emotional quality of the mother-child and father-child relationship and the child with ASD's severity of ASD symptoms and co-occurring behavior problems across three time points spanning 2 years.

**Dissertation Sample.** Each of the three papers drew from an ongoing longitudinal study following 188 families of a child with ASD over 4 time points, each spaced 12 months apart. Families in the study had a child diagnosed with ASD (who was aged 5-12 years at the first time point) and parents had been in a longstanding couple relationship for a minimum of 3 years.

Recruitment strategies for this study involved mailings to schools and childcare programs, posting fliers at ASD clinics and in community settings (e.g., YMCA and libraries), and using research registries. At the initial time point, 34.4% of the children with ASD had intellectual disability, 87.3% were male, and their average age 7.88 ( $SD = 2.24$ ) years. Mothers had an average age of 38.71 years ( $SD = 5.59$ ), 74.7% had a college degree, and 89.9% were white, non-Hispanic. Fathers had an average age of 40.44 years ( $SD = 6.24$ ), 67.9% had a college degree, and 87.6% were white, non-Hispanic. Parents had been in their current couple relationship for an average of 11.30 years ( $SD = 5.23$ ). On average, parents had 2.41 ( $SD = 1.08$ ) children, and their median household income was \$80-89K ( $SD = 30K$ ).

**Dissertation Methodology.** Families in the larger study were seen by research staff approximately once every 12 months for 4 waves of data collection. Research visits occurred either at the Waisman Center (University of Madison – Wisconsin) or at the family’s home or a community setting of the family’s choosing. The FMSS was introduced into the study protocol at the second wave of data collection. Paper 1 used measures of parenting stress and parent depressive symptoms at Time 1 to predict FMSS ratings of the parent-child relationship at Time 2. Paper 2 used both parent-child and parent couple FMSS ratings at Time 2 to investigate overall family emotional climate subtypes. Finally, paper 3 used FMSS ratings of the emotional quality of the parent-child relationship and ratings of child ASD symptoms and behavior problems from Time 2, 3, and 4 in the cross-lagged panel design.

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Chapter 2:

Psychological Well-Being and Emotional Quality of the Parent-Child Relationship in Families of  
Children with Autism: An Actor-Partner Model

### Abstract

Parents of children with autism spectrum disorder (ASD) often report poor psychological well-being, including a high level of parenting stress and depressive symptoms. Little is known about the extent to which poor parent psychological well-being alters the emotional quality of the parent-child relationship in a context of child ASD. The current study examined the association between actor and partner level of parenting stress and depressive symptoms and the emotional quality of the parent-child relationship using a Five Minute Speech Sample (FMSS) in 150 families of children with ASD, aged 5-12 years (85.7% male). Mothers and fathers were aged 38.69 ( $SD = 5.62$ ) and 40.76 ( $SD = 6.19$ ), respectively; 76% of mothers and 68% of fathers had a college degree. Structural equation modeling, using Analysis of Moment Structures software, was used to test Actor-Partner Interdependence Models. Results indicated an actor effect of level of parenting stress on FMSS Warmth and Criticism for mothers and on Warmth for fathers of children with ASD. There was also an actor effect of level of depressive symptoms on FMSS Warmth and Criticism for mothers of children with ASD. There was a partner effect of level of parenting stress on FMSS Warmth for fathers of children with ASD. Overall, findings indicate that the mother-child and father-child relationship are both impacted by parent psychological well-being in families of children with ASD; however, actor effects are stronger for mothers and partner effects were only found for fathers. Implications for interventions are discussed.

*Keywords:* Five Minute Speech Sample, Warmth, Criticism, Emotional Quality, Parent-child Relationship, Autism, Expressed Emotion

## Psychological Well-Being and Emotional Quality of the Parent-Child Relationship in Families of Children with Autism: An Actor-Partner Model

Autism spectrum disorder (ASD) is a neurodevelopmental disability involving impairments in social communication, restricted and repetitive interests and behaviors, and sensory sensitivities (American Psychiatric Association, 2014). In the United States, ASD is currently estimated to impact 1 in 59 children, with a male to female ratio of 4:1 (Center for Disease Control and Prevention [CDC], 2018). Parents of children with ASD face challenges that stem from their son or daughter's ASD symptoms and co-occurring behavior problems (Maskey, Warnell, Parr, Le Coutuer, & McConachie, 2013; Valicenti-McDermott et al., 2015). In addition, parents of children with ASD report challenges related to navigating the special education (Whitaker, 2002) and healthcare (Nesbitt, 2000) systems, and dealing with the financial cost of ASD (Sharpe & Baker, 2007). These challenges may contribute to the heightened level of parenting stress and depressive symptoms reported by parents of children with ASD relative to other parents (e.g., Hartley, Seltzer, Head, & Abbeduto, 2012; Hayes & Watson, 2013). Despite this vulnerability, little is known about the extent to which a high level of parenting stress and depressive symptoms alter the parent-child relationship in a context of child ASD. The goal of the current study was to examine the association between actor and partner level of parenting stress and depressive symptoms and the emotional quality of the parent-child relationship 12 months later in sample of 150 families of children with ASD.

The elevated level of parenting stress and depressive symptoms reported by parents of children with ASD has been well-documented. As a group, parents of children with ASD report a higher level of parenting stress than parents of typically developing children (Estes et al., 2013; Lai, Goh, Oei, & Sung, 2015; Pisula & Porębowicz-Dörsmann, 2017) and parents of children

with other types of neurodevelopmental disabilities (Hayes & Watson, 2013; Valicenti-McDermott et al., 2015), with group differences of small to moderate effect size. Across studies, 20-56% of parents of children with ASD report a clinically significant level of depressive symptoms, relative to 7-29% of parents of children with other types of disabilities, and 8-19% of parents of typically developing children (Abbeduto et al., 2004; Cohrs & Leslie, 2017; Hartley et al., 2012; Ingersoll & Hambrick, 2011). In the general population, a high level of parenting stress (e.g., Nelson, O'Brien, Blankson, Calkins, & Keane, 2009; Puff & Renk, 2014) and depressive symptoms (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007; Kiernan & Huerta, 2008) has been shown to be associated with maladaptive parenting behaviors and/or a lower quality parent-child relationship. In a longitudinal study spanning 6 years, Mackler and colleagues (2015) found that having a higher level of parenting stress predicted increases in negative parenting responses, such as punishment and minimization (e.g., telling the child they were overreacting), in a general population sample of mothers of children aged 4-10 years. Similarly, in a meta-analysis of 28 studies examining the effects of parent depression on parenting, Wilson and Durbin (2010) found strong evidence that parent depression had significant, albeit small effect-sized, associations with reduced positive (e.g., affectionate, sensitive, engaged, and accepting) parenting behaviors ( $r^2 = -0.19 - 0.20$ ) and increased negative (e.g., hostile, intrusive, restrictive, and critical) parenting behaviors ( $r^2 = 0.16 - 0.22$ ).

In addition to impacting one's own parent-child relationship, in a family systems perspective, a high level of parenting stress and depressive symptoms in one parent would be expected to impact the other partner's parent-child relationship (Belsky, 1981). Specifically, high parenting stress or depressive symptoms experienced by one partner is theorized to alter the nature of the parent couple relationship and co-parenting relationship, which in turn, takes a toll

on the other partner's ability to engage in warm and positive parent-child interactions (Cummings, Keller, & Davies, 2005; Young, Riggs, & Kaminski, 2017). There is evidence of such cross-partner effects of stress on the emotional quality of the parent-child relationship in the general population (Nelson et al., 2009; Ponnet, Wouters, Goedemé, & Mortelmans, 2016). In a sample of 101 couples who had a 7-year old child (Nelson et al., 2009), when employed mothers and fathers had higher stress related to their job, their partner was less supportive of the child's negative emotions. Similarly, cross-partner effects of depressive symptoms have been found for the parent-child relationship in non-ASD samples (Williams, 2018; Wymbs et al., 2017). In a study involving parents of children exhibiting attention-deficit/hyperactivity disorder or oppositional defiant disorder behavior (Wymbs et al., 2017), parents with elevated depressive symptoms reported that their partner managed the child more negatively (29-79% higher on a rating of negativity, on average) than parents with low depressive symptoms.

There is some evidence from studies on the general population that cross-partner effects of poor psychological well-being on the emotional quality of the parent-child relationship differ for mothers versus fathers. In a study involving 203 families of typically developing children aged 8 to 16 years, Kouros, Papp, Goeke-Morey, and Cummings (2014) found that mother's daily depressive symptoms were associated with lower emotional quality in the father-child relationship, yet father's daily depressive symptoms were associated with higher emotional quality in the mother-child relationship. Research that has found a similar pattern has interpreted this to mean that mothers may be better at compartmentalizing family relationships than fathers, and/or may try to compensate for poor father psychological well-being by upping the emotional quality of mother-child interactions over time (e.g., Elam, Chassin, Eisenberg, & Spinrad, 2017; Stevenson et al., 2014). To date, research assessing cross-partner effects of poor psychological

well-being on the parent-child relationship in any population have been limited to self-report measures of global emotional quality of the parent-child relationship and have largely been cross-sectional. The current study adds to the broader literature by examining actor and partner effects of level of parenting stress and depressive symptoms on a direct measure of the emotional quality of the parent-child relationship (via a speech sample) 12 months later. Moreover, the current study provides the first examination of these associations in a context of child ASD. Cross-partner effects of poor psychological well-being may be pronounced in a context of high parenting stress such as child ASD. Individuals undergoing chronic stressors have been found to exhibit elevated stress reactions when faced with additional stressors (Caputo & Simon, 2013). Thus, the high level of child-related challenges faced by parents of children with ASD may mean that they have fewer resources to manage and/or compensate for a highly stressed or depressed partner. As a result, partner parenting stress and depressive symptoms may have marked effects on the parent-child relationship for both mothers and fathers of families of children with ASD.

### **The Current Study**

The current study assessed the emotional quality of the parent-child relationship through the Five Minute Speech Sample (FMSS; Magaña et al., 1986). In the FMSS, parents talk about their child and their relationship with him/her for five minutes. Parent responses are transcribed and coded to capture indicators of the emotional quality of the parent-child relationship, including the parents' level of Warmth (e.g., caring tone of voice, empathy, and interest) and Criticism (e.g., negativity, disapproval, and dissatisfaction) toward the child. The FMSS has the advantage of reducing response biases by eliciting open-ended responses based on a general prompt, rather than asking value-laden questions that can trigger socially desirable responses. FMSS ratings have been found to correlate with the observed emotions and behaviors of parents

within actual parent-child interactions (Weston, Hawes, & Pasalich, 2017), and have high reliability and validity in diverse populations (Magaña et al., 1986; Van Humbeeck, Van Audenhove, De Hert, Pieters, & Storms, 2002), including in parents of children with neurodevelopmental disabilities (Hastings, Daley, Burns, & Beck, 2006) and ASD specifically (Greenberg, Seltzer, Hong, & Orsmond, 2006).

The study draws from a sample of 166 families of children with ASD (aged 5-12 years) who participated in two waves of data collection spaced approximately 12 months apart. The research questions were: (1) Does parents' own (actor effect) level of parenting stress and depressive symptoms predict their Warmth and Criticism toward the child with ASD 12 months later? (2) Does partner's (partner effect) level of parenting stress and depressive symptoms predict the other parent's Warmth and Criticism toward the child with ASD 12 months later? Based on previous research, we hypothesized that one's own level of parenting stress and depressive symptoms (actor effect) would be negatively associated with Warmth toward the child with ASD and positively associated with Criticism toward the child with ASD. Based on cross-partner findings in the general population, mother level of parenting stress and depressive symptoms was predicted to be negatively related to father Warmth and positively related to father Criticism toward the child with ASD. In contrast, we hypothesized that mothers would attempt to compensate for poor partner psychological well-being; thus, higher father level of parenting stress and depressive symptoms was predicted to be related to increased mother Warmth and decreased Criticism toward the child with ASD 12 months later.

## **Method**

### **Participants**

Analyses are based on the first and second waves of data collection (spaced approximately 12 months apart) in a longitudinal study originally including 188 couples who had a child with ASD aged 5-12 years. Measures of parenting stress and depressive symptoms were based at the first data collection time point (corresponding to 2013 - 2014) and FMSS ratings of Warmth and Criticism were obtained at the second data collection time point.

Recruitment occurred through mailings to schools and childcare programs, fliers posted at ASD clinics and in community settings (e.g., libraries), and research registries. In order to participate, parents were required to be in a longstanding couple relationship ( $\geq 3$  years), and have a child aged 5-12 years with a documented ASD diagnosis. Twelve families had more than one child with ASD. In these families, the oldest was selected as the child of focus, as this was when parenting in the context of ASD began. Parents were required to provide medical/educational records of the child's ASD diagnosis, and these records had to indicate that the diagnostic evaluation included the Autism Diagnosis Observation Schedule (Lord et al., 2000). Parents completed the Social Responsiveness Scale – Second Edition (SRS-2; Constantino & Gruber, 2012) to assess the child's current ASD symptoms. Five children had a SRS-2 Total t-score  $< 60$ , and were excluded, resulting in 183 families at the first time point. At the second time point, data was available for 166 families. The other 24 families did not participate for the following reasons: 3 could not be reached, 6 declined participation, and 15 were too busy to participate at that time but remained in the study. There was not a significant difference in parent education level, household income, family size, couple relationship length, child age, child SRS-2 Total t-score or Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) Total t-score between the families who did versus did not participate at the second time point. Sixteen families completed questionnaire packets via mail but did not complete the FMSS.

These 16 families significantly differed from the 150 families with FMSS data in father education ( $\chi^2 = 2.12, p = .04$ ), but not in maternal education level, household income, family size, relationship length, child age, and child SRS-2 Total t-score or child CBCL Total t-score. Of the 150 families ( $n = 300$  parents) in current analyses, 34.4% of the children with ASD had intellectual disability, 85.7% were male, and their average age was 7.97 years ( $SD = 2.25$ ). Children with ASD had a mean SRS-2 Total t-score of 77.84 ( $SD = 10.60$ ) as reported by mothers and 76.23 ( $SD = 9.93$ ) as reported by fathers. The average CBCL Total t-score for children with ASD was 65.35 ( $SD = 9.88$ ) as reported by mothers and 64.25 ( $SD = 9.38$ ) as reported by fathers. On average, mothers were aged 38.69 years ( $SD = 5.62$ ) and 23.9% did not have a college degree. Fathers average age was 40.76 ( $SD = 6.19$ ) and 32.4% did not have a college degree. The average household income was \$80-89K ( $SD = 30K$ ). The child had been adopted in four families (occurred at least 5 years prior). Two couples were not married but had lived together for at least 5 years. In 8 families, one parent was a stepparent who had been married to the biological parent for at least 3 years.

### **Procedure and Measures**

At each data collection time point, parents were interviewed and independently completed questionnaires about family socio-demographics, the child with ASD, and the parent-child relationship during a 2.5-hour home or lab visit. Parents were each paid \$50 for their participation at each wave of data collection.

**Socio-demographic information.** The following variables were examined and included in analyses, as relevant, to control for their association with key variables of interest. The race/ethnicity of each parent was coded as White, non-Hispanic (0) versus other (1). Parent educational level was coded less than high school degree (0), high school diploma or General

Equivalency Diploma (1), some college (2), college degree (3), some graduate school (4), and graduate/professional degree (5). Family size, operationalized as the number of children in the family, and duration of the parent couple relationship, defined as number of years in a committed relationship (coded in years), were jointly reported on by mothers and fathers. The date of birth of the child with ASD was used to calculate child age (in years). Parents reported on the child's gender, which was coded as female (1) or male (2). Children with ASD were considered to have intellectual disability if they had a medical diagnosis of ID and/or met criteria for ID based on review of medical and/or educational records reporting IQ and adaptive behavior testing. Parents reported on their household income, coded from 1-14, starting at  $\leq$ \$9,999 (1) and increasing by \$10,000 to \$20,000 intervals to  $\geq$ \$160,000 (14).

**Child ASD symptoms and co-occurring behavior problems.** In order to control for the impact of the child's ASD symptoms and co-occurring behavior problems on parent level of Warmth and Criticism in the FMSS, these variables were reported on by parents and controlled for in models. Each parent independently rated the severity of child's ASD symptoms during the past 6 months from 'Not True' (1) to 'Almost Always True' (4) using the SRS-2 (Appendix A; Constantino & Gruber, 2012), a 65-item self-reported questionnaire. Items are summed to create a Total t-score, which was used in current analyses. The SRS-2 has high internal consistency in samples of children with ASD (Bruni, 2014). Cronbach's alphas for the SRS-2 Total t-score in the current sample were  $\alpha = 0.95$  for mothers and  $\alpha = 0.94$  for fathers. The frequency and severity of the child with ASD's co-occurring behavior problems was assessed through the CBCL (Appendix B; Achenbach & Rescorla, 2001) Total t-score. Items are rated on a 3-point scale with responses 'Not True' (0), 'Somewhat or Sometimes True' (1) and 'Very True or Often True' (2). The CBCL has been shown to have good internal consistency and construct validity in

ASD samples (Duarte, Bordin, Oliveira, & Bird, 2003; Sikora, Hall, Hartley, Gerrard-Morris, & Cagle, 2008). In the current sample, the Cronbach's alpha for the Total t-score child was  $\alpha = 0.95$  for mothers and  $\alpha = 0.94$  for fathers.

**Parenting stress.** Mothers and fathers independently completed the Zarit Burden Interview (Appendix C; Zarit, Reever, & Bach-Peterson, 1980), a measure of subjective perception of the personal difficulty and distress associated with caregiving. The Burden Interview was completed at Time 1 and Time 2. The Burden Interview consists of 29 items rated on a 3-point scale from 0 (*'not at all'*) to 2 (*'extremely'*) and has been shown to have strong reliability and concurrent validity in the general population (Hébert, Bravo, & Prévile, 2000) and in mothers of individuals with ASD (Hartley, Barker, Seltzer, Greenberg, & Floyd, 2011). The Total score was used in analyses; higher scores indicate a higher level of parenting stress. In the current sample, the Cronbach's alpha for the Burden Interview was  $\alpha = 0.91$  and  $\alpha = 0.88$ , respectively for mothers and fathers.

**Parental depressive symptoms.** Parent level of depressive symptoms were measured at both time points using the Center for Epidemiologic Studies Depression Scale (CES-D; Appendix D; Radloff, 1977), a 20 item self-report scale of depressive symptoms. Parents individually rated the frequency of each depressive symptom in the past week on a 4-point scale from *'Rarely'* (0) to *'Most of the Time'* (3). The Total score was used in analyses. Cronbach's alphas for CES-D were  $\alpha = 0.92$  for mothers and  $\alpha = 0.89$  for fathers. In the current sample, 36.3% of mothers and 29.3% of fathers scored above the cutoff ( $\geq 16$ ) for clinically significant depressive symptoms.

**Emotional quality of the parent-child relationship.** The FMSS (Magaña et al., 1986) was used to assess Warmth and Criticism in the parent-child relationship. Parents were

individually asked to speak about their child with ASD for five minutes, addressing what kind of person their child is and how they got along together. The speech sample was recorded, transcribed, and coded (according to Vaughn & Leff, 1976) by a trained FMSS rater who was blind to study questions.

**Warmth.** An overall Warmth rating was based on (a) tone of voice; (b) spontaneity of expression of sympathy, concern, and empathy; and (c) expression of interest in the child with ASD, and globally considered across the entire speech sample as ‘low’ (0), ‘medium’ (3), or ‘high’ (5) (Magaña et al., 1986). The following excerpt is from a sample rated as ‘high Warmth’:

*“He’s, like I said, very creative, creates his own super heroes... Loves arts and crafts. Likes to be helpful, really working on sharing, and offering people things. I think he’s got a very kind heart.”*

**Criticism.** An overall Criticism rating was globally considered across the entire speech sample on a 3-point scale: ‘no Criticism’ (0), ‘borderline’ (1), or ‘high Criticism’ (2) (Magaña et al., 1986). Parents were rated as ‘high Criticism’ if they (a) made a negative opening remark, (b) negatively described their relationship with their child with ASD, or (c) made one or more critical comments about their child with ASD during the FMSS. Parents were rated as ‘borderline’ if they made one or more statements of dissatisfaction but did not satisfy the requirements of a ‘high Criticism’ score and were rated as ‘no Criticism’ if they did not make any critical comments throughout the entire FMSS. The following excerpt is from a speech sample rated as ‘high Criticism’:

*“I get frustrated often, every day with him. He’s not able to do basic routines. He can’t stay on task for things. He still has a lot of bathroom accidents, and just hygiene stuff,*

*that's pretty frustrating. I get pretty frustrated and I do sometimes yell at him or things I wish I wouldn't..."*

Past research has found a significant relation between FMSS codes of Warmth and Criticism and observed interactions and behaviors in observed parent-child interactions (Weston et al., 2017).

### **Data Analysis Plan**

We used SPSS version 24 (SPSS; Arbuckle, 2016) to examine descriptive statistics and the normality of data. Missing item values were item-mean imputed prior to the calculation of total scores (Eekhout et al., 2014) in cases with at least 80% of the items answered. Pearson correlations were used to identify socio-demographics associated with variables of interest. Paired sample t-tests were used to compare mother and father level of Warmth and Criticism. Structural equation modeling within Analysis of Moment Structures (AMOS, version 24.0; Arbuckle, 2016) was used to test Actor-Partner Interdependence Models (APIM; Cook & Kenny, 2005; Kashy & Kenny, 1999). APIM simultaneously estimates the associations between a respondent's independent variable and their own dependent variable (i.e., actor effect), as well as another respondent's dependent variable (i.e., partner effect) (Campbell, Simpson, Kashy, & Rholes, 2001), and accounts for the non-independence of data from partners in a couple relationship. The first APIM examined the link between actor and partner level of parenting stress at Time 1 and Warmth and Criticism in the FMSS at Time 2 (12 months later). This APIM also included parent ratings of the child's ASD symptoms (SRS-2) and co-occurring behavior problems (CBCL), as well as child gender and father ethnicity, which were correlated with level of parenting stress. The second APIM examined the link between actor and partner level of depressive symptoms at Time 1 and Warmth and Criticism in the FMSS at Time 2 (12 months later). This APIM also included parent ratings of the child's ASD symptoms (SRS-2) and co-

occurring behavior problems (CBCL), as well as household income, which were the variables correlated with depressive symptoms.

## **Results**

Table 1 displays the correlations between variables of interest (i.e., parenting stress, depressive symptoms, and FMSS Warmth and Criticism) and socio-demographic variables. Mother level of parenting stress was significantly positively correlated with mother and father ratings of child ASD symptoms and co-occurring behavior problems. Father level of parenting stress was higher if the child with ASD was male rather than female, and in White, non-Hispanic fathers than fathers of other race/ethnicities. Mother and father rating of child ASD symptoms and co-occurring behavior problems were significantly positively correlated with level of parenting stress. Mother level of depressive symptoms was significantly positively correlated with mother rating of child ASD symptoms, and mother and father rating of child co-occurring behavior problems. Father level of depressive symptoms was significantly positively correlated with father rating of child ASD symptoms, and mother and father rating of child co-occurring behavior problems, and significantly negatively correlated with household income. Further, mother Warmth was significantly negatively correlated with mother rating of child co-occurring behavior problems. Father Warmth was significantly negatively correlated with mother rating of child ASD symptoms and mother and father rating of child co-occurring behavior problems. Mother Criticism was significantly positively correlated with mother rating of child ASD symptoms and co-occurring behavior problems.

Mother level of parenting stress was correlated with mother and level of depressive symptoms and FMSS Warmth and Criticism, in the expected directions. Father level of parenting stress was significantly positively correlated with mother level of parenting stress,

mother and father level of depressive symptoms, and father Criticism. Father level of parenting stress was significantly negatively correlated with mother Warmth. Mother level of depressive symptoms was significantly positively correlated with father level of depressive symptoms and mother Criticism, and significantly negatively correlated with mother Warmth. Mother and father FMSS ratings of Warmth and Criticism were significantly correlated in expected directions. Paired samples t-tests revealed that mothers showed a significantly higher level of parenting stress than fathers at Time 1 ( $t(149) = 3.10, p = 0.002$ ) and Time 2 ( $t(149) = 2.88, p = 0.005$ ), a higher level of depressive symptoms at Time 1 ( $t(149) = 2.29, p = 0.023$ ), and higher Criticism at Time 2 ( $t(147) = 2.26, p = 0.025$ ).

### **Actor-Partner Interdependence Models**

Figure 2.1 presents the calculated maximum likelihood estimates for the effect of mother and father level of parenting stress at Time 1 on Warmth and Criticism at Time 2, controlling for child gender, father ethnicity, and mother and father ratings of the child's ASD symptoms and co-occurring behavior problems. Results indicated significant actor effects of one's own level of parenting stress on Warmth (critical ratio =  $-2.95, p < .01$ ) and Criticism (critical ratio =  $2.91, p < .01$ ) for mothers and on Criticism (critical ratio =  $2.29, p = .02$ ) for fathers 12 months later. There was also a significant partner effect of mother parenting stress on fathers Warmth 12 months later (critical ratio =  $-2.34, p = .02$ ). In other words, mother level of parenting stress at Time 1 predicted mother (actor) and father (partner) Warmth, and mother (actor) Criticism toward the child with ASD at Time 2. Father level of parenting stress at Time 1 predicted father (actor) Criticism toward the child with ASD at Time 2. Figure 2.2 presents the calculated maximum likelihood estimates for the effect of mother and father level of depressive symptoms at Time 1 on Warmth and Criticism at Time 2, controlling for household income, and mother and

father ratings of the child's ASD symptoms and co-occurring behavior problems. Results indicated a significant actor effect of one's own level of depressive symptoms on Time 2 Warmth (critical ratio = -2.32,  $p = .02$ ) and Criticism (critical ratio = 2.39,  $p = .02$ ) for mothers. In other words, mother level of depressive symptoms predicted mother (actor) Warmth and Criticism toward the child with ASD 12 months later.

### **Discussion**

Parents of children with ASD report facing numerous child-related challenges (Maskey et al., 2013; Valicenti-McDermott et al., 2015) and have been shown to be at risk for experiencing a high level of parenting stress (e.g., Lai et al., 2015) and depressive symptoms (Cohrs & Leslie, 2017). Drawing on the family systems perspective (Belsky, 1981), the current study examined the association between actor and partner level of parenting stress and depressive symptoms and a direct measure of the emotional quality of the parent-child relationship in families of children with ASD, using two time points of data spaced approximately 12 months apart. Findings indicated that one's own and their partner's psychological well-being have important longitudinal implications for the emotional quality of the parent-child relationship in families of children with ASD. Consistent with previous studies (Foody, James, & Leader, 2015; Pisula & Porębowicz-Dörsmann, 2017), mothers of children with ASD experienced a significantly higher level of parenting stress and depressive symptoms than fathers. Moreover, actor effects of psychological-being on the emotional quality of the parent-child relationship were more prominent for mothers of children with ASD than fathers. In support of our hypothesis, mothers own level of parenting stress and depressive symptoms predicted her Warmth and Criticism toward the child with ASD 12 months later. In contrast, father level of parenting stress predicted his Criticism, but not Warmth, toward the child with ASD 12 months later. Further, father's own

level of depressive symptoms was not significantly related to his Criticism or Warmth toward the child with ASD 12 months later. Thus, mothers of children with ASD appear to be vulnerable to experiencing higher levels of parenting stress and depressive symptoms than fathers, and poor psychological well-being appears to take a greater toll on their parent-child relationship than it does for fathers. These findings suggest that mother psychological well-being is an important target for ASD interventions, as improvements may have impacts for the emotional quality of both the mother- and father-child relationship.

Our findings of stronger actor effects of psychological well-being on the parent-child relationship in mothers than fathers of children with ASD is in contrast to evidence in the general population showing comparable effects for mothers and fathers (Wilson & Durbin, 2010). Research has shown that families of children with ASD are more likely than their peers who have typically developing children to engage in role specialization in which one parent (most often mothers) take on the bulk of childcare and the other parent (most often fathers) focus on paid employment (Callander & Lindsay, 2017; McCall & Starr, 2016). The stronger association between level of parenting stress and depressive symptoms and the emotional quality of the parent-child relationship in mothers compared to fathers of children with ASD may, in part, be due to increased mother time spent in childcare. Fathers of children with ASD, on the other hand, may be better able to separate their own psychological well-being from their parent-child relationship given more time spent in paid employment as opposed to childcare. That said, fathers' level of parenting stress was associated with his Criticism toward the child with ASD 12 months later, indicating that these pathways are still occurring.

Cross-partner effects of psychological well-being only occurred for fathers of children with ASD. If mothers had a high initial level of parenting stress, fathers reported a lower level of

Warmth toward their child with ASD 12 months later. Perhaps, as has been reported in the general population (e.g., Radcliffe & Cassell, 2015; Stevenson et al., 2014), mothers often serve as a “gatekeeper” for the child with ASD. When mother level of parenting stress is low, mothers of children with ASD may be better able to facilitate father Warmth by planning fun family activities. Alternatively, if mothers of children with ASD experience high parenting stress, this stress may spill into the parent couple relationship, and subsequently drain emotional resources and/or lead fathers to be less warm in their parent-child relationship. In contrast to research in the general population (Williams, 2018), no partner effects of psychological well-being were found for the emotional quality of the mother-child relationship in our sample of families of children with ASD.

There are several strengths of the current study. The study included mothers and fathers of children with ASD and investigated actor and partner effects in a relatively large sample and across two time points. The study is also employed a direct measure (as opposed to self-report measure) of the emotional quality of the parent-child relationship. This study also had limitations. Causality of associations cannot be determined given only two time points. The sample is also relatively homogeneous in terms of race/ethnicity and socio-economic status. Further studies are needed to examine the role of the emotional quality of the parent couple relationship in mediating cross-partner effects of poor psychological well-being on the emotional quality of the parent-child relationship, given its theoretical link between these constructs in a family systems perspective (Belsky, 1981). Future studies should also examine other aspects of the parent-child relationship such as observed indicators of parenting quality, and/or also include the perspective the child with ASD.

Findings have important implications for interventions for parents of children with ASD. Psychoeducational interventions and supports aimed at reducing level of parenting stress may have critical impacts on the emotional quality of the parent-child relationship in a context of child ASD. The mother-child and father-child relationship are both impacted by parent psychological well-being in families of children with ASD; however, actor effects are stronger for mothers and partner effects were only found for fathers. Thus, in some ways, interventions that focus on enhancing the psychological well-being of mothers of children with ASD may have the greatest effects on child outcomes as they may lead to a better mother-child relationship and better father-child relationship.

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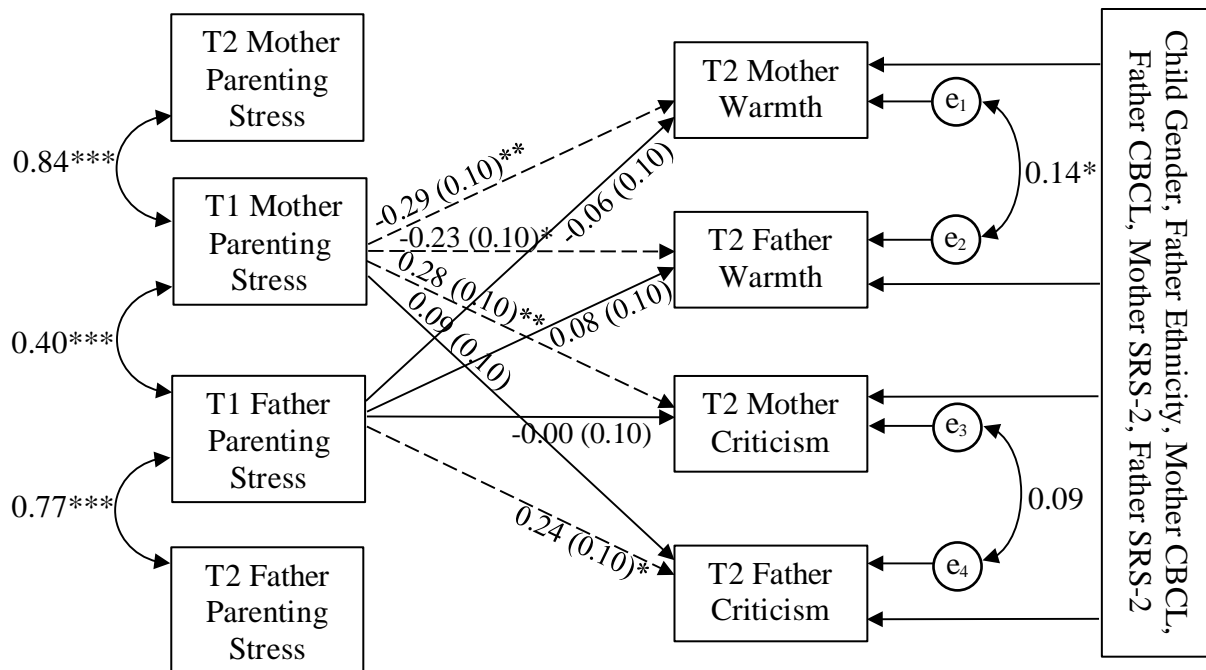
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Table 2.1

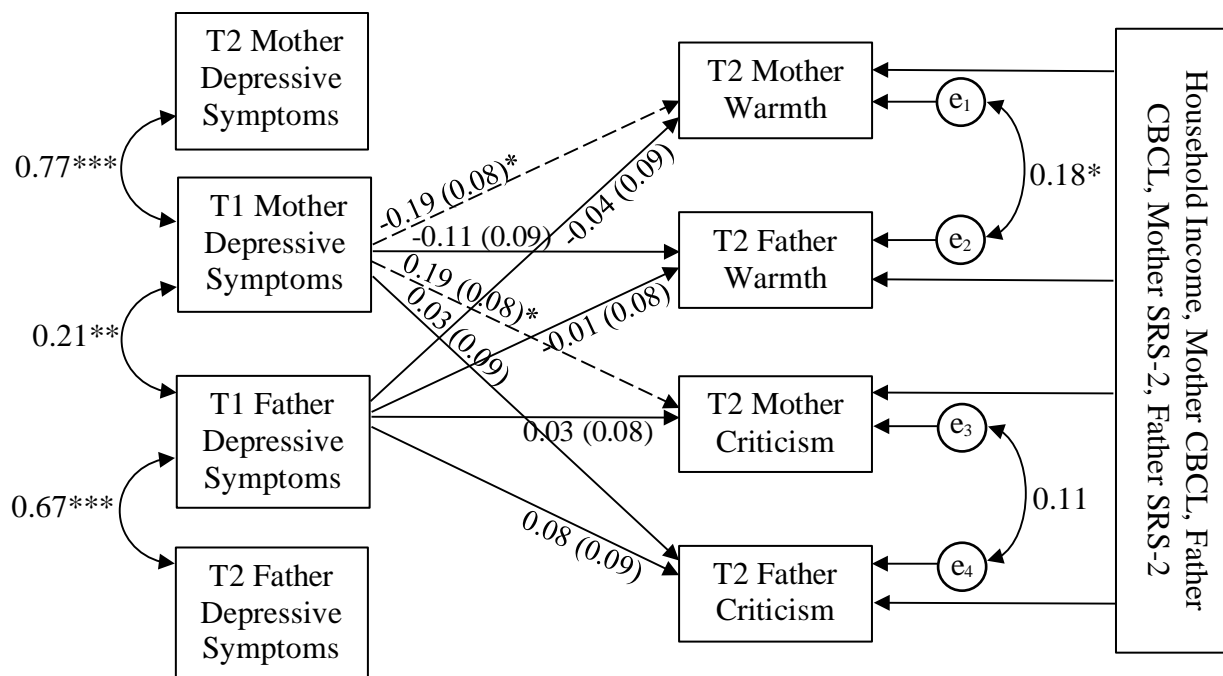
*Correlations with demographic variables*

Variable	Mother Parenting Stress	Father Parenting Stress	Mother Depressive Symptoms	Father Depressive Symptoms	Mother Warmth	Father Warmth	Mother Criticism	Father Criticism
Child Gender	0.04	0.15*	-0.07	0.07	0.04	0.07	-0.04	-0.08
Child Age	-0.13	-0.12	-0.05	-0.02	0.01	-0.02	0.01	-0.04
Child ID	0.11	0.11	0.02	0.01	0.02	-0.09	-0.02	-0.01
Mother SRS-2	0.39***	0.31***	0.15*	0.14	-0.15	-0.18*	0.22**	0.10
Father SRS-2	0.18*	0.34***	0.05	0.20**	-0.03	-0.09	-0.10	-0.03
Mother CBCL	0.52***	0.36***	0.31***	0.16*	-0.25**	-0.21*	0.28**	0.12
Father CBCL	0.28***	0.53***	0.18*	0.33***	-0.12	-0.26**	-0.03	0.12
Mother Age	0.09	0.13	0.06	0.12	0.01	-0.07	-0.00	-0.03
Mother Ethnicity	-0.01	-0.10	0.05	-0.02	0.01	0.03	-0.02	-0.01
Mother Education	0.03	0.03	-0.13	-0.06	-0.04	-0.03	0.07	0.05
Father Age	0.03	0.14	-0.01	0.05	0.05	-0.10	-0.05	-0.08
Father Ethnicity	0.01	-0.19**	0.06	-0.08	0.06	0.08	-0.03	0.01
Father Education	0.07	0.08	0.04	-0.10	-0.08	0.10	-0.05	-0.14
Family Size	-0.12	-0.01	-0.02	-0.02	-0.11	-0.04	0.08	-0.06
Household Income	-0.03	0.01	-0.13	-0.16*	-0.08	0.04	0.04	0.05
Relationship Length	-0.03	0.12	-0.08	0.04	0.06	0.01	0.01	-0.07
Mother Parenting Stress	--							
Father Parenting Stress	0.41***	--						
Mother Depressive Symptoms	0.60***	0.31***	--					
Father Depressive Symptoms	0.20**	0.55***	0.18*	--				
Mother Warmth	-0.29***	-0.18*	-0.28**	-0.10	--			
Father Warmth	-0.23**	-0.13	-0.08	-0.10	0.23**	--		
Mother Criticism	0.33***	0.06	0.27**	0.02	-0.51***	-0.19*	--	
Father Criticism	0.19*	0.23**	0.10	0.11	-0.20*	-0.35***	0.16*	--

*Note.* The race/ethnicity of each parent was coded as White, non-Hispanic (0) versus other (1). Parents reported on child's gender, which was coded as either female (1) or male (2). Parents individually reported on their household income, coded from 1-14, starting at ≤\$9,999 (1) and increasing by \$10,000 to \$20,000 intervals to ≥\$160,000 (14). *p*-value = \* > 0.05; \*\* > 0.01; \*\*\* > 0.001.



*Figure 2.1.* Path diagram and estimates for the actor-partner interdependence model of parenting stress on mother and father Warmth and Criticism including child gender, father ethnicity, and mother and father SRS-2 (Social Responsiveness Scale – Second Edition) and CBCL (Child Behavior Checklist) ratings as covariates. Single-headed arrows indicate predictive paths; double-headed arrows indicate correlated variables. Dashed lines indicate significant predictive path.  $p$ -value = \* > 0.05; \*\* > 0.01; \*\*\* > 0.001.



*Figure 2.2.* Path diagram and estimates for the actor-partner interdependence model of depressive symptoms on mother and father Warmth and Criticism including household income and mother and father SRS-2 (Social Responsiveness Scale – Second Edition) and CBCL (Child Behavior Checklist) ratings as covariates. Single-headed arrows indicate predictive paths; double-headed arrows indicate correlated variables. Dashed lines indicate significant predictive path.  $p$ -value = \* > 0.05; \*\* > 0.01; \*\*\* > 0.001.

### Chapter 3:

#### Subtypes of Family Emotional Quality in the Context of Child Autism

## Abstract

Little research has examined family emotional climate in the context of having a child with autism spectrum disorder (ASD). The goal of the current study was to determine how emotional quality across family subsystems (mother-child, father-child, and parent couple) combine to create various subtypes of family emotional climate. Emotional quality of subsystems was assessed using Five Minute Speech samples from mothers and fathers. The second goal of the study was to identify predictors of subtype membership. In total, 148 families of children with ASD were included in analyses. The child with ASD was aged 6-17 (85.8% male) and 72% of parents had at least a college degree, and all families were from a mid-western state in the U.S. Latent class analysis (LCA) was used to identify subtypes of family emotional quality.

Associations between family subtype membership and family characteristics (i.e., parent level of broader autism phenotype, having an additional child with ASD or other neurodevelopmental disability or psychological disorder) were investigated using one-way repeated measure analysis of co-variance (MANCOVA) along with follow-up Bonferroni-corrected pairwise comparisons. Five family emotional quality subtypes were found: 1) *Family Resilient* (n = 63 [42.6%]); 2) *Couple Distressed* (n = 20 [13.5%]); 3) *Mother Distressed with Partner* (n = 12 [8.1%]); 4) *Family Distressed* (n = 18 [12.2%]; and 5) *Mother Distressed – Father Resilient* (n = 35 [23.6%]). Parent level of broader autism phenotype and child behavior problems were associated with subtype membership. Implications for interventions are discussed.

*Keywords:* Family systems, Autism, Expressed Emotion, Emotional quality, Parent-child relationship, Parent-couple relationship, Family subtypes

### Subtypes of Family Emotional Quality in the Context of Child Autism

Expressed emotion is a research construct intended to capture the emotional quality of relationships between family members (Brown, Birley, & Wing, 1972; Vaughn & Leff, 1976). One way that expressed emotion has been assessed is via the Five Minute Speech Sample (FMSS; Magaña, 1986), which asks individuals to speak about a family member and their relationship with that family member for five minutes. The emotion (e.g., Criticism and Warmth) expressed about the family member and dyadic relationship in the speech sample is then coded (Magaña, 1986). The FMSS has been shown to mirror the emotions and behaviors in actual family interactions (e.g., McCarty, Lau, Valeri, & Weisz, 2004; Weston, Hawes, & Pasalich, 2017). A growing body of research on both the general population (Khafi, Yates, & Sher-Censor, 2015; Labella, Narayan, & Masten, 2016) and neurodevelopmental disability population (Musser, Karalunas, Dieckmann, Peris, & Nigg, 2016; Romero-Gonzalez, Chandler, & Simonoff, 2018) has used the FMSS to examine the emotional quality of the mother-child relationship. However, little research has used the FMSS to assess the emotional quality of other family dyads – such as the father-child and parent couple relationship – and virtually nothing is known about the extent to which emotional quality across family subsystems combine to create family subtypes. The goal of the current study was to identify subtypes of family emotional quality, and their predictors, in families of children with autism spectrum disorder (ASD).

In the United States, it is estimated that 1 in 59 children meet diagnostic criteria for ASD (Center for Disease Control and Prevention [CDC], 2018), which is a neurodevelopmental disability involving difficulties in social communication, restricted and repetitive interests and behaviors, and sensory sensitivities (American Psychiatric Association, 2014). In addition to these ASD symptoms, about one-third of children with ASD have intellectual disability (CDC,

2018), and more than one-half of children with ASD demonstrate marked emotional and behavior problems such as anxiety, attention deficits, and difficulty making transitions (Maskey, Warnell, Parr, Le Couteur, & McConachie, 2013; McStay, Dissanayake, Scheeren, Koot, & Begeer, 2014). Across studies, parents of children with ASD report an elevated level of parenting stress (Estes et al., 2013; Pisula & Porębowicz-Dörsmann, 2017) and symptoms of depression and anxiety (Cohrs & Leslie, 2017; Lai, Goh, Oei, & Sung, 2015), and more dissatisfying and shorter-term couple relationships (Saini et al., 2015; Sim, Cordier, Vaz, & Falkmer, 2016) than comparison groups. In part, the child with ASD's challenging behaviors have been shown to contribute to these altered experiences (Estes et al., 2013; Argumedes, Lanovaz, & Larivée, 2018). However, there is also evidence that parent psychological well-being (e.g., Yorke et al., 2018) and couple relationship quality (Hartley Papp, & Bolt, 2016) shape the functioning of the child with ASD. Thus, in a reciprocal transactional process, the child with ASD's symptoms and behavior problems may take a toll on parent psychological well-being and couple relationship quality, which subsequently alters parenting behaviors in ways that reinforce the child's symptoms and behavior problems (Guralnick, 2011).

Families of children with ASD may also experience a unique family context by virtue of the genetic etiology of ASD (Schaefer & Mendelsohn, 2013). This genetic etiology leads to multiplex families, defined as having multiple family members affected by ASD or related conditions. Indeed, 15-21% of parents of children with ASD, compared to 4-8% of parents of typically developing children, demonstrate the broader autism phenotype (BAP) (e.g., Bora, Aydın, Saraç, Kadak, & Köse, 2017; Page et al., 2016), involving mild autistic-like traits including cognitive rigidity, anxious personality traits, and difficulties with social interactions (Ingersoll, 2010; Losh, Childress, Lam, & Piven, 2008). There is evidence that BAP has its own

influence on family relationships. For example, in a sample of 195 couples from the general population, BAP was negatively linked to couple relationship satisfaction (Pollmann, Finkenauer, & Begeer, 2010). BAP has also been linked to shorter and more dissatisfying romantic relationships in college students (Jobe & Williams White, 2007; Lamport & Turner, 2014). Further, as many as 40% of siblings of children with ASD exhibit ASD symptoms by 12 months of age and about 20% of siblings are diagnosed with ASD by 36 months of age (Ozonoff et al., 2011; Messinger et al., 2015). Siblings of children with ASD also have a heightened risk for other types of neurodevelopmental disabilities and psychological disorders (Jokiranta-Olkonemi, Cheslack-Postava, & Sucksdorff, 2016), which may add to family distress. The extent to which multiplex families – those who have a parent or sibling affected by ASD or a related condition – evidence altered emotional quality in the parent-child and/or parent couple relationship in the context of child ASD has yet to be studied.

Previous studies using the FMSS to examine the emotional quality of family relationships in the context of child ASD have been limited to studies of the mother-child relationship (Baker, Smith, Greenberg, Seltzer, & Taylor, 2011; Smith, Greenberg, Seltzer, & Hong, 2008). These studies focused on FMSS ratings of Criticism and Warmth and showed a range in the emotional quality of the mother-child relationship. Across samples of mothers of children and adolescents and young adults with ASD, 12-18% expressed high Criticism toward the son or daughter with ASD (Baker et al., 2011; Griffith, Hastings, Petalas, & Lloyd, 2015), and 20-40% expressed high Warmth (Griffith et al., 2015; Smith et al., 2008). Mothers were found to be more likely to express high Criticism and low Warmth toward a child with ASD than toward a typically developing sibling (Griffith et al., 2015). To date, there are no published FMSS studies of expressed emotion in the father-child relationship in a context of child ASD; thus, it is not clear

if the father-child relationship differs from that of the mother-child relationship in Warmth and Criticism. Mothers of children with ASD, however, often report a higher level of parenting stress than fathers (e.g., Dabrowska & Pisula, 2010; Foody, James, & Leader, 2015). This elevated level of parenting stress may mean that the mother-child relationship is at greater risk for high Criticism and low Warmth than the father-child relationship in a context of child ASD.

The FMSS has also been used to examine emotional quality in the couple relationship in research on non-ASD populations (e.g., Favez, Cairo, Notari, Antonini, & Charvoz, 2017; Trombello, Post, & Smith, 2018). These studies found that women (62% high Criticism), on average, were more likely to express high Criticism toward their partner than men (49% high Criticism) (Favez et al., 2017). To date, there are no published FMSS studies of the emotional quality of the parent couple relationship in families of children with ASD or other types of neurodevelopmental disabilities. Parents of children with ASD have been found to report less satisfying (e.g., Gau et al., 2012; Sim et al., 2016) and more conflict-ridden (Hartley et al., 2017) couple relationships and to have a higher rate of separation/divorce (Hartley et al., 2010; Saini et al., 2015) than their peers who have typically developing children. Thus, families of children with ASD may often consist of one or both parents expressing low Warmth and high Criticism toward her/his partner.

According to family systems theory, the emotional quality of the parent-child and parent couple relationship are intertwined (Belsky, 1981). In part, this link is explained by the *spillover hypothesis*, which posits that affect and behaviors originating in one subsystem carry over into other subsystems (Almeida, Wethington, & Chandler, 1999). For example, tension, negative affect, and conflict generated in parents' couple relationship may lead to tension, negative affect, and conflict in the parent-child relationship, and vice versa. There is recent evidence that stress

spillover between the parenting and couple relationship subsystems is greater when the child with ASD has more challenging behavior (i.e., higher severity of child ASD symptoms and behavior problems) (Hartley, Papp, & Bolt, 2016). Thus, the *spillover hypothesis* predicts that families of children with ASD, and especially those undergoing high child-related challenges, will experience low Warmth and high Criticism across family relationships (mother-child, father-child, and parent couple relationship). On the other hand, families of children with ASD may experience opposing emotional quality across family subsystems. According to a *divergence hypothesis*, parents compensate for an unsatisfying relationship in one subsystem by devoting additional time and energy into another subsystem (Belsky, Youngblade, Rovine, & Volling, 1991; Erel & Burman, 1995). In the context of child ASD, some parents describe forming a stronger couple relationship (e.g., deeper commitment and intimacy), as a result of shared child-related challenges (Hock, Timm, & Ramisch, 2012). Alternatively, one parent may attempt to compensate for his/her partner's low emotional quality parent-child relationship (i.e., high Criticism and/or low Warmth) through their own high quality parent-child relationship (i.e., low Criticism and/or high Warmth). Indeed, family subtypes consisting of one emotionally supportive parent and one emotionally detached or negative parent are evident in the general population (Ryan, Martin, & Brooks-Gunn, 2006).

The overarching goal of the current study was to identify subtypes of family emotional quality in the context of child ASD. We used FMSS ratings, conducted separately with mothers and fathers, of the parent-child relationship and parent couple relationship in a sample of 148 families of children with ASD (aged 5-12 years). The study aims were to: 1) describe and compare Criticism and Warmth in the parent-child and partner relationship expressed by mothers versus fathers of children with ASD; 2) identify subtypes of family emotional quality based on

the parent-child relationship and parent couple relationship; and 3) determine predictors of family emotional quality subtype membership. Given previous evidence that mothers report a higher level of parenting stress than fathers of children with ASD (Dabrowska & Pisula, 2010; Foody et al., 2015), mothers were hypothesized to express high Criticism and low Warmth in the parent-child relationship more often than fathers. Based on FMSS research on the general population (e.g., Favez et al., 2017), mothers of children with ASD were expected to express high Criticism about the parent couple relationship more often than fathers. In line with the *spillover hypothesis* (e.g., Almeida et al., 1999), families undergoing high child challenges (i.e., child with higher severity of ASD symptoms and behavior problems) were predicted to exhibit low Warmth and high Criticism across family relationships (mother-child, father-child, and couple relationship). In line with the *divergence hypothesis* (Ryan et al., 2006), we also expected that some families would exhibit opposing emotional quality across mother and father parent-child and parent couple relationships. Finally, we hypothesized that multiplex families would be more likely to express high Criticism and low Warmth across family relationships than families with only one member affected (i.e., target child with ASD).

## **Method**

### **Participants**

The present study is based on the second wave of data collection (occurring in 2014-2015) in a larger longitudinal study. The study originally included 187 mother-father couples who had a child with ASD aged 5-12 years. The second wave of data collection was analyzed because this is when the FMSS was included. Families were recruited through fliers posted at ASD clinics and in community settings (e.g., libraries), mailings to schools and childcare programs, and research registries. Study inclusion criteria included having both parents

participate in the study, being in a longstanding couple relationship ( $\geq 3$  years), and having a child aged 5-12 years with a diagnosis of ASD. Parents had to provide medical or educational records documenting ASD diagnosis and the diagnostic evaluation had to have included the Autism Diagnosis Observation Schedule (Lord et al., 2012; Lord et al., 2000). Twelve families had more than one child with ASD. In these families, the oldest child with ASD was selected as the target child for study purposes, as this was when parenting in the context of ASD began. The child had been adopted in four families ( $\geq 5$  years prior). Two couples were not married but had lived together for  $\geq 5$  years. In 6 families, one parent was a stepparent who had been married to the biological parent for at least 3 years. Parents individually completed the Social Responsiveness Scale – Second Edition (SRS-2; Constantino & Gruber, 2012) to assess the target child's current ASD symptoms. Five children with ASD had an SRS-2 Total t-score  $< 60$  and were excluded resulting in 182 families at the first wave of data collection.

Of the 182 families who completed the first wave of data collection, 166 completed part or all of the second wave of data collection one year later (8 could not be reached, 2 moved out of state, and 6 declined). The families who were not involved in the study did not significantly differ from those who remained in the study in parent education level, household income, family size, couple relationship length, child age, child SRS-2 Total t-score or Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) Total t-score. Sixteen families completed questionnaire packets via mail only, and thus did not complete the FMSS. These 16 families significantly differed from the 150 families with FMSS data in father education ( $\chi^2 = 2.12, p = .04$ ), but not in maternal education, household income, family size, relationship length, child age, and child SRS-2 Total t-score or child CBCL Total t-score. In addition, two families had FMSS data from only one parent and were excluded from analyses. Of the 148 families in current analyses,

35.1% of target children with ASD had intellectual disability (ID), 85.8% were male, and their average age was 9.12 years ( $SD = 2.35$ ). The target children with ASD had a mean SRS-2 Total t-score of 75.82 ( $SD = 10.30$ ) as reported by mothers and 74.47 ( $SD = 10.52$ ) as reported by fathers. Their average CBCL Total t-score was 63.61 ( $SD = 9.96$ ) as reported by mothers and 62.92 ( $SD = 8.85$ ) as reported by fathers. Mothers' average age was 39.52 years ( $SD = 5.60$ ) and 23.9% did not have a college degree. Fathers had an average age of 41.57 ( $SD = 6.25$ ) and 32.4% did not have a college degree. Mean household income was \$80-89K ( $SD = 30K$ ). Overall, 36.5% of families had an additional child[ren] with a neurodevelopmental or psychological disorder. On average, families had 2.44 ( $SD = 1.07$ ) children.

### **Procedure**

Parents were interviewed and independently completed questionnaires about family socio-demographics and the child with ASD during a 2.5-hour lab or home visit. The FMSS was conducted individually with mothers and fathers and in separate rooms so that they could not hear one another's speech samples. Parents were each paid \$50 for this portion of the study.

### **Measures**

**Family Socio-demographics.** Socio-demographic information was reported on by parents and included in analyses to assess for their association with family subtypes of emotional quality and then control for these associations in subsequent analyses. Target child age was coded in years and gender was coded as female = 1 and male = 0. Target child ID status (1 = ID, 0 = no ID) was based on a medical or educational diagnosis of ID and/or if the child met criteria based on review of records reporting IQ and adaptive behavior. Family size was operationalized as the number of children in the family. The duration of the couple relationship was defined as

number of years in a committed relationship. Household income was coded from 1-14, starting at  $\leq \$9,999$  (1) and increasing by \$10,000 to \$20,000 intervals to  $\geq \$160,000$  (14).

**Multiplex Families.** Two variables were used to examine whether multiple members in the family were affected by ASD or related conditions. First, the presence of an additional child[ren] in the family with a neurodevelopmental disability (including ASD) or psychological disorder was reported on by parents and coded as yes = 1 or no = 0. Second, parents independently completed the Broad Autism Phenotype Questionnaire (BAPQ; Hurley, Losh, Parlier, Reznick, & Piven, 2007) to assess level of BAP. The BAPQ was derived from a direct assessment of personality and language characteristics associated with ASD (Hurley et al, 2007). The measure includes 36 statements rated from ‘*very rarely*’ (1) to ‘*very often*’ (6) and has been found to have good internal consistency (Hurley et al., 2007). The BAPQ total score was used in analyses. Cronbach’s alphas for the BAPQ were  $\alpha = 0.93$  for mothers and  $\alpha = 0.91$  for fathers.

**Child-Related Challenges.** The severity of the child’s ASD symptoms were assessed using the SRS-2 (Appendix A; Constantino & Gruber, 2012). The SRS-2 is a 65-item self-reported questionnaire. Each parent independently rated the severity of child’s ASD symptoms during the past 6 months from ‘*Not True*’ (1) to ‘*Almost Always True*’ (4). The Total standardized t-score was used in analyses. The SRS-2 has been shown to have high internal consistency (Bruni, 2014). Cronbach’s alphas for the SRS-2 in the current sample were  $\alpha = 0.94$  for mothers and  $\alpha = 0.94$  for fathers. The frequency and severity of the target child’s behavior problems was assessed through the CBCL (Appendix B; Achenback & Rescorla, 2001). Parents rated each item as ‘*Not True*’ (0), ‘*Somewhat or Sometimes True*’ (1) and ‘*Very True or Often True*’ (2). Items were summed to create a standardized CBCL Total t-score. The CBCL has been shown to have good internal consistency and construct validity in ASD samples (Sikora,

Hall, Hartley, Gerrard-Morris, & Cagle, 2008). In the current sample, the Cronbach's alpha for the Total CBCL t-score was  $\alpha = 0.95$  for mothers and  $\alpha = 0.94$  for fathers.

**FMSS Emotional Quality.** Separate FMSS (Magaña et al., 1986) from mothers and fathers were used to assess emotional quality in the 1) parent-child and 2) parent couple relationships, resulting in four FMSS ratings per family. Mothers and fathers were prompted to speak about the target child for 5 minutes, addressing what kind of person the child is and how they got along together. Parents were then given these same prompts in relation to his/her partner. The speech samples, which were audio recorded and transcribed, were coded by a trained FMSS rater who was blind to study questions (according to Magaña et al., 1986). Past research has found a significant relation between these FMSS codes and the observed emotional quality of actual interactions (e.g., McCarty et al., 2004; Weston et al., 2017).

**Criticism.** Mothers and fathers were rated as High, Borderline, or Low in Criticism, according to procedures outlined by Magaña et al. (1986), for each speech sample (child and partner). Samples were coded as High Criticism if the parent made a negative opening remark, negatively described their relationship with the child/partner, and/or made one or more critical comments about their child/partner (Magaña et al., 1986). Additional samples were coded as Borderline Criticism if the parent made one or more statements of dissatisfaction about their child/partner. Samples were coded as Low Criticism if the parent did not make any critical comments. A dichotomous FMSS Criticism rating was then created by combining the High and Borderline categories (coded 1) versus Low Criticism (coded 0), given the relatively low number of speech samples originally coded as High Criticism.

**Warmth.** Mothers and fathers were rated as High, Borderline, or Low in Warmth, according to procedures outlined by Vaughn & Leff (1976), for each speech sample (child and

partner). Samples were coded as High Warmth if parents expressed clear warmth based on tone, expression of interest, and spontaneity of expression of sympathy, concern, and empathy (Vaughn & Leff, 1976). Due to the relatively low number of speech samples coded as Low Warmth in the original FMSS coding (Vaughn & Leff, 1976), a dichotomous FMSS Warmth rating was created by combining the Low and Borderline Warmth categories (coded 0) versus the High Warmth (coded 1).

### **Data Analysis Plan**

Descriptive statistics and boxplots were used to examine the normality of data in SPSS, version 24 (SPSS; Arbuckle, 2016). Pearson correlations were used to examine associations among mother and father Warmth and Criticism, predictor variables (i.e., target child severity of ASD symptoms and severity of behavior problems, mother level of BAP, father level of BAP, and additional child[ren] with a neurodevelopmental disability or psychological disorder), and family socio-demographics (i.e., child age, gender, and ID status, parent couple relationship length, family size, and household income). McNemar's tests were then conducted to examine within-couple mother-father differences in Criticism and Warmth in the parent-child and parent couple relationships. Latent class analysis (LCA), assessed in SAS, version 9.4 (SAS Institute Inc., 2013), was used to identify subtypes of family emotional quality. Mother and father Criticism and Warmth in the parent-child and parent couple relationships were entered in LCA models, totaling eight dichotomous latent variables per family. Fit statistics were examined for two- to six-class solutions. The models were fit by successively increasing the number of groups in the model and then comparing indicators of model fit. Model fit was evaluated based on the Akaike information criterion (AIC; Akaike, 1974) the Bayesian information criterion (BIC; Schwarz, 1978), and entropy (Celeux & Soromenho, 1996). AIC and BIC examine the extent to

which the model fits the data, with lower AIC and BIC indicating better fit. Entropy is a summary statistic of all posterior probabilities derived by the model, ranging from 0 to 1; values closer to 1 indicate meaningful differences between groups. Finally, we examined the association between family subtype membership and family socio-demographics, using a one-way repeated measure analysis of variance (MANOVA), and predictor variables, using one-way repeated measure analysis of co-variance (MANCOVA) controlling for relevant family socio-demographics (i.e., those significantly related to predictor variables). Follow-up Bonferroni-corrected ( $p < .007$ ) pairwise comparisons were used to identify subtype differences.

## **Results**

### **Preliminary Statistics**

Histograms revealed that family socio-demographic (i.e., child age, family size, parent couple relationship length, and household income) and predictor variables (i.e., target child severity of ASD symptoms and severity of behavior problems, mother level of BAP, and father level of BAP) were normally distributed. Associations among family socio-demographic characteristics, FMSS Warmth and Criticism, and our predictor variables are shown in Table 2.1. Target child ID status was significantly positively correlated with mother and father ratings of child ASD symptoms and father rating of child behavior problems. Family size was significantly positively correlated with the presence of additional child[ren] in the family with a neurodevelopmental disability or psychological disorder.

Table 2.1 also displays the correlations among the FMSS ratings of Criticism and Warmth in the parent-child and parent couple relationships for mothers and fathers. Mother Warmth in the parent-child relationship was significantly positively associated with mother Warmth in the parent couple relationship and father Warmth in the parent-child and parent

couple relationships, and negatively associated with mother and father Criticism in the parent-child relationship. Father Warmth in the parent-child relationship was also significantly positively associated with father Warmth in the parent couple relationship, and negatively associated with father Criticism in the parent-child relationship. Mother Warmth in the parent couple relationship was significantly positively associated with father Warmth in the parent couple relationship, and negatively associated with mother Criticism in the parent-child relationship and mother and father Criticism in the parent couple relationship. Father Warmth in the parent couple relationship was also significantly negatively associated with mother Criticism in the parent couple relationship and father Criticism in the parent-child and parent couple relationships. Mother Criticism in the parent-child relationship was significantly positively associated with mother Criticism in the parent couple relationship and father Criticism in the parent-child relationship. Father Criticism in the parent-child relationship was also significantly positively associated with father Criticism in the parent couple relationship. Finally, mother and father Criticism in the parent couple relationship was significantly positively associated.

### **Mother versus Father Warmth and Criticism**

Overall, 46.6% of mothers and 50.7% of fathers had high Warmth toward their child and 47.3% of mothers and 48.0% of fathers had high Warmth toward her/his partner. Overall, 23.0% of mothers and 13.5% of fathers had high Criticism toward their child and 29.7% of mothers and 18.9% of fathers had high Criticism toward her/his partner. McNemar's tests revealed that mothers were more likely to express high Criticism in the parent-child relationship ( $\chi^2 = 5.28, p = .022$ ) and in the parent couple relationship ( $\chi^2 = 5.63, p = .018$ ) than fathers, within couples. There were no significant differences between the percentage of mothers versus father with high Warmth in the parent-child relationship ( $\chi^2 = 0.43, p = .511$ ) or in the parent couple relationship

( $\chi^2 = 0.00, p = 1.000$ ), at a within-couple level. At a within-person level, mothers showed comparable Warmth ( $\chi^2 = 0.00, p = 1.000$ ) and Criticism ( $\chi^2 = 1.76, p = .185$ ) in the parent-child and parent couple relationships. Fathers also showed comparable Warmth ( $\chi^2 = 0.15, p = .699$ ) and Criticism ( $\chi^2 = 1.53, p = .216$ ) in the parent-child and parent couple relationships.

### **LCA Model Selection**

Table 3.2 presents the fit statistics for 2-6 latent class models. LCA revealed a drop in AIC and sample size adjusted BIC with the addition of each class from a two-group to a six-group class model; however, the magnitude of change in AIC was small between 5 and 6 classes, suggesting that the fit of a 5- and 6-class model was fairly equal. All models had relatively high entropy, ranging from 0.82-0.93. The largest increase in entropy was between the 4- and 5-class model. The 6-class model had the lowest AIC and adjusted-BIC, without a drop in entropy from the 5-class model; yet, two classes in the 6-class model were made up of only 4-6% of the sample. Thus, the 5-class (i.e., subtype) model was thought to provide the best fit based on theoretical grounds, parsimony, and fit statistics.

### **Subtype Descriptions**

Table 3.3 presents the percentages of low and high Warmth and Criticism for mothers and fathers in each LCA subtype. Figure 3.1 displays the average Criticism and Warmth rating for each subtype. There was a *Family Resilient* subtype (Subtype 1;  $n = 63$  [42.6%]) in which both parents in the family had low Criticism and high Warmth in both the parent-child and parent couple relationships. In support of our hypothesis, there was a *Family Distressed* subtype (Subtype 4;  $n = 18$  [12.2%]) in which both parents in the family had high Criticism and low Warmth in both the parent-child and parent couple relationships. Three divergent subtypes of family emotional quality emerged, also consistent with our hypothesis. The *Couple Distressed*

subtype (Subtype 2;  $n = 20$  [13.5%]) consisted of families in which both parents had low Criticism and high Warmth in the parent-child relationship but high Criticism and low Warmth in the couple relationship. The *Mother Distressed with Partner* subtype (Subtype 3;  $n = 12$  [8.1%]) involved mothers with low Criticism and high Warmth in the parent-child relationship but high Criticism and low Warmth in the parent couple relationship, while fathers had low Criticism and a mixed pattern of Warmth in the parent-child and the parent couple relationship. Finally, in the *Mother Distressed – Father Resilient* subtype (Subtype 5;  $n = 35$  [23.6%]), mothers had low Warmth, paired with a mix of low and high Criticism, in the parent-child and parent couple relationships and fathers showed low Criticism, paired with a mix of high and low Warmth in the parent-child and parent couple relationships.

### **Socio-demographic Characteristics and Predictors of Family Subtype Membership**

Table 3.4 displays the means and standard deviations for socio-demographics and our predictor variables (target child severity of ASD symptoms and behavior problems, mother level of BAP, father level of BAP, and additional child[ren] in family with neurodevelopmental disability or psychological disorder) for each family subtype and the overall sample. A MANOVA indicated that family socio-demographics were not associated with family subtype membership ( $F(24, 479) = 0.69, p = .863$ ; Wilk's  $\Lambda = 0.89$ ). A one-way repeated measure MANCOVA, controlling for family socio-demographics related to predictor variables (i.e., child ID status and family size), indicated a significant difference in predictor variables, based on family subtype ( $F(24, 462) = 2.56, p < .001$ ; Wilk's  $\Lambda = 0.65$ ). Tests of between subject effects revealed that family subtypes differed on mother ( $F(4, 137) = 2.98, p = .021$ ) and father ( $F(4, 137) = 5.30, p = .001$ ) level of BAP and mother ( $F(4, 137) = 7.35, p < .001$ ) and father ( $F(4, 137) = 4.32, p = .003$ ) rating of child behavior problems. Follow-up Bonferroni-corrected

pairwise comparisons indicated that mother level of BAP was significantly lower in Subtype 1 than in Subtype 5. Father level of BAP was significantly lower in Subtype 1 and Subtype 5 than in Subtype 4. Mother rating of child behavior problems was significantly lower in Subtype 1 than in Subtype 2, Subtype 4, and Subtype 5. Father rating of child behavior problems was significantly lower in Subtype 1 than Subtype 4 and Subtype 5. Having an additional child[ren] with a neurodevelopmental disability or psychological disorder, was not significantly associated with subtype membership.

### **Discussion**

Families of children with ASD experience a unique context that has been shown to alter the parent-child and parent couple relationships (Estes et al., 2013; Saini et al., 2015; Sim et al., 2016). However, little is known about how the emotional quality of the parent-child and parent couple relationships combine within families of children with ASD to create subtypes of family emotional climate. The goal of the current study was to use the FMSS as a direct measure of the emotional quality of mother-child, father-child, and parent couple relationship in families of children with ASD and to identify subtypes of families based on these relationships. In addition, we identified family characteristics predictive of subtype membership.

In our sample, 23.0% of mothers and 13.5% of fathers expressed high Criticism (combined High and Borderline categories from Magaña et al., [1986]), and 46.6% of mothers and 50.7% of fathers expressed high Warmth, toward the target child with ASD. Further, 29.7% of mothers and 18.9% of fathers expressed high Criticism (combined High and Borderline categories from Magaña et al., [1986]), and 47.3% of mothers and 48.0% of fathers expressed high Warmth, toward their partner. Within couples, mothers of children with ASD were more likely than fathers to express high Criticism in the parent-child relationship. This mother-father

difference may be related to findings that mothers, on average, report a higher level of parenting stress than fathers in families of children with ASD (e.g., Foody et al., 2015). Mothers of children with ASD were also more likely to express high Criticism in the parent couple relationship than fathers at a within-couple level. This gender difference was also found in FMSS research on non-ASD populations (e.g., Favez et al., 2017; Trombello et al., 2018), and thus may reflect broader female-male differences in the experienced or expressed emotional quality of the couple relationship. Previous studies using the FMSS to examine the emotional quality of the mother-child relationship in families of adolescent and adult children with ASD (e.g., Baker et al., 2011; Smith et al., 2008) found that 46-59% of mothers expressed high Criticism (combined High and Borderline categories from Magaña et al., [1986]), toward their adolescent or adult son or daughter with ASD, and 37-46% expressed high Warmth. Thus, together these findings suggest that parents may express higher Warmth and lower Criticism toward children with ASD when they are in middle childhood to early adolescence as opposed to later adolescence and adulthood.

The largest family emotional climate subtype ( $n = 63$ ; 42.6%) was *Resilient Family*, involving low Criticism and high Warmth across family relationships (parent-child and parent couple relationships for both mothers and fathers). Only 12.2% ( $n = 18$ ) of families were in the *Distressed Family* subtype involving high Criticism and low Warmth (combined Low and Borderline categories from Magaña et al., [1986]), across family relationships. Thus, in accordance with a stress *spillover hypothesis* (e.g., Belsky, 1981), a subset of families of children with ASD experienced distress broadly across family subsystems. The remaining families of children with ASD exhibited opposing emotional quality across subsystems, in line with the *divergence hypothesis* (Belsky et al., 1991; Erel & Burman, 1995). Indeed, nearly one-fourth of

families (23.6%,  $n = 35$ ), were in the *Mother Distressed – Father Resilient* subtype in which mothers expressed low Warmth and a mix of low and high Criticism in the parent-child and parent couple relationships and fathers showed low Criticism and a mix of high and low Warmth in the parent-child and parent couple relationships. The *Couple Distressed* subtype occurred in 13.5% ( $n = 20$ ) of families and involved mothers and fathers with low Criticism and high Warmth in the parent-child relationship and high Criticism and low Warmth in the parent couple relationship. The remaining families ( $n = 12$ ; 8.1%) were in the *Mother Distressed with Partner* subtype in which mothers and fathers showed low Criticism and high Warmth in the parent-child relationship and fathers similarly showed low Criticism and high Warmth in the parent couple relationship, however mothers showed high Criticism and low Warmth in the parent couple relationship. Thus, it appears that in many families of children with ASD, one or both parents are able to isolate distress in one family relationship from carrying over into other relationships, and/or may attempt to compensate for distressing relations with one family member by devoting resources to ensure other family relationships are positive, in line with the *divergence hypothesis* and consistent with findings in the general population (Ryan et al., 2006).

We also sought to identify characteristics of families of children with ASD that were predictive of membership in the various family emotional climate subtypes. Families who had a child with ASD with a lower (rather than higher) severity of behavior problems, based on both mother and father ratings, were more likely to be in the *Family Resilient* subtype than other subtypes. In contrast, and consistent with our hypothesis, families who had a child with ASD with a higher (rather than lower) severity of behavior problems were more likely to be in the *Family Distressed* (based on mother and father rating of child behavior problems), *Couple Distressed* subtypes (based on mother and father rating of child behavior problem) or *Mother*

*Distressed – Father Resilient* (based on mother rating of child behavior problems) subtypes. The severity of the target child's ASD symptoms, in contrast, were not related to family emotional quality subtype in our sample. There is evidence from previous work that child behavior problems are more stressful for parents than core ASD symptoms (Lecavalier, Leone, & Wiltz, 2006; McStay et al., 2014), in line with our finding that the severity of the child with ASD's behavior problems may be more predictive of maladaptive family emotional climate subtypes than the severity of ASD symptoms, as they contribute to greater levels of parenting stress. As a result, intervention efforts to improve family emotional quality may be most effective when focused on reducing child behavior problems, as opposed to solely child ASD symptoms.

We also found that multiplex families were at risk for maladaptive subtypes of family emotional quality. Specifically, families in which mothers had a high level of BAP were more likely to be in the *Mother Distressed – Father Resilient* subtype than the *Family Resilient* subtype. In contrast, families in which fathers had a high level of BAP were most likely to be in the *Family Distressed* subtype. Thus, the effect of father BAP appears to take a toll on overall family emotional quality, while the effect of mother BAP is localized, only impacting mother's experienced family relationships. Families of children with ASD in which fathers exhibit a high level of BAP may benefit most from family-wide interventions, whereas interventions may be most effective when directed at mothers in families in which mothers have a high level of BAP. Previous studies have shown that mothers and fathers who are high on BAP have different presentation of ASD-like traits (Klusek, Losh, & Martin, 2014); specifically, fathers exhibited high aloof personality traits, whereas mothers exhibited high pragmatic language and social personality traits. In part, the different effect of father versus mother BAP on family emotional quality subtype may be due to the different constellation of BAP traits in fathers versus mothers.

In contrast to our hypothesis, the presence of an additional child[ren] with neurodevelopmental or psychological disorders did not predict family emotional quality subtype. Thus, in line with the *divergence hypothesis* (Belsky et al., 1991; Erel & Burman, 1995), it appears that families with an additional child[ren] with a neurodevelopmental or psychological disorder who often report added parenting stress (e.g., Orsmond, Lin, & Seltzer, 2007), are able to prevent this stress from impacting their parent couple relationship and/or the parent-child relationship with their child with ASD.

The current study had several strengths. We investigated the parent-child and parent couple relationships in both mothers and fathers of children with ASD, providing a rich family-wide assessment of emotional quality. The study employed a direct measure of the emotional quality of family relationships via the FMSS, which has been shown to mirror actual family interactions (e.g., McCarty et al., 2004; Weston et al., 2017). The study also had limitations. The sample was fairly homogeneous in race/ethnicity and socio-economic status and focused only on two-parent mother-father families of children with ASD. The profile of family emotional subtypes may differ in families of children with ASD who are not reflected by these socio-demographics. The study is also limited in that associations between the FMSS emotional quality of the parent-child relationship and the child with ASD's severity of ASD symptoms and behavior problems may be inflated because the SRS-2 and CBCL were parent-reported.

In summary, our findings indicate that the most common subtype of family emotional quality, occurring in 43% of the sample, was *Family Resilient* in which there was low Criticism and high Warmth in the mother-child, father-child, and parent couple relationships. The remaining 57% families of children with ASD experienced various combinations of maladaptive family emotional quality subtypes. Findings have important implications for directing and

developing interventions for families of children with ASD. Interventions should be directed toward families in which parents evidence high BAP and/or the child with ASD evidences a high severity of behavior problems, as these factors are associated with maladaptive family emotional quality subtypes. Finally, interventions should engage the entire family, as the parent-child relationships and the emotional quality of the parent couple relationship are often connected. Future longitudinal research is needed to determine how family emotional quality subtypes shift across time and the impact of these subtypes on the longer-term outcomes of parents and children with ASD.

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Table 3.1

*Correlations between variables of interest (N = 148 couples)*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Mother Child Warmth	--														
2. Mother Partner Warmth	0.34***	--													
3. Father Child Warmth	0.22**	0.12	--												
4. Father Partner Warmth	0.24**	0.55***	0.19*	--											
5. Mother Child Criticism	-0.45***	-0.26**	-0.14	-0.11	--										
6. Mother Partner Criticism	-0.07	-0.56***	-0.07	-0.45***	0.21**	--									
7. Father Child Criticism	-0.17*	-0.06	-0.40***	-0.18*	0.30***	0.13	--								
8. Father Partner Criticism	-0.07	-0.32***	-0.01	-0.46***	0.02	0.29***	0.21**	--							
9. Mother BAPQ	-0.07	-0.19*	-0.18*	-0.20*	0.08	0.15	0.12	0.08	--						
10. Father BAPQ	0.01	-0.29***	-0.14	-0.22**	0.02	0.16	0.28**	0.21*	0.10	--					
11. Mother SRS-2	-0.15	-0.15	-0.18*	-0.03	0.17*	0.18*	0.10	0.05	0.08	0.08	--				
12. Father SRS-2	-0.20*	-0.07	-0.27**	-0.17*	0.08	0.06	0.08	0.09	0.14	0.16	0.49***	--			
13. Mother CBCL	-0.27**	-0.32***	-0.19*	-0.22**	0.19*	0.28**	0.17*	0.18*	0.24**	0.13	0.45***	0.35***	--		
14. Father CBCL	-0.29***	-0.23**	-0.25**	-0.21*	0.19*	0.13	0.15	0.10	0.16	0.17*	0.37***	0.72***	0.43***	--	
15. Additional Child with Disability	-0.15	-0.07	-0.15	-0.08	-0.01	0.09	0.07	-0.01	0.04	0.09	0.06	-0.05	0.15	-0.02	--
Child Age	0.08	0.08	-0.03	0.06	-0.03	0.04	-0.03	-0.08	0.02	-0.09	-0.13	-0.12	0.02	-0.07	0.13
Child Gender	-0.01	-0.08	0.06	0.00	-0.05	0.01	0.05	-0.10	0.04	-0.06	-0.00	0.02	-0.06	0.09	-0.01
Child ID status	-0.04	-0.05	-0.10	-0.03	0.07	0.05	-0.08	-0.03	-0.04	0.02	0.23**	0.26**	0.11	0.22**	0.12
Rel. Length	0.08	0.06	0.03	0.10	-0.04	-0.01	-0.13	-0.01	-0.03	0.04	0.01	0.05	0.09	0.00	-0.01
Family Size	-0.16	-0.04	-0.05	-0.07	0.02	0.05	0.00	-0.02	-0.08	-0.07	-0.01	-0.15	-0.08	-0.12	0.39***
Household Income	-0.01	-0.06	-0.04	-0.02	0.06	0.01	0.09	0.02	-0.09	0.02	-0.07	-0.09	-0.05	-0.04	-0.01

*Note.* Parents reported on child age (coded in years), child gender (1 = female, 2 = male), child with ASD's ID status (1 = yes, 0 = no), family size (coded as number of children in the family), presence of additional child with a disability (1 = yes, 0 = no), couple relationship length (coded in years), and household income (coded from 1-14). BAPQ = Broader Autism Phenotype Questionnaire; SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavioral Checklist. *p*-value = \* > .05; \*\* > .01; \*\*\* > .001

Table 3.2

*Latent class analysis fit statistics*

No. of Classes	AIC	BIC	Adjusted BIC	Entropy
2	233.25	284.43	230.63	0.82
3	211.73	290.01	207.72	0.88
4	203.53	308.90	198.13	0.85
5	198.92	331.39	192.14	0.93
6	198.10	357.66	189.92	0.93

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion. AIC and BIC measure of the extent to which the model fits the data; models with lower AIC and BIC values are preferred. Entropy, ranging from 0 to 1, indicates more meaningful differences between groups as value approaches 1.

Table 3.3

*Subtype number and percentages of mother and father high and low warmth and criticism*

	1 Family Resilient (n = 63; 42.6%)	2 Couple Distressed (n = 20; 13.5%)	3 Mother Distressed with Partner (n = 12; 8.1%)	4 Family Distressed (n = 18; 12.2%)	5 Mother Distressed – Father Resilient (n = 35; 23.6%)
<b>Parent-child relationship</b>					
<b>Mother</b>					
High Warmth	44 (69.8%)	10 (50.0%)	12 (100.0%)	3 (16.7%)	0 (0.0%)
Low Warmth	19 (30.2%)	10 (50.0%)	0 (0.0%)	15 (83.3%)	35 (100.0%)
High Criticism	5 (7.9%)	2 (10.0%)	0 (0.0%)	11 (61.1%)	16 (45.7%)
Low Criticism	58 (92.1%)	18 (90.0%)	12 (100.0%)	7 (38.9%)	19 (54.3%)
<b>Father</b>					
High Warmth	40 (63.5%)	14 (70.0%)	7 (58.3%)	0 (0.0%)	14 (40.0%)
Low Warmth	23 (36.5%)	6 (30.0%)	5 (41.7%)	18 (100.0%)	21 (60.0%)
High Criticism	2 (3.2%)	0 (0.0%)	0 (0.0%)	18 (100.0%)	0 (0.0%)
Low Criticism	61 (96.8%)	20 (100.0%)	12 (100.0%)	0 (0.0%)	35 (100.0%)
<b>Parent couple relationship</b>					
<b>Mother</b>					
High Warmth	61 (96.8%)	3 (15.0%)	0 (0.0%)	6 (33.3%)	0 (0.0%)
Low Warmth	2 (3.2%)	17 (85.0%)	12 (100.0%)	12 (66.7%)	35 (100.0%)
High Criticism	1 (1.6%)	10 (50.0%)	11 (91.7%)	9 (50.0%)	13 (37.1%)
Low Criticism	62 (98.4%)	10 (50.0%)	1 (8.3%)	9 (50.0%)	22 (62.9%)
<b>Father</b>					
High Warmth	55 (87.3%)	0 (0.0%)	4 (33.3%)	3 (16.7%)	9 (25.7%)
Low Warmth	8 (12.7%)	20 (100.0%)	8 (66.7%)	15 (83.3%)	26 (74.3%)
High Criticism	0 (0.0%)	20 (100.0%)	0 (0.0%)	8 (44.4%)	0 (0.0%)
Low Criticism	63 (100.0%)	0 (0.0%)	12 (100.0%)	10 (55.6%)	35 (100.0%)

*Note.* Low Warmth combined Low and Borderline categories from Vaughn & Leff (1976). High Criticism combined the High and Borderline categories from Magaña et al., (1986).

Table 3.4

*Descriptive statistics of family characteristics in each subtype and in total sample*

Variable	1 Family Resilient (n = 63; 42.6%)	2 Couple Distressed (n = 20; 13.5%)	3 Mother Distress with Partner (n = 12; 8.1%)	4 Family Distressed (n = 18; 12.2%)	5 Mother Distressed – Father Resilient (n = 35; 23.6%)	Bonferroni- corrected Difference by Subtype	Total (N=148)
<b>Multiplex Families</b>							
Addl. Child with Dis. (N [%])	18 (28.6%)	7 (35.0%)	6 (50.0%)	9 (50.0%)	14 (40.0%)		54 (36.5%)
Mother BAPQ (M [SD])	91.13 (17.54)	94.63 (21.38)	96.17 (25.43)	105.61 (31.97)	104.74 (21.65)	5 > 1	97.03 (22.47)
Father BAPQ (M [SD])	102.23 (21.61)	114.37 (19.69)	115.25 (19.86)	125.28 (17.51)	107.35 (20.14)	4 > 1, 5	109.01 (21.58)
<b>Child-related Challenges</b>							
Mother SRS-2 (M [SD])	73.43 (11.43)	75.42 (10.97)	74.75 (9.89)	79.44 (8.15)	78.59 (7.93)		75.77 (10.29)
Father SRS-2 (M [SD])	72.75 (12.17)	75.47 (12.02)	74.33 (8.76)	77.33 (6.21)	75.50 (8.55)		74.46 (10.51)
Mother CBCL (M [SD])	58.93 (11.21)	65.89 (8.41)	63.67 (6.64)	68.39 (7.15)	67.71 (7.09)	2, 4, 5 > 1	63.50 (9.98)
Father CBCL (M [SD])	59.90 (9.38)	63.32 (9.83)	63.92 (7.56)	67.50 (7.52)	65.09 (6.97)	4, 5 > 1	62.86 (8.90)

*Note.* BAPQ = Broader Autism Phenotype Questionnaire; SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavioral Checklist.

Family size and target child ID status were included as covariates.

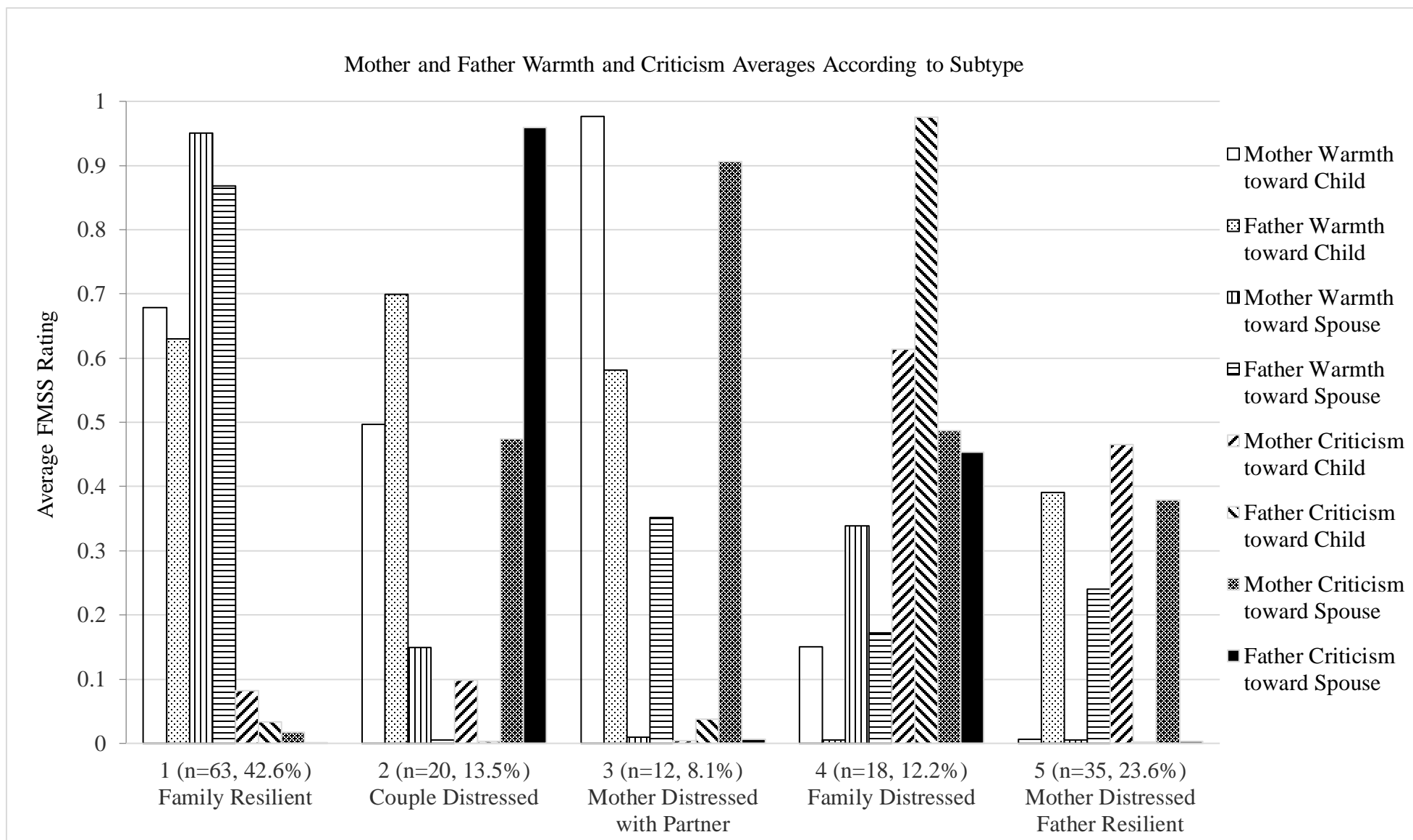


Figure 3.1. Bar graph of average mother and father Warmth and Criticism in each Subtype.

Chapter 4:

Bidirectional Relation between Parent Warmth and Criticism and Child Autism Symptoms and  
Behavior Problems

## Abstract

To-date research on families of children with autism spectrum disorder (ASD) has devoted relatively little attention to understanding how the family environment, including the emotional quality of the parent-child relationship, may be bidirectionally related to the severity of child ASD symptoms and behavior problems. The goal of the current study was to examine the direction of effects between Warmth and Criticism in the parent-child relationship, assessed via the Five Minute Speech Sample, in mothers and fathers of children with ASD and the child's severity of ASD symptoms and behavior problems across three time points spanning 2 years. These associations were examined in a sample of 159 families who had a child with ASD (aged 5 to 12 years). Mothers and fathers average age was 39.53 ( $SD = 5.55$ ) and 41.66 years ( $SD = 6.19$ ), respectively, 89.9% of mothers and 88.7% of fathers were white, non-Hispanic and the average household income was \$80-89K ( $SD = 30K$ ). Four crossed-lagged panel structural equation models in AMOS were conducted. Results indicated bidirectional effects between the emotional quality of the mother-child relationship and the functioning of children with ASD. In contrast, only child-driven effects were observed for the emotional quality of the father-child relationship and the functioning of children with ASD. Specifically, the child's severity of ASD symptoms was impacted by mother Warmth. In the opposite direction, the child's severity of ASD symptoms and behavior problems took a toll on mother Criticism and father Warmth. Implications for family-wide interventions are discussed.

*Keywords:* Five minute speech sample, Expressed emotion, Autism Spectrum Disorder, Parent-child relationship, Emotional quality

## Bidirectional Relation between Parent Warmth and Criticism and Child Autism Symptoms and Behavior Problems

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental condition involving impairments in social communication, restricted and repetitive behaviors, and sensory sensitivities (American Psychiatric Association, 2014). In addition to these core ASD symptoms, more than half of children with ASD exhibit clinically significant co-occurring behavior problems such as inattention, disruptive behavior, and anxiety (e.g., Maskey, Warnell, Parr, Le Coutuer, & McConachie, 2013). There is growing evidence that variability in the severity of ASD symptoms and behavior problems, at both a between-child and within-child level, is shaped by a multitude of factors. To date, a great deal of research has focused on the role of genetic (e.g., de novo loss-of-function mutations) and neurological mechanism (e.g., cortical thickness) in variability in the severity of ASD symptoms and behavior problems in ASD samples (Alabdali, Al-Ayadhi, & El-Ansary, 2014; De Rubeis et al., 2014; Krumm, O’Roak, Shendure, & Eichler, 2014). Less attention, however, has been given to the role of the family environment, including the emotional quality of the parent-child relationship, in shaping ASD symptoms and behavior problems in children with ASD. Instead, family research in the field of ASD has focused on describing the effect of child challenges on parents, usually mothers, and given little attention to the ways in which parents may also influence the development of children with ASD (Huang et al., 2014; Weitlauf, Vehorn, Taylor, & Warren, 2014). The current study used a cross-panel structural equation modeling (SEM) design to examine the bidirectional associations between the emotional quality of the mother-child and father-child relationship and the severity of ASD symptoms and behavior problems in children with ASD (aged 5-12 years) across three time points, each spaced 12 months apart.

There is substantial evidence from studies on the general population that the emotional quality of the parent-child relationship impacts child outcomes (e.g., for review see Wilson & Durbin, 2012). Longitudinal research on the general population has shown that the emotional quality of the parent-child relationship predicts child academic functioning (Moed et al., 2017) and psychological well-being (Lipscomb et al., 2011) across childhood and into adulthood (Kiff, Lengua, & Zalewski, 2011). This research has measured the emotional quality of the parent-child relationship in varied ways, including through parent-reported surveys (e.g., Booth-LaForce & Oxford, 2008; Bridgett et al., 2009), parent interviews (e.g., Colman, Hardy, Albert, Raffaelli, & Crockett, 2006), observed parent-child interactions (e.g., Lengua, Honorado, & Bush, 2007; Scaramella, Sohr-Preston, Mirabile, Robison, & Callahan, 2008), and Five Minute Speech Samples (FMSS; Magaña et al., 1986). In the FMSS, parents talk about their child and the parent-child relationship for five minutes. The emotional quality of the parent-child relationship is then rated using coded dimensions (e.g., Warmth and Criticism). FMSS ratings have been found to have high reliability and validity in diverse populations (Magaña et al., 1986; Van Humbeeck, Van Audenhove, De Hert, Pieters, & Storms, 2002), including in parents of children with neurodevelopment conditions (e.g., Hastings, Daley, Burns, & Beck, 2006) and ASD specifically (Greenberg, Seltzer, Hong, & Orsmond, 2006). Further, FMSS ratings have been found to correlate with observed behaviors and emotions of parents in observed parent-child interactions (Weston, Hawes, & Pasalich, 2017).

In longitudinal studies on the general population, the relation between the emotional quality of the parent-child relationship and child functioning has been shown to be bidirectional, with both directions being of relatively equal strength in early to middle childhood (Combs-Ronto, Olson, Lunkenheimer, & Sameroff, 2009; Neece, Green, & Baker, 2012). In other words,

child functioning alters the emotional quality of the parent-child relationship in important ways, and reciprocally, the emotional quality of the parent-child relationship predicts later child functioning. A small number of well-designed studies have examined the emotional quality of the parent-child relationship in families of children with ASD or other types of neurodevelopmental conditions (Abbeduto, 2004; Ciciolla, Gerstein, & Crnic, 2014; Greenberg, Seltzer, Krauss, Chou, & Hong, 2004; Orsmond, Seltzer, Greenberg, & Krauss, 2006); yet, most of these studies were cross-sectional and based on a single reporter (i.e., parent reported measures). The few longitudinal studies to date that have examined the association between emotional quality of the parent-child relationship using the FMSS and child functioning in families of children with neurodevelopmental conditions have been limited to the mother-child relationship and samples of adolescents and adults with ASD. Smith and colleagues (2008) found that FMSS ratings of mother's Warmth (i.e., concern, empathy, interest in the child) and praise (i.e., number of times a mother praised son or daughter) were negatively associated with the adolescent or adult son/daughter with ASD's repetitive behaviors across 18 months, and in the opposite direction, the adolescent or adult son/daughter with ASD's repetitive behaviors was negatively associated with ratings of mother's praise across 18 months. Using this same sample, Baker, Smith, Greenberg, Seltzer, and Taylor (2011) found that FMSS rating of maternal Criticism (i.e., negative remarks, Criticisms about child) in the parent-child relationship positively predicted increases in the adolescent or adult son/daughter with ASD's behavior problems across 7 years, but not vice versa. It is not clear if this same pattern occurs at earlier stages of child development. In samples of families of young children with ASD, there is evidence that child challenges predict parenting stress (Estes et al., 2009) and parent-child attachment at later time points (Hobson, Tarver, Beurkens, & Hobson, 2016). Thus, it is possible

that child-driven effects (i.e., effect of child's ASD symptoms and behavior problems on the emotional quality of the parent-child relationship) are stronger when the son/daughter with ASD is in childhood as opposed to adolescence and adulthood.

There is also a need to examine the association between the father-child relationship and the functioning of children with ASD. Parents of children with ASD are more likely than their peers who have typically developing children to engage in role specialization, or the 'divide and conquer' strategy, in which one parent (most often mothers) take on the bulk of childcare and the other parent (most often fathers) focus on paid employment (Callander & Lindsay, 2017; Hartley, Mihaila, Otolara-Fadner, & Bussanich, 2014; McCall & Starr, 2016). As a result of spending more time with the child with ASD, the association (in both directions) between the emotional quality of the mother-child relationship and child functioning may be stronger than the association between the emotional quality of the father-child relationship and child functioning in a context of child ASD. Indeed, in a cross-sectional study of families of children with ASD, Goodman and Glenwick (2012) found an association between child functioning and mother-child but not father-child attachment.

Previous FMSS studies examining the association between the emotional quality of the parent-child relationship and the functioning of children with ASD have also yet to examine parent Warmth and Criticism in the same longitudinal model; thus, it is not clear whether positive (i.e., Warmth) versus negative (i.e., Criticism) aspects of emotional quality in the parent-child relationship impact the functioning of children with ASD during middle childhood to the same extent. Comparisons across FMSS studies suggest that both Warmth and Criticism have small to moderate effects on the functioning of adolescents and adults with ASD (Baker et al., 2011; Greenberg et al., 2006; Smith et al., 2008).

The overarching goal of the present study was to examine the potential bidirectional effects between FMSS ratings of Warmth and Criticism in the mother-child and father-child relationship and the severity of ASD symptoms and behavior problems in children with ASD (aged 5 to 12 years) across three time points spanning 2 years. The current study built on previous research by examining the emotional quality of both the mother-child and father-child relationship and by examining both positive (i.e., Warmth) and negative (i.e. Criticism) aspects. In total, 159 families of children with ASD (originally aged 5-12 years) were included in the study. We had one overall research question with two sub-components: 1) How is the emotional quality of the parent-child relationship associated with child severity of ASD symptoms and behavior problems across 12 months? a) Do these associations differ for mothers and fathers? b) Do these associations differ for Warmth versus Criticism?

Based on previous research (Baker et al., 2011; Smith et al., 2008), we hypothesized that a higher level of Warmth and a lower level of Criticism in the parent-child relationship would be associated with a lower severity of child ASD symptoms and behavior problems. We also predicted that the emotional quality of the mother-child relationship would be a stronger predictor the child's severity of ASD symptoms and behavior problems than the emotional quality of the father-child relationship, based on mothers' tendency to be the primary caregiver (Callander & Lindsay, 2017; McCall & Starr, 2016) in families of children with ASD. Based on previous studies (Lancaster, Balling, Hastings, & Lloyd, 2014; Smith et al., 2008; Greenberg et al., 2006), we expected that both Warmth and Criticism would have small to moderate effects on child functioning at later time points. Specific hypotheses about whether Warmth versus Criticism would have stronger effect on child functioning was not made a priori.

## **Method**

## **Participants**

The present study is based on the second, third, and fourth waves of data collection in a longitudinal study originally including a sample of 166 mother-father couples who had a child with ASD aged 5-12 years. The second wave of data collection was selected as the initial time point as this is when the FMSS was first included in the study protocol. The FMSS, and the child's ASD symptoms and behavior problems were assessed in the second, third, and fourth (occurring approximately 12 months apart) waves of data collection. Recruitment occurred through mailings to schools and childcare programs, fliers posted at ASD clinics and in community settings (e.g., libraries, YMCA), and research registries. Inclusion criteria for parents included having both partners participate in the study, being in a longstanding couple relationship ( $\geq 3$  years), and having a child aged 5-12 years with an ASD diagnosis documented in medical or educational records. In four families, the child with ASD had been adopted ( $\geq 5$  years prior). Two couples were not married but had lived together for at least 5 years. In twelve families, one parent was a stepparent who had been married to the biological parent for at least 3 years. In families with more than one child with ASD ( $n = 12$ ), the oldest was selected as the target child of focus, as this was when parenting in the context of ASD began. The child's medical/educational records had to indicate that the diagnostic evaluation included the Autism Diagnosis Observation Schedule [Lord et al., 2000]). Parents individually completed the Social Responsiveness Scale – Second Edition (SRS-2; Constantino & Gruber, 2012) to assess the target child's current ASD symptoms. Five children with ASD had an SRS-2 Total t-score  $< 60$ , and these families were excluded. About one-third of the children with ASD had intellectual disability.

## **Procedure and Measures**

At each wave of data collection, parents participated in a 2.5-hour lab or home visit in which they were interviewed and independently completed questionnaires about family socio-demographics and the child with ASD. The FMSS was separately administered to mothers and fathers. Parents were each paid \$50 for this portion of data collection at each wave.

**Socio-demographic information.** The child with ASD's date of birth was used to calculate child age. Parents reported on child's gender, coded as female (1) or male (2). Children with ASD were considered to have intellectual disability if they had a medical diagnosis of intellectual disability and/or met criteria based on review of medical and/or educational records reporting IQ and adaptive behavior testing. Parents reported on their household income, coded from 1-14, starting at  $\leq$ \$9,999 (1) and increasing by \$10,000 to \$20,000 intervals to  $\geq$ \$160,000 (14).

**Parent Warmth and Criticism.** The FMSS (Magaña et al., 1986) was used to assess the emotional quality of the parent-child relationship. Mothers and fathers were individually asked to speak about their child with ASD for 5 minutes, addressing what kind of person their child is and how they got along together. The speech sample, which was audio recorded and transcribed, was coded (Magaña et al., 1986; Vaughn & Leff, 1976) by a trained FMSS rater who was blind to study questions. An overall Warmth rating based on (a) tone of voice; (b) spontaneity of expression of sympathy, concern, and empathy; and (c) expression of interest in the child with ASD, was globally considered across the entire speech sample on a 3-point scale: '*No Warmth*' (0), '*Borderline Warmth*' (3), '*High Warmth*' (5) (according to Vaughn & Leff, 1976). An overall Criticism rating was globally considered across the entire speech sample on a 3-point scale: '*No Criticism*' (0), '*Borderline Criticism*' (1), or '*High Criticism*' (2) for each mother and father based on their responses in the FMSS (according to Magaña et al., 1986). Mothers and

fathers were rated as '*High Criticism*' if they (a) made a negative opening remark, (b) negatively described their relationship with their child with ASD, or (c) made one or more critical comments about their child with ASD during the FMSS. Parents were rated as '*Borderline Criticism*' if they made one or more statements of dissatisfaction about their relationship with their child with ASD but did not satisfy the requirements of a *High Criticism* score and were rated as '*No Criticism*' if they did not make any critical comments throughout the FMSS. Past research has found a significant relation between these FMSS codes and observed Criticism in actual parent-child interactions (McCarty, Lau, Valeri, & Weisz, 2004; Weston, Hawes, & Pasalich, 2017).

**Child Autism Symptoms and Behavior Problems.** The severity of the child's ASD symptoms were assessed using the SRS-2 (Appendix A; Constantino & Gruber, 2012). The SRS-2 is a 65-item self-reported questionnaire that was independently completed by mothers and fathers. Mothers and fathers rated the severity of child's ASD symptoms during the past 6 months from '*Not True*' (1) to '*Almost Always True*' (4). The Total score was used in the present analyses. The SRS-2 has been shown to have high internal consistency in samples of children with ASD (Bruni, 2014). Cronbach's alphas for the SRS-2 in the current sample from Time 2-4 ranged from  $\alpha = 0.94-0.95$  for mothers,  $\alpha = 0.95-0.95$  for fathers. The frequency and severity of the child with ASD's behavior problems was assessed through the Child Behavior Checklist (CBCL; Appendix B; Achenbach & Rescorla, 2001). Mothers and fathers completed the CBCL using a 3-point scale with responses '*Not True*' (0), '*Somewhat or Sometimes True*' (1) and '*Very True or Often True*' (2). Items were summed to create a Total t-score. The CBCL has been shown to have good internal consistency and construct validity in ASD samples (Duarte, Bordin, Oliveira, & Bird, 2003; Sikora, Hall, Hartley, Gerrard-Morris, & Cagle, 2008).

Cronbach's alphas for the CBCL at the first time point in the current sample ranged from  $\alpha = 0.91-0.94$  for mothers,  $\alpha = 0.94-0.94$  for fathers.

### **Data Analysis**

Of the 183 families who participated at the first time point, data was available for 166 families at the second time point. The other 24 families did not participate for the following reasons: 3 could not be reached, 6 declined participation, and 15 were too busy to participate at that time but remained in the study. Parents who dropped out of the study after Time 1 did not significantly differ from parents who remained in the study in household income, child age, child SRS-2 Total t-score or Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) Total t-score between the families who did versus did not participate at the second time point. Of those 166 families, at least one parent from 159 families completed the FMSS at one or more time points. The 7 families without FMSS data completed measures via mail only at Time 2 and then withdraw from the study prior to Time 3. Overall, data was available from 149 mothers and 149 fathers at Time 2, 127 mothers and 123 fathers at Time 3, and 114 mothers and 105 fathers at Time 4. Of the 159 families ( $n = 318$  parents) included in analyses, 35.2% of the children with ASD had intellectual disability, 86.2% were male, and their average age was 9.07 years ( $SD = 2.33$ ) at Time 2. 39.8% of families had an additional child with a neurodevelopmental disability or psychological disorder. Mothers average age was 39.53 years ( $SD = 5.55$ ), 26.4% did not have a college degree, and 89.9% were white, non-Hispanic. Fathers average age was 41.66 years ( $SD = 6.19$ ), 30.8% did not have a college degree, and 88.7% were white, non-Hispanic. The average household income was \$80-89K ( $SD = 30K$ ) and the average parent couple relationship length was 10.97 years ( $SD = 5.14$ ).

Pearson correlations were used to examine associations between mothers and father Warmth and Criticism and ratings of the child's ASD symptoms and behavior problems and child age, gender, and intellectual disability status, and household income. Correlations between socio-demographic and study variables are presented in Table 4.1. In order to control for associations between socio-demographic variables and variables of interest, socio-demographic variables (child age, gender, ID status, and household income) were regressed on each variable of interest using multiple linear regression in SPSS. In each of these regression procedures, the unstandardized residual value was saved as a new variable and used in SEM analyses. Paired samples t-tests were conducted to investigate mother-father differences in Warmth, Criticism, and ratings of the child's ASD symptoms and behavior problems at each time point. Paired samples t-test results, as well as the means and standard deviations of the variables involved (mother and father Warmth, Criticism, and ratings of the child's ASD symptoms and behavior problems), are presented in Table 4.2.

Four cross-lagged models were employed using SEM in Analysis of Moment Structures (AMOS, version 24.0; Arbuckle, 2016) to test bidirectional cross-lagged effects between parent Warmth and Criticism and child ASD symptoms and behavior problems across three waves of data (approximately 12 months apart). Model 1, presented in Figure 4.1, included mother Warmth and Criticism and mother-rated child ASD symptoms (SRS-2). Model 2 (Figure 4.2) included mother Warmth and Criticism and mother-rated child behavior problems (CBCL). Model 3 (Figure 4.3) included father Warmth and Criticism and father-rated child ASD symptoms (SRS-2). Model 4 (Figure 4.4) included father Warmth and Criticism and father-rated child behavior problems (CBCL). All models examined the effect of the preceding time point (i.e., 12 months earlier). Means and standard deviations for key measures at each time point are

included in Table 4.2. All analyses were assessed for significance at the  $p < .05$  level. Original models included predictive paths indicated in figures. Fit statistics and residual matrices were examined, and effects between mother to father Warmth and Criticism variables and lag-2 effects were added to account for covariance and improve fit. Fit statistics for the final models are presented in Table 4.3.

## Results

**Preliminary Analyses.** Child age was associated with father ratings of child behavior problems ( $r = -0.19, p = .043$ ) at Time 3. Child intellectual disability status was associated with mother ( $r = 0.24, p = .004$ ) and father ( $r = 0.20, p = .021$ ) ratings of child ASD symptoms at Time 2, mother ( $r = 0.28, p = .002$ ) ratings of child ASD symptoms at Time 3, and mother ( $r = 0.35, p < .001$ ) and father ( $r = 0.31, p = .002$ ) ratings of child ASD symptoms at Time 4, as well as father ratings of child behavior problems at Time 2 ( $r = 0.18, p = .032$ ), and mother ratings of child behavior problems at Time 3 ( $r = 0.22, p = .027$ ). Mother and father Warmth and Criticism were not associated with any socio-demographic variables (i.e., child age, child gender, child ID status, household income). As shown in Table 4.2, mothers expressed a significantly higher level of Criticism than fathers at Time 2 ( $t = 2.49, p = .014$ ) and 3 ( $t = 2.57, p = .011$ ). Mothers also reported significantly higher child ASD symptoms than fathers at Time 3 ( $t = 2.06, p = .041$ ).

**Cross-lagged Models.** The results from the SEM crossed-lagged models indicated that mother and father rated child ASD symptoms (SRS-2) and behavior problems (CBCL) at each time point predicted mother and father rated child ASD symptoms ( $\beta = 0.48-0.82$ ) and behavior problems ( $\beta = 0.50-0.79$ ) the following time point. In addition, Warmth and Criticism at each time point predicted Warmth and Criticism at the following time point for mothers ( $\beta = 0.34-$

0.44) and fathers ( $\beta = 0.19-0.44$ ), with the exception of mother Criticism from Time 3 to Time 4 (Models 1 and 2). There were child-driven cross-lagged effects of child functioning on the emotional quality of the parent-child relationship for mothers and fathers. Mother rated child ASD symptoms at Time 2 predicted mother Warmth (C.R. =  $-2.09$ ,  $p = 0.037$ ) and Criticism (C.R. =  $3.46$ ,  $p < 0.001$ ) at Time 3. Mother rated child behavior problems at Time 3 predicted mother Criticism (C.R. =  $1.98$ ,  $p = 0.048$ ) at Time 4. Father rated child ASD symptoms at Time 2 predicted father Criticism at Time 3 (C.R. =  $2.06$ ,  $p = 0.040$ ). Both child ASD symptoms (C.R. =  $-2.37$ ,  $p = 0.018$ ) and child behavior problems (C.R. =  $-3.79$ ,  $p < 0.001$ ) at Time 3 predicted father Warmth at Time 4. In the opposite direction, only one parent-driven effect of the emotional quality of the parent-child relationship on child functioning was found; specifically, mother Warmth at Time 3 predicted mother rated child ASD symptoms at Time 4 (C.R. =  $-2.35$ ,  $p = 0.019$ ).

### **Discussion**

Family research in the field of ASD has focused on describing the impact of child challenges on parents, usually mothers, and given little attention to the ways in which mothers and fathers reciprocally influence the development of the child with ASD (Huang et al., 2014; Weitlauf et al., 2014). Indeed, there is a paucity of research on the role of the family environment, including the emotional quality of the parent-child relationship, in shaping ASD symptoms and behavior problems in children with ASD. The current study used cross-lagged models in SEM to examine the bidirectional associations between the emotional quality of the mother-child and father-child relationship and the severity of ASD symptoms and behavior problems in children with ASD (aged 5 to 12 years), across three waves of data collection, each spaced 12 months apart.

Overall, we found evidence of bidirectional effects between the emotional quality of the mother-child relationship and the functioning of the child with ASD. Specifically, in line with previous FMSS studies on the emotional quality of the mother-child relationship in families of adolescents and adults with ASD (Greenberg et al., 2006; Smith et al., 2008), a higher severity of child ASD symptoms predicted mother Warmth and Criticism and a higher severity of behavior problems predicted mother Criticism at the subsequent time point in the current study. Thus, for mothers, the severity of ASD symptoms of the child with ASD appear to influence both the positive and negative emotional aspects of the parent-child relationship, and the severity of behavior problems of the child with ASD appear to influence only the negative emotional aspects of the parent-child relationship in middle childhood. In the opposite direction, only mother Warmth predicted the severity ASD symptoms of the son or daughter at the sequent time point in the current study. Thus, maternal Warmth, more than Criticism, may be a particularly important determinant of changes in the severity of ASD symptoms in middle childhood.

In contrast to the pattern for mothers, we found only child-driven effects between the emotional quality of the father-child relationship and the functioning of the child with ASD. For fathers, a higher severity of child ASD symptoms led to declines in Warmth and increases in Criticism and a higher severity of behavior problems led to declines in Warmth 12 months later. This is consistent with the pattern seen in mothers and suggests that child functioning also shapes positive and negative emotional aspects of the parent-child relationship for fathers of children with ASD in middle childhood. However, no significant parent-driven effects were observed; in other words, Warmth and Criticism in the father-child relationship were not predictive of later severity of child ASD symptoms or behavior problems in our sample. A lack of parent-driven effects for fathers could be partly due to the tendency for a gendered division of labor in families

of children with ASD (Callander & Lindsay, 2017; McCall & Starr, 2016). Thus, it is possible that the mother-child relationship plays more of a role in child functioning in the context of ASD due to the increased amount of time mothers spend with the child and are involved in the child's treatment. Because mothers of children with ASD often take on more of the child care responsibilities, they may also be more likely to recognize and have to cope with child behavior problems, which could partially explain the positive association between mother Criticism and child behavior problems in the current study. Further, within the general population, mothers often serve as a "gatekeeper" for the child (Radcliffe & Cassell, 2015; Stevenson et al., 2014). Thus, in response to low child behavior problems, mothers of children with ASD may be better able to facilitate father Warmth by making time for play, which has been found to be a central part of the father-child relationship in the general population (Fletcher, May, St George, Morgan, & Lubans, 2011), which may in part explain the finding of the negative association between father Warmth and child behavior problems in the current study.

There were several strengths to the current study. We used a direct measure of the emotional quality of the parent-child relationship via the FMSS, which has been shown to mirror actual family interactions (e.g., McCarty et al., 2004; Weston et al., 2017). We also assessed both positive (i.e., Warmth) and negative (i.e., Criticism) indicators of the emotional quality of the parent-child relationship. Further, our study was family-wide in that we included both mothers and fathers in SEM models. The study also had limitations. The sample was fairly homogeneous in race/ethnicity and socio-economic status and thus it is not clear if findings generalize to families of children with ASD from minority racial/ethnic groups and/or of lower socio-economic status. Further, the cross-lagged models only included three time points and spanned middle childhood; thus, we are not able to make conclusions about the longer-term

relations between the emotional quality of the parent-child relationship and child functioning or how these associations look at other developmental stages.

In summary, our findings indicate that the emotional quality of the mother-child relationship is bidirectionally related to the severity of ASD symptoms in children with ASD and is also predicted by the severity of child behavior problems during middle childhood. In contrast, the emotional quality of the father-child relationship appears to be impacted by the severity of ASD symptoms and child behavior problems in children with ASD but did not reciprocally impact child functioning. Findings have important implications for directing and developing interventions for families of children with ASD. Interventions directed toward mothers, in particular, should focus on increasing mother Warmth toward the child with ASD, in order to positively impact child ASD symptoms, and prevent mother Criticism in response to high child ASD symptoms and behavior problems. Interventions directed at fathers of children with ASD should consider ways to educate fathers about how to remain engaged with their child and cope with child ASD symptoms and behavior problems while maintaining Warmth in the father-child relationship. Future longitudinal research is needed to determine how mother and father Warmth and Criticism shift across time and the bidirectional impact of the emotional quality of the parent-child relationship and longer-term child outcomes of parents and children with ASD.

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Table 4.1

*Correlations between variables of interest (N = 159 couples)*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Time 2																									
1. Mother Warmth	--																								
2. Father Warmth	0.23**	--																							
3. Mother Criticism	-0.51***	-0.17*	--																						
4. Father Criticism	-0.22**	-0.38***	0.31***	--																					
5. Mother SRS-2	-0.18*	-0.18*	0.16	0.08	--																				
6. Father SRS-2	-0.17*	-0.28**	0.08	0.09	0.49***	--																			
7. Mother CBCL	-0.30***	-0.19*	0.24**	0.16*	0.48***	0.39***	--																		
8. Father CBCL	-0.24**	-0.26**	0.19*	0.15	0.40***	0.72***	0.46***	--																	
Time 3																									
9. Mother Warmth	0.47***	0.30**	-0.34***	-0.17	-0.23*	-0.14	-0.21*	-0.21*	--																
10. Father Warmth	0.22*	0.38***	-0.26**	-0.36***	-0.09	-0.13	-0.16	-0.19*	0.30**	--															
11. Mother Criticism	-0.45***	-0.29**	0.51***	0.26**	0.27**	0.14	0.14	0.24**	-0.60***	-0.25**	--														
12. Father Criticism	-0.21*	-0.31**	0.28**	0.44***	0.02	0.14	0.11	0.17	-0.23*	-0.47***	0.34***	--													
13. Mother SRS-2	-0.21*	-0.20*	0.21*	0.13	0.79***	0.56***	0.45***	0.42***	-0.29**	-0.12	0.35***	0.08	--												
14. Father SRS-2	-0.16	-0.13	0.07	0.08	0.46***	0.81***	0.29**	0.63***	-0.17	-0.15	0.16	0.14	0.55***	--											
15. Mother CBCL	-0.23*	-0.13	0.29**	0.15	0.53***	0.47***	0.61***	0.50***	-0.26**	-0.24*	0.31**	0.00	0.72***	0.42***	--										
16. Father CBCL	-0.21*	-0.26**	0.18	0.19*	0.36***	0.60***	0.35***	0.79***	-0.29**	-0.33***	0.28**	0.23*	0.42***	0.72***	0.49***	--									
Time 4																									
17. Mother Warmth	0.41***	0.22*	-0.48***	-0.18	-0.10	-0.24*	-0.17	-0.19*	0.55***	0.26**	-0.50***	-0.32**	-0.21*	-0.31**	-0.30**	-0.32**	--								
18. Father Warmth	0.29**	0.31**	-0.25**	-0.24*	-0.18	-0.24*	-0.17	-0.36***	0.30**	0.39***	-0.30**	-0.39***	-0.24*	-0.21*	-0.27**	-0.34**	0.41***	--							
19. Mother Criticism	-0.39***	-0.16	0.38***	0.13	0.14	0.13	0.23*	0.15	-0.46***	-0.23*	0.33***	0.21*	0.19	0.17	0.32**	0.26*	-0.44***	-0.25*	--						
20. Father Criticism	-0.21*	-0.42***	0.38***	0.32**	0.07	0.18	0.21*	0.21*	-0.45***	-0.35***	0.45***	0.49***	0.23*	0.16	0.26*	0.22*	-0.45***	-0.51***	0.39***	--					
21. Mother SRS-2	-0.21*	-0.22*	0.19*	0.08	0.77***	0.63***	0.45***	0.45***	-0.38***	-0.12	0.34***	0.06	0.88***	0.57***	0.62***	0.48***	-0.20*	-0.22*	0.17	0.25*	--				
22. Father SRS-2	-0.16	-0.23*	0.08	0.16	0.53***	0.81***	0.37***	0.67***	-0.27**	-0.20*	0.18	0.14	0.65***	0.81***	0.48***	0.66***	-0.21*	-0.23*	0.12	0.19	0.70***	--			
23. Mother CBCL	-0.33**	-0.14	0.32**	0.16	0.51***	0.48***	0.64***	0.49***	-0.34***	-0.27**	0.32**	0.05	0.58***	0.35***	0.84***	0.44***	-0.26**	-0.33**	0.30**	0.24*	0.62***	0.47***	--		
24. Father CBCL	-0.28**	-0.36***	0.26**	0.26**	0.45***	0.67***	0.39***	0.82***	-0.38***	-0.31**	0.30**	0.24*	0.53***	0.63***	0.51***	0.85***	-0.28**	-0.42***	0.26**	0.31**	0.58***	0.77***	0.54***	--	
Child Age	0.06	-0.06	0.01	0.00	-0.09	-0.10	0.03	-0.01	-0.13	-0.04	0.07	0.11	-0.03	-0.16	-0.09	-0.19*	-0.02	-0.11	-0.02	0.08	-0.07	-0.10	0.02	-0.07	-0.07
Child Gender	0.07	0.04	-0.06	0.08	-0.05	0.07	-0.05	0.09	0.02	-0.04	-0.04	0.09	-0.12	0.01	-0.11	0.04	0.20	0.02	-0.05	0.04	-0.04	-0.02	-0.07	0.07	0.07
Child ID status	-0.01	-0.07	0.04	-0.11	0.24**	0.20*	0.14	0.18*	0.02	0.09	-0.10	-0.13	0.28**	0.18	0.22*	0.04	0.06	0.11	0.02	-0.13	0.35***	0.31**	0.14	0.16	0.16
Household Income	-0.12	0.01	0.05	0.03	0.01	-0.09	0.09	-0.10	-0.15	0.09	0.03	-0.11	-0.06	-0.11	-0.04	-0.18	0.05	0.06	-0.05	0.02	-0.09	-0.10	0.01	-0.12	-0.12

Note. SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavioral Checklist. Parents reported on child age (coded in years), child gender (1 = female, 2 = male), child with ASD's ID status (1 = yes, 0 = no), and household income (coded from 1-14).  $p$ -value = \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Table 4.2

*Means, standard deviations, and paired samples t-tests of primary study variables*

Variable	Mothers (M/SD)	Fathers (M/SD)	Mother-Father Comparison
Time 2 Warmth	3.83 (1.2)	4.01 (1.0)	$t = -1.60$
Time 3 Warmth	3.69 (1.4)	3.79 (1.3)	$t = -0.52$
Time 4 Warmth	3.73 (1.3)	3.90 (1.4)	$t = -1.30$
Time 2 Criticism	0.28 (0.6)	0.16 (0.4)	$t = 2.49^*$
Time 3 Criticism	0.34 (0.6)	0.19 (0.5)	$t = 2.57^*$
Time 4 Criticism	0.27 (0.6)	0.20 (0.5)	$t = 1.38$
Time 2 SRS-2	75.56 (10.5)	74.21 (10.7)	$t = 1.53$
Time 3 SRS-2	75.22 (11.1)	73.55 (11.5)	$t = 2.06^*$
Time 4 SRS-2	74.78 (11.7)	74.07 (11.2)	$t = 0.75$
Time 2 CBCL	63.47 (10.0)	62.75 (9.3)	$t = 0.98$
Time 3 CBCL	62.99 (8.9)	62.07 (9.0)	$t = 1.17$
Time 4 CBCL	62.82 (8.8)	62.22 (9.8)	$t = 0.97$

*Note.* SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavior Checklist.  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$ .

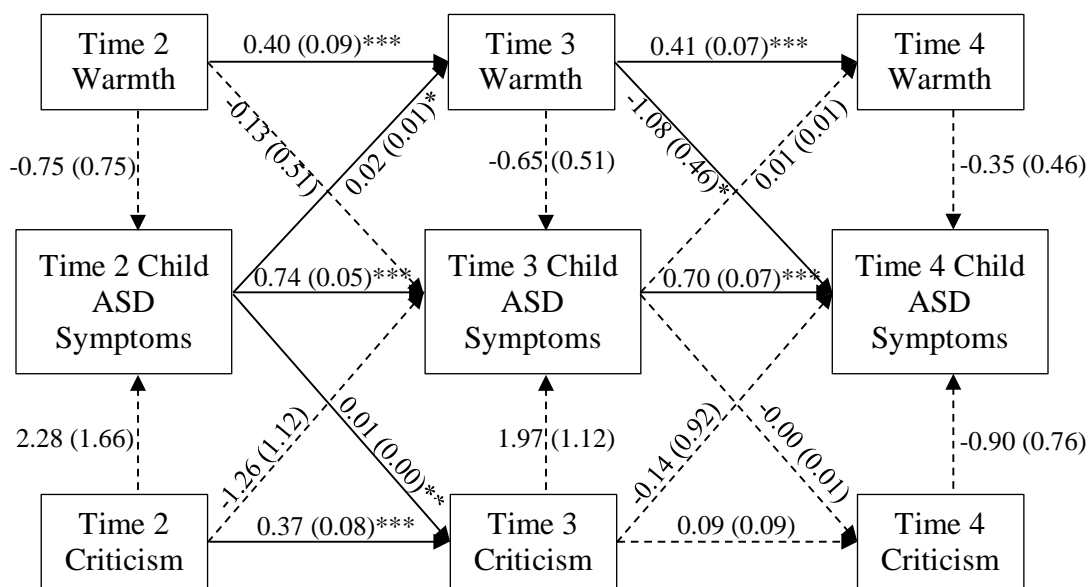
Table 4.3

*Cross-lagged model fit statistics*

Model	$\chi^2$ (df)	P	RMSEA	TLI	CFI
1	31.18 (8)	0.00	0.14	0.85	0.97
2	31.15 (8)	0.00	0.14	0.84	0.97
3	13.21 (8)	0.11	0.06	0.96	0.99
4	21.15 (8)	0.01	0.10	0.91	0.98

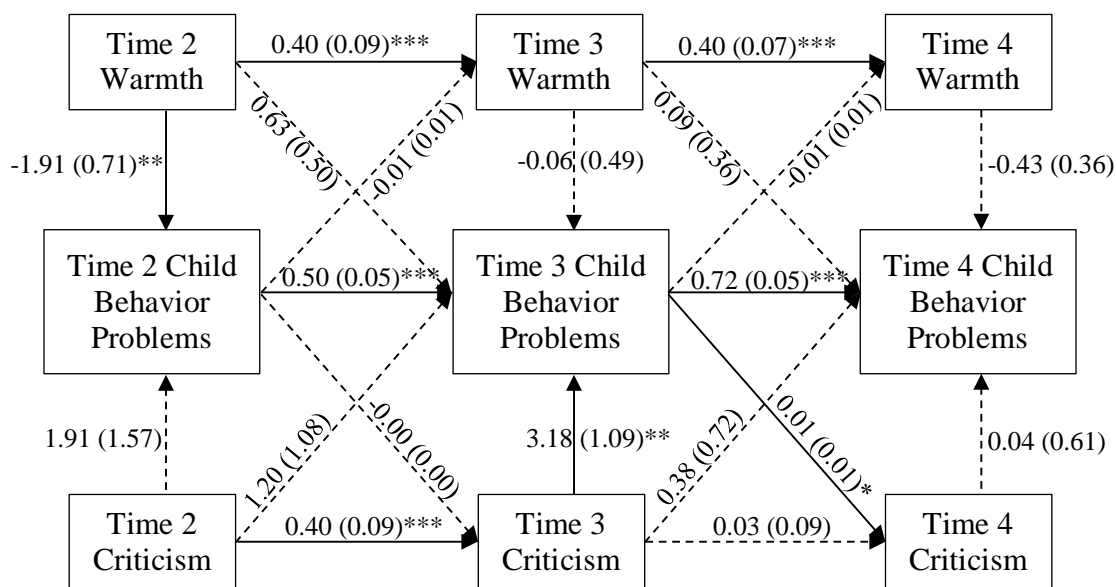
*Note.* Model 1 = Cross-lagged model of mother Warmth and Criticism and mother-rated child ASD symptoms; Model 2 = Cross-lagged model of mother Warmth and Criticism and mother-rated child behavior problems; Model 3 = Cross-lagged model of father Warmth and Criticism and father-rated child ASD symptoms; Model 4 = Cross-lagged model of father Warmth and Criticism and father-rated child behavior problems.  $\chi^2$  = Chi-squared test of absolute model fit; P =  $\chi^2$  p-value; RMSEA = Root Mean Square Error of Approximation; TLI = Tucker-Lewis Index; CFI = Confirmatory Fit Index. All fit statistics reported were for the default model.

Figure 4.1. Cross-lagged model for mother warmth and criticism and mother-rated child ASD symptoms



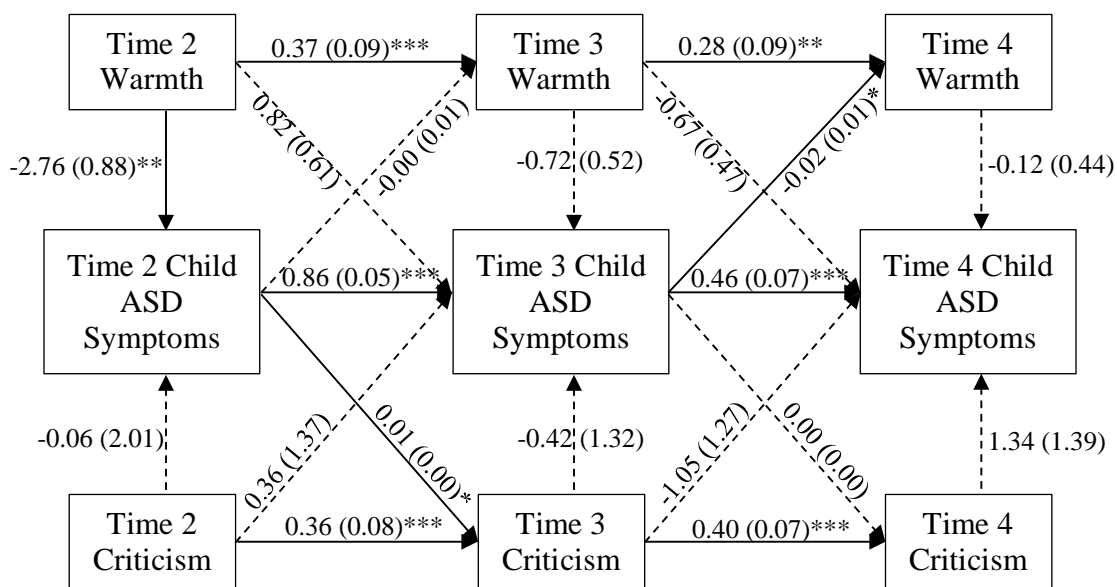
Note. SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition. Estimates and standard errors represent associations with mother SRS-2 ratings (i.e., child ASD symptoms). Significant effects are marked in solid lines. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Paths across variables, accounting for covariance, are not shown in figure but were included in SEM analysis.

Figure 4.2. Cross-lagged model for mother warmth and criticism and mother-rated child behavior problems



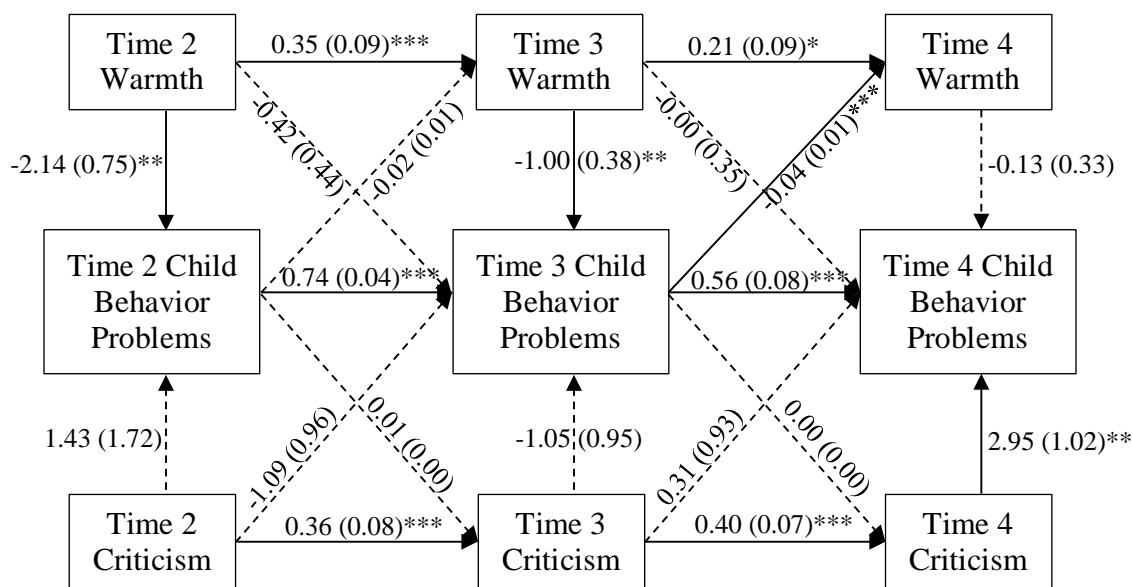
Note. CBCL = Child Behavior Checklist. Estimates and standard errors represent associations with mother CBCL ratings (i.e., child behavior problems). Significant effects are marked in solid lines. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Paths across variables, accounting for covariance, are not shown in figure but were included in SEM analysis.

Figure 4.3. Cross-lagged model for father warmth and criticism and father-rated child ASD symptoms



Note. SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition. Estimates and standard errors represent associations with father SRS-2 ratings (i.e., child ASD symptoms). Significant effects are marked in solid lines. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Paths across variables, accounting for covariance, are not shown in figure but were included in SEM analysis.

Figure 4.4. Cross-lagged model for father warmth and criticism and father-rated child behavior problems



Note. CBCL = Child Behavior Checklist. Estimates and standard errors represent associations with father CBCL ratings (i.e., child behavior problems). Significant effects are marked in solid lines. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Paths across variables, accounting for covariance, are not shown in figure but were included in SEM analysis.

## Chapter 5: Conclusions

It is currently estimated that 1 in 59 children in the United States has ASD (Center for Disease Control and Prevention [CDC], 2018), making ASD an important public health concern. The presence of child ASD shapes the broader system in varied ways, such that intervention efforts must not only pay attention to the needs of the child with ASD but also those of family members. Parents of children with ASD report unique child-related challenges (Maskey et al., 2013; Valicenti-McDermott et al., 2015) and have been shown to be at risk for experiencing a high level of parenting stress (e.g., Lai et al., 2015), and depressive symptoms (Cohrs & Leslie, 2017), and altered the parent-child and parent couple relationships (Estes et al., 2013; Hartley et al., 2010; Saini et al., 2015; Sim et al., 2016). Drawing on the family systems perspective (Belsky, 1981), the goal of my dissertation was to add to current understanding of the emotional quality of family subsystems, and especially the parent-child relationship, in families of children with ASD. Across my papers, three themes emerged about the emotional quality of family subsystems in the context of child ASD.

**Emotional quality of family subsystems differ in mothers and fathers.** The first theme is that there are important mother-father differences in emotional quality of family subsystems in mothers versus fathers of children with ASD. In paper 1, findings add novel information about how parent psychological well-being, including parenting stress and depressive symptoms, impact the emotional quality of both one's own and one's partner's parent-child relationship in families of children with ASD. We found that mothers of children with ASD experienced a higher level of parenting stress and depressive symptoms than fathers. Moreover, poor psychological well-being took a greater toll on the emotional quality of the mother-child relationship than the father-child relationship. Specifically, mother level of parenting stress and

depressive symptoms at Time 1 predicted both mother Warmth and Criticism toward the child with ASD 12 months later.

In paper 2, we found that mothers of children with ASD were more likely than fathers to express high Criticism in the parent-child and parent couple relationship. Moreover, there were bidirectional effects (i.e., parent-driven and child-driven) between the emotional quality of the mother-child relationship and the functioning of the child with ASD. In contrast, there were only child-driven effects between the emotional quality of the father-child relationship and the functioning of the child with ASD. Previous research has shown that families of children with ASD are more likely than their peers who have typically developing children to engage in role specialization in which one parent (most often mothers) take on the bulk of childcare and the other parent (most often fathers) focus on paid employment (Callander & Lindsay, 2017; Hartley, Mihaila, Otolora-Fadner, & Bussanich, 2014; McCall & Starr, 2016). The parent-driven effects seen in mothers but not fathers of children with ASD may, in part, be due to increased mother time spent in childcare. Fathers of children with ASD, on the other hand, may be better able to separate their own psychological well-being from their parent-child relationship given more time spent in paid employment as opposed to childcare.

Fathers, however, were not immune to the stressors related to raising a child with ASD. In paper 1, we found actor effects of fathers parenting stress on his own Warmth toward the child with ASD. Moreover, there were cross-partner effects of mother parenting stress on father's Warmth toward their child with ASD 12 months later. Thus, when mothers of children with ASD are experiencing high parenting stress, it not only impacts their own parent-child relationship, but also that of fathers. Finally, in paper 3, the emotional climate of the father-child relationship was impacted by child functioning, suggesting that the child's severity of ASD symptoms leads

to declines in Warmth and increases in Criticism and that severity of behavior problems alters father Warmth. Together, these papers demonstrate the importance of including fathers in family research in the context of ASD.

**There is marked variability in emotional quality of family subsystems.** Another theme to emerge across the three papers was that there is marked variability in the emotional quality of family subsystems in families of children with ASD. In paper 2, we found a variety of subtypes of family emotional climate, with some exhibiting congruent emotional quality across subsystems – such as the *Resilient Family* subtype (n = 63; 42.6%) and the *Distressed Family* subtype (12.2%, n = 18) – and others exhibiting opposing emotional quality across subsystems – such as the *Mother Distressed – Father Resilient* subtype (23.6%, n = 35), the *Couple Distressed* subtype (13.5%, n = 20), and the *Mother Distressed with Partner* subtype (n = 12; 8.1%). Thus, a pattern of *stress spillover* was observed across the parent-child and parent couple relationship in a subset of families. However, in many other families, one or both parents were able to isolate distress in one family relationship from carrying over into other relationships, and/or may attempt to compensate for distressing relations with one family member by devoting resources to ensure other family relationships are positive, in line with the *divergence hypothesis*. Finally, many families of children with ASD were also found to be thriving in the face of difficult child-related challenges. The largest family emotional climate subtype was *Resilient Family*, representing almost 43% of families of children with ASD.

In part, family characteristics appeared to predict some of the variability in emotional quality of family subsystems in the context of child ASD. In paper 2, the family emotional quality subtypes differed on mother and father level of BAP and the severity of the child with ASD's behavior problems. Specifically, a higher severity of the child with ASD's behavior

problems and higher parent BAP were predictive of maladaptive family emotional climate subtypes.

**Positive and negative emotional aspects of the parent-child relationship operate differently.** A third theme to emerge from my dissertation was that positive and negative emotional aspects of the parent-child relationship operate differently. Both the positive (i.e., Warmth) and negative aspects (i.e., Criticism) of the emotional quality of family relationships were important across studies, but often in different ways. In paper 1, there was a cross-partner effect of mother parenting stress on father Warmth toward the child with ASD 12 months later, but no effect on father Criticism. Thus, if mothers are stressed, this may lead fathers to be less warm but not more critical with the child with ASD. In contrast, when fathers experienced high parenting stress they had higher Criticism toward the child with ASD 12 months later. In paper 3, mother's Warmth, but not her Criticism, predicted later child ASD symptoms. Thus, Warmth in the mother-child relationship may have the stronger effects on shaping child functioning than Criticism in middle childhood.

The studies shared several strengths. All studies included mothers and fathers of children with ASD, which allowed for a family-wide investigation and the inclusion of actor and partner effects. Moreover, two of the three studies included multiple data points, allowing us to begin to understand predictors of emotional quality of family relationships and its impact on the child's ASD symptoms and behavior problems across time. Each of these studies also employed a direct measure (as opposed to self-report measure) of the emotional quality of the family relationships in the context of ASD. The FMSS has been shown to mirror actual family interactions (e.g., McCarty et al., 2004; Weston et al., 2017) and can be rated (according to Magaña, 1986 and Vaughn & Leff, 1976) for both positive (i.e., Warmth) and negative (i.e., Criticism) indicators of

emotional quality in family relationships. However, the studies also had limitations. The overall sample was relatively homogeneous in terms of race/ethnicity and socio-economic status and focused only on two-parent mother-father families of children with ASD. The emotional quality of family relationships may differ in families of children with ASD who are not reflected by these socio-demographics. Although data from two to three time points were included, more time points of data would be needed to make stronger claims about the causality and trajectories across time. These studies are also limited in that associations between the FMSS emotional quality and other key variables (e.g., child with ASD's severity of ASD symptoms and behavior problems) may be inflated because they were reported by the parents.

Overall, these papers added to existing research on the emotional quality of family relationships in the context of ASD in important ways. Information stemming from these papers can be used to inform supports and services for families of children with ASD. Some of the key implications resulting from this work are provided below.

- Mother psychological well-being is an important target for ASD interventions, as mothers showed higher parenting stress, depressive symptoms, and Criticism toward the child with ASD than fathers.
- Interventions and supports aimed at reducing parenting stress, depressive symptoms, and Criticism toward the child with ASD in mothers may have the greatest effects on child outcomes, as they may also enhance the emotional quality of the father-child relationship.
- Efforts to increase Warmth in the mother-child relationship may lead to decreases in the severity of child ASD symptoms across time.

- It is important to consider presence of parent BAP and/or the extent of child related challenges (i.e., severity of behavior problems), as these factors are associated with maladaptive family emotional climate subtypes.
- Interventions are encouraged to engage the entire family, as the emotional quality of the parent-child and parent couple relationships are often connected.

Further longitudinal studies are needed to examine other aspects of the family system (e.g., observed indicators of parenting quality, the perspective the child with ASD, indicators of the emotional quality of sibling relationship and parent-child relationships with other children in the family). Moreover, outside ratings of child ASD symptoms and behavior problems could be used to determine how the emotional quality of relationships in the family generalize to impact the child's ASD symptoms and behavior problems outside of the home. Longitudinal research is also needed to get a better sense of the trajectories of families and why some families are faring better than others in the context of ASD over a longer period of time.

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## Appendix A

### Correlations between all variables and Teacher ratings of child ASD symptoms and behavior problems.

Table A1

Correlations between variables of interest (N = 159 couples)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30										
Time 2																																								
1. Mother Warmth	--																																							
2. Father Warmth	0.23**	--																																						
3. Mother Criticism	-0.51***	-0.17*	--																																					
4. Father Criticism	-0.22**	-0.38***	0.31***	--																																				
5. Mother SRS-2	-0.18*	-0.18*	0.16	0.08	--																																			
6. Father SRS-2	-0.17*	-0.28**	0.08	0.09	0.49***	--																																		
7. Mother CBCL	-0.30***	-0.19*	0.24**	0.16*	0.48***	0.39***	--																																	
8. Father CBCL	-0.24**	-0.26**	0.19*	0.15	0.40***	0.72***	0.46***	--																																
9. Teacher SRS-2	-0.07	0.01	0.04	-0.10	0.36***	0.39***	0.26*	0.30**	--																															
10. Teacher CBCL	-0.23*	0.05	0.19	0.05	0.19	0.30**	0.35**	0.37**	0.64***	--																														
Time 3																																								
11. Mother Warmth	0.47***	0.30**	-0.34***	-0.17	-0.23*	-0.14	-0.21*	-0.21*	-0.10	-0.08	--																													
12. Father Warmth	0.22*	0.38***	-0.26**	-0.36***	-0.09	-0.13	-0.16	-0.19*	0.01	-0.12	0.30**	--																												
13. Mother Criticism	-0.45***	-0.29**	0.51***	0.26**	0.27**	0.14	0.14	0.24**	0.05	0.09	-0.60***	-0.25**	--																											
14. Father Criticism	-0.21*	-0.31**	0.28**	0.44***	0.02	0.14	0.11	0.17	-0.07	0.07	-0.23*	-0.47***	0.34***	--																										
15. Mother SRS-2	-0.21*	-0.20*	0.21*	0.13	0.79***	0.56***	0.45***	0.42***	0.40***	0.24*	-0.29**	-0.12	0.35***	0.08	--																									
16. Father SRS-2	-0.16	-0.13	0.07	0.08	0.46***	0.81***	0.29**	0.63***	0.35**	0.24*	-0.17	-0.15	0.16	0.14	0.55***	--																								
17. Mother CBCL	-0.23*	-0.13	0.29**	0.15	0.53***	0.47***	0.61***	0.50***	0.20	0.35**	-0.26**	-0.24*	0.31**	0.00	0.72***	0.42***	--																							
18. Father CBCL	-0.21*	-0.26**	0.18	0.19*	0.36***	0.60***	0.35***	0.79***	0.21	0.31**	-0.29**	-0.33**	0.28**	0.23*	0.42***	0.72***	0.49***	--																						
19. Teacher SRS-2	-0.24*	-0.16	0.12	-0.04	0.46***	0.52***	0.23*	0.36***	0.67***	0.32**	-0.05	-0.00	0.06	-0.02	0.47***	0.51***	0.23*	0.33**	--																					
20. Teacher CBCL	-0.30***	-0.12	0.07	0.02	0.29**	0.41***	0.33**	0.40***	0.43***	0.43***	-0.19	-0.10	0.12	0.01	0.42***	0.41***	0.35**	0.39***	0.67***	--																				
Time 4																																								
21. Mother Warmth	0.41***	0.22*	-0.48***	-0.18	-0.10	-0.24*	-0.17	-0.19*	-0.03	-0.07	0.55***	0.26**	-0.50***	-0.32**	-0.21*	-0.31**	-0.30**	-0.32**	-0.18	-0.16	--																			
22. Father Warmth	0.29**	0.31**	-0.25**	-0.24*	-0.18	-0.24*	-0.17	-0.36***	-0.11	-0.08	0.30**	0.39***	-0.30**	-0.39***	-0.24*	-0.21*	-0.27**	-0.34**	-0.08	-0.26*	0.41***	--																		
23. Mother Criticism	-0.39***	-0.16	0.38***	0.13	0.14	0.13	0.23*	0.15	0.16	0.19	-0.46***	-0.23*	0.33***	0.21*	0.19	0.17	0.32**	0.26*	0.23*	0.28**	-0.44***	-0.25*	--																	
24. Father Criticism	-0.21*	-0.42***	0.38***	0.32**	0.07	0.18	0.21*	0.21*	-0.02	0.03	-0.45***	-0.35***	0.45***	0.49***	0.23*	0.16	0.26*	0.22*	-0.04	0.12	-0.45***	-0.51***	0.39***	--																
25. Mother SRS-2	-0.21*	-0.22*	0.19*	0.08	0.77***	0.63***	0.45***	0.45***	0.53***	0.26*	-0.38***	-0.12	0.34***	0.06	0.88***	0.57***	0.62***	0.48***	0.56***	0.40***	-0.20*	-0.22*	0.17	0.25*	--															
26. Father SRS-2	-0.16	-0.23*	0.08	0.16	0.53***	0.81***	0.37***	0.67***	0.55***	0.33**	-0.27**	-0.20*	0.18	0.14	0.65***	0.81***	0.48***	0.66***	0.49***	0.35**	-0.21*	-0.23*	0.12	0.19	0.70***	--														
27. Mother CBCL	-0.33**	-0.14	0.32**	0.16	0.51***	0.48***	0.64***	0.49***	0.29*	0.41**	-0.34***	-0.27**	0.32**	0.05	0.58***	0.35***	0.84***	0.44***	0.25*	0.32**	-0.26**	-0.33**	0.30**	0.24*	0.62***	0.47***	--													
28. Father CBCL	-0.28**	-0.36***	0.26**	0.26**	0.45***	0.67***	0.39***	0.82***	0.38**	0.40**	-0.38***	-0.31**	0.30**	0.24*	0.53***	0.63***	0.51***	0.85***	0.31**	0.34**	-0.28**	-0.42***	0.26**	0.31**	0.58***	0.77***	0.54***	--												
29. Teacher SRS-2	-0.14	-0.15	0.13	0.09	0.47***	0.48***	0.18	0.40***	0.57***	0.35**	-0.13	-0.10	0.09	0.05	0.43***	0.44***	0.30**	0.38**	0.66***	0.38**	-0.10	-0.17	0.03	-0.00	0.50***	0.56***	0.28**	0.35**	--											
30. Teacher CBCL	-0.23*	-0.02	0.39***	0.20	0.21	0.35**	0.27*	0.31**	0.41***	0.54***	-0.20	-0.11	0.16	0.09	0.35**	0.31**	0.47***	0.31**	0.43***	0.42***	-0.29**	-0.28**	0.28**	0.30**	0.36**	0.41***	0.44***	0.36**	0.61***	--										
Child Age	0.06	-0.06	0.01	0.00	-0.09	-0.10	0.03	-0.01	0.03	0.09	-0.13	-0.04	0.07	0.11	-0.03	-0.16	-0.09	-0.19*	-0.24*	-0.13	-0.02	-0.11	-0.02	0.08	-0.07	-0.10	0.02	-0.07	-0.11	-0.15										
Child Gender	0.07	0.04	-0.06	0.08	-0.05	0.07	-0.05	0.09	-0.31**	-0.04	0.02	-0.04	-0.04	0.09	-0.12	0.01	-0.11	0.04	-0.27**	-0.14	0.20	0.02	-0.05	0.04	-0.04	-0.02	-0.07	0.07	-0.18	0.06										
Child ID status	-0.01	-0.07	0.04	-0.11	0.24**	0.20*	0.14	0.18*	0.45***	0.17	0.02	0.09	-0.10	-0.13	0.28**	0.18	0.22*	0.04	0.50***	0.16	0.06	0.11	0.02	-0.13	0.35***	0.31**	0.14	0.16	0.46***	0.34**										
Household Income	-0.12	0.01	0.05	0.03	0.01	-0.09	0.09	-0.10	-0.27**	-0.09	-0.15	0.09	0.03	-0.11	-0.06	-0.11	-0.04	-0.18	-0.14	-0.13	0.05	0.06	-0.05	0.02	-0.09	-0.10	0.01	-0.12	-0.30**	-0.15										

Note. SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavioral Checklist. Parents reported on child age (coded in years), child gender (1 = female, 2 = male), child with ASD's ID status (1 = yes, 0 = no), and household income (coded from 1-14). *p*-value = \**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

## Appendix B

### Mother, Father, and Teacher Comparisons of Primary Study Variables

Mothers and fathers reported higher levels of child ASD symptoms on the SRS-2 than teacher/support staff at all time points. Research in the field of ASD has emphasized the importance of taking parent- and teacher- reports of child functioning into consideration due to discrepancies in parent- versus teacher-reported child ASD symptoms (Donnelly et al., 2018; Mayes & Lockridge, 2018) and child behavior problems (Kanne, Abbacchi, & Constantino, 2009). Our findings are consistent regarding higher parent- than teacher-reported child ASD symptoms (e.g., Donnelly et al., 2018; Mayes & Lockridge, 2017), but we did not find significant differences between parent and teacher ratings of child behavior problems at any time point. By including multiple informants, the current study gained a broader view of the bidirectional impacts of mother- and father-child relationship quality and child functioning.

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Table B1

*Means, standard deviations, and paired samples t-tests of primary study variables*

Variable	Mothers ( <i>M/SD</i> )	Fathers ( <i>M/SD</i> )	Mother-Father Comparison	Teacher ( <i>M/SD</i> )	Mother-Teacher Comparison	Father-Teacher Comparison
Time 2 Warmth	3.83 (1.2)	4.01 (1.0)	$t = -1.60$			
Time 3 Warmth	3.69 (1.4)	3.79 (1.3)	$t = -0.52$			
Time 4 Warmth	3.73 (1.3)	3.90 (1.4)	$t = -1.30$			
Time 2 Criticism	0.28 (0.6)	0.16 (0.4)	$t = 2.49^*$			
Time 3 Criticism	0.34 (0.6)	0.19 (0.5)	$t = 2.57^*$			
Time 4 Criticism	0.27 (0.6)	0.20 (0.5)	$t = 1.38$			
Time 2 SRS-2	75.56 (10.5)	74.21 (10.7)	$t = 1.53$	67.66 (10.6)	$t = 6.08^{***}$	$t = 4.95^{***}$
Time 3 SRS-2	75.22 (11.1)	73.55 (11.5)	$t = 2.06^*$	67.85 (10.5)	$t = 6.41^{***}$	$t = 4.90^{***}$
Time 4 SRS-2	74.78 (11.7)	74.07 (11.2)	$t = 0.75$	67.30 (11.4)	$t = 6.09^{***}$	$t = 5.09^{***}$
Time 2 CBCL	63.47 (10.0)	62.75 (9.3)	$t = 0.98$	62.03 (6.8)	$t = 0.78$	$t = 0.76$
Time 3 CBCL	62.99 (8.9)	62.07 (9.0)	$t = 1.17$	62.22 (7.1)	$t = 0.35$	$t = -0.73$
Time 4 CBCL	62.82 (8.8)	62.22 (9.8)	$t = 0.97$	62.13 (7.6)	$t = 1.27$	$t = -0.42$

*Note.* SRS-2 = Social Responsiveness Scale, 2<sup>nd</sup> Edition; CBCL = Child Behavior Checklist.  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$ .

## Appendix C

### Model Fit Statistics including Models using Teacher-Rated Child ASD Symptoms and Behavior Problems

Two follow-up models were also investigated using teacher-reported measures of child ASD symptoms, rated using the SRS-2, and behavior problems, rated using the CBCL. These models are presented in Appendix D.

Table C1

*Cross-lagged model fit statistics*

Model	$\chi^2$ (df)	P	RMSEA	TLI	CFI
1	31.18 (8)	0.00	0.14	0.85	0.97
2	31.15 (8)	0.00	0.14	0.84	0.97
3	13.21 (8)	0.11	0.06	0.96	0.99
4	21.15 (8)	0.01	0.10	0.91	0.98
5	77.56 (24)	0.00	0.12	0.71	0.93
6	84.40 (24)	0.00	0.13	0.69	0.93

*Note.* Model 1 = Cross-lagged model of mother Warmth and Criticism and mother-rated child ASD symptoms; Model 2 = Cross-lagged model of mother Warmth and Criticism and mother-rated child behavior problems; Model 3 = Cross-lagged model of father Warmth and Criticism and father-rated child ASD symptoms; Model 4 = Cross-lagged model of father Warmth and Criticism and father-rated child behavior problems; Model 5 = Cross-lagged model of mother and father Warmth and Criticism and teacher-rated child ASD symptoms; Model 6 = Cross-lagged model of mother and father Warmth and Criticism and teacher-rated child behavior problems.  $\chi^2$  = Chi-squared test of absolute model fit; P =  $\chi^2$  p-value; RMSEA = Root Mean Square Error of Approximation; TLI = Tucker-Lewis Index; CFI = Confirmatory Fit Index. All fit statistics reported were for the default model.

## Appendix D

### Cross-lagged Models for Mother and Father Warmth and Criticism and Teacher-rated Child

#### ASD Symptoms and Behavior Problems

We also attempted to examine the pathways between the emotional quality of the parent-child relationship and teacher-reported child functioning, in order to determine if patterns maintained when a rater outside of the family reported on the child with ASD's functioning. Results from the crossed-lagged models involving teacher-reports of child ASD symptoms and behavior problems partially mirrored the pattern seen when using mother and father reported child functioning measures. Specifically, the emotional quality of the parent-child relationship quality (i.e., Warmth and Criticism) predicted later child functioning across time points for mothers and fathers. In the opposite direction, the child with ASD's symptoms and behavior problems were negatively associated with Warmth in the father-child relationship. Thus, the pattern of associations using teacher ratings of ASD symptoms and child behavior problems highlight similar findings from the first four SEM models in which parent-driven effects were seen for mothers and child-driven effects were seen for fathers; yet, it adds some indication that fathers, too, may experience bidirectional effects between child functioning and parent-child relationship quality. It should be noted, however, that additional paths were significant in models using teacher ratings of child ASD symptoms and behavior problems and were not in the expected directions. Further, it is difficult to compare the first four models to the final two models because of different informants of child ASD symptoms and behavior problems and, therefore, these results should be interpreted with caution. Future research might consider including a more direct observational measures of child ASD symptoms and behavior problems to avoid such confusion.



Figure D2. Cross-lagged model estimates and standard errors for mother and father warmth and criticism and teacher-rated child behavior problems

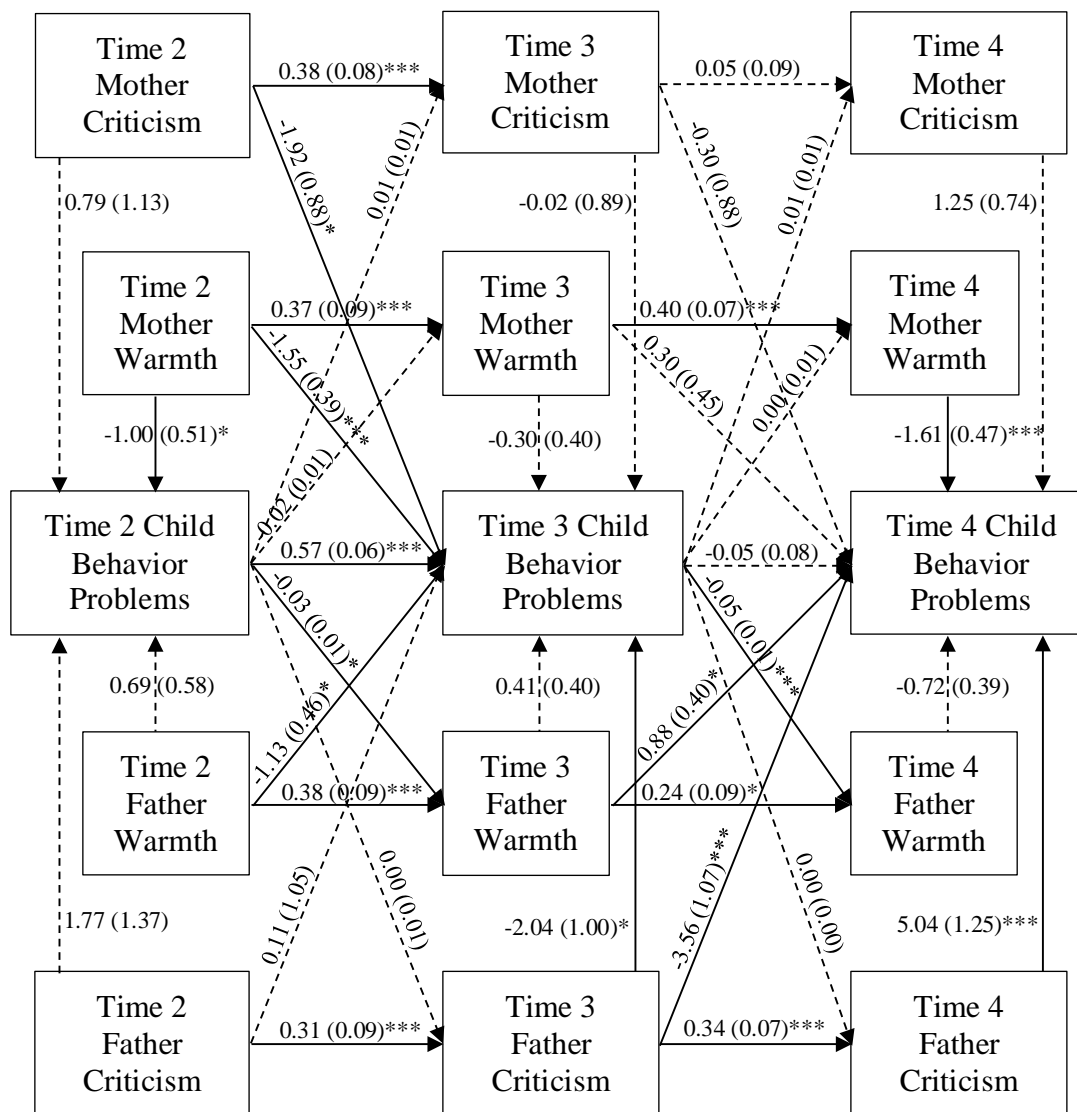


Figure 4.6a. Note. Child behavior problem ratings were from teacher CBCL = Child Behavior Checklist. Estimates and standard errors represent associations with teacher CBCL ratings (i.e., child behavior problems). Significant effects are marked in solid lines. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Paths across variables, accounting for covariance, are not shown in figure but were included in SEM analysis.

## Appendix E

## Social Responsiveness Scale – Second Edition

**QUESTIONS ABOUT THE TARGET CHILD**

**This section asks questions about your child with autism spectrum disorder, or the target child for this study. We are asking both you and your spouse to separately complete these measures. It is OK if your responses are different from those of your spouse; you each see your child in different contexts and in different ways.**

For each question, please circle the number that best describes this child's behavior over the past 6 months.

<b>1=NOT TRUE 2=SOMETIMES TRUE 3=OFTEN TRUE 4=ALMOST ALWAYS TRUE</b>				
1. Seems to fidget much more in social situations than when alone.	1	2	3	4
2. Expressions on his or her face don't match what he or she is saying.	1	2	3	4
3. Seems self-confident when interacting with others.	1	2	3	4
4. When under stress, he or she shows rigid or inflexible patterns of behavior that seem odd.	1	2	3	4
5. Doesn't recognize when others are trying to take advantage of him or her.	1	2	3	4
6. Would rather be alone than with others.	1	2	3	4
7. Is aware of what others are thinking or feeling.	1	2	3	4
8. Behaves in ways that seem strange or bizarre.	1	2	3	4
9. Clings to adults, seems too dependent on them.	1	2	3	4
10. Takes things too literally and doesn't get the real meaning of a conversation.	1	2	3	4
11. Has good self-confidence.	1	2	3	4
12. Is able to communicate his or her feelings.	1	2	3	4
13. Is awkward in turn-taking interactions with peers (for example, doesn't seem to understand the give-and-take of conversations).	1	2	3	4
14. Is not well coordinated.	1	2	3	4
15. Is able to understand the meaning of other people's tone of voice and facial expressions.	1	2	3	4
16. Avoids eye contact or has unusual eye contact.	1	2	3	4
17. Recognizes when something is unfair.	1	2	3	4

18. Has difficulty making friends, even when trying his or her best.	1	2	3	4
19. Gets frustrated trying to get ideas across in conversations.	1	2	3	4
20. Shows unusual sensory interests (for example, mouthing or spinning objects) or strange ways of playing with toys.	1	2	3	4
21. Is able to imitate others' actions.	1	2	3	4
22. Plays appropriately with children his or her age.	1	2	3	4
23. Does not join group activities unless told to do so.	1	2	3	4
24. Has more difficulty than other children with changes in his or her routine.	1	2	3	4
25. Doesn't seem to mind being out of step with or "not on the same wavelength" as others.	1	2	3	4
26. Offers comfort to others when they are sad.	1	2	3	4
27. Avoids starting social interactions with peers or adults.	1	2	3	4
28. Thinks or talks about the same thing over and over.	1	2	3	4
29. Is regarded by other children as odd or weird.	1	2	3	4
30. Becomes upset in a situation with lots of things going on.	1	2	3	4
31. Can't get his or her mind off something once he or she starts thinking about it.	1	2	3	4
32. Has good personal hygiene.	1	2	3	4
33. Is socially awkward, when he or she is trying to be polite.	1	2	3	4
34. Avoids people who want to be emotionally close to him or her.	1	2	3	4
35. Has trouble keeping up with the flow of a normal conversation.	1	2	3	4
36. Has difficulty relating to adults.	1	2	3	4
37. Has difficulty relating to peers.	1	2	3	4
38. Responds appropriately to mood changes in others (for example, when a friend's or playmate's mood changes from happy to sad).	1	2	3	4
39. Has an unusually narrow range of interests.	1	2	3	4
40. Is imaginative, good at pretending (without losing touch with reality).	1	2	3	4
41. Wanders aimlessly from one activity to another.	1	2	3	4
42. Seems overly sensitive to sounds, textures, or smells.	1	2	3	4
43. Separates easily from caregivers.	1	2	3	4
44. Doesn't understand how events relate to one another (cause and effect) the way other children his or her age do.	1	2	3	4

45. Focuses his or her attention to where others are looking or listening.	1	2	3	4
46. Has overly serious facial expressions.	1	2	3	4
47. Is too silly or laughs inappropriately.	1	2	3	4
48. Has a sense of humor, understands jokes.	1	2	3	4
49. Does extremely well at a few tasks, but does not do as well on most other tasks.	1	2	3	4
50. Has repetitive, odd behaviors such as hand flapping or rocking.	1	2	3	4
51. Has difficulty answering questions directly and ends up talking around the subject.	1	2	3	4
52. Knows when he or she is talking too loud or making too much noise.	1	2	3	4
53. Talks to people with an unusual tone of voice (for example, talks like a robot or like he or she is giving a lecture).	1	2	3	4
54. Seems to react to people as if they are objects.	1	2	3	4
55. Knows when he or she is too close to someone or is invading someone's space.	1	2	3	4
56. Walks in between two people who are talking.	1	2	3	4
57. Gets teased a lot.	1	2	3	4
58. Concentrates too much on parts of things rather than seeing the whole picture. For example, if asked to describe what happened in a story, he or she may talk only about the kind of clothes the characters were wearing.	1	2	3	4
59. Is overly suspicious.	1	2	3	4
60. Is emotionally distant, doesn't show his or her feelings.	1	2	3	4
61. Is inflexible, has a hard time changing his or her mind.	1	2	3	4
62. Gives unusual or illogical reasons for doing things.	1	2	3	4
63. Touches others in an unusual way (for example, he or she may touch someone just to make contact and then walk away without saying anything).	1	2	3	4
64. Is too tense in social settings.	1	2	3	4
65. Stares or gazes off into space.	1	2	3	4

## Appendix F

## Child Behavior Checklist (CBCL)

## CBCL (6-18 years)

Below is a list of items that describe children and youths. For each item that describes your child *now or within the past 6 months*, please circle the **2** if the item is *very true* or *often true* of your child. Circle **1** if the item is *somewhat* or *sometimes true* of your child. If the item is *not true* of your child, circle the **0**. Please answer all items as well as you can, even if some do not seem to apply to your child.

**0 = Not True    1 = Somewhat or Sometimes True    2 = Very True or Often True**

0	1	2	1. Acts too young for his/her age	28. Breaks rules at home, school, or elsewhere	0	1	2
0	1	2	2. Drinks alcohol without parents' approval	29. Fears certain animals, situations, or places other than school	0	1	2
0	1	2	3. Argues a lot	30. Fears going to school	0	1	2
0	1	2	4. Fails to finish things he/she starts	31. Fears he/she might think or do something bad	0	1	2
0	1	2	5. There is very little he/she enjoys	32. Feels he/she has to be perfect	0	1	2
0	1	2	6. Bowel movements outside toilet	33. Feels or complains that no one loves him/her	0	1	2
0	1	2	7. Bragging, boasting	34. Feels others are out to get him/her	0	1	2
0	1	2	8. Can't concentrate, can't pay attention for long	35. Feels worthless or inferior	0	1	2
0	1	2	9. Can't get his/her mind off certain thoughts; obsessions	36. Gets hurt a lot, accident-prone	0	1	2
0	1	2	10. Can't sit still, restless, or hyperactive	37. Gets in many fights	0	1	2
0	1	2	11. Clings to adults or too dependent	38. Gets teased a lot	0	1	2
0	1	2	12. Complains of loneliness	39. Hangs around with others who get in trouble	0	1	2
0	1	2	13. Confused or seems to be in a fog	40. Hears sounds or voices that aren't there	0	1	2
0	1	2	14. Cries a lot	41. Impulsive or acts without thinking	0	1	2
0	1	2	15. Cruel to animals	42. Would rather be alone than with others	0	1	2
0	1	2	16. Cruelty, bullying, or meanness to others	43. Lying or cheating	0	1	2
0	1	2	17. Daydreams or gets lost in his/her thoughts	44. Bites fingernails	0	1	2
0	1	2	18. Deliberately harms self or attempts suicide	45. Nervous, high-strung, or tense	0	1	2

0	1	2	19. Demands a lot of attention	46. Nervous movements or twitching	0	1	2
0	1	2	20. Destroys his/her own things	47. Nightmares	0	1	2
0	1	2	21. Destroys things belonging to his/her family or others	48. Not liked by other kids	0	1	2
0	1	2	22. Disobedient at home	49. Constipated, doesn't move bowels	0	1	2
0	1	2	23. Disobedient at school	50. Too fearful or anxious	0	1	2
0	1	2	24. Doesn't eat well	51. Feels dizzy or lightheaded	0	1	2
0	1	2	25. Doesn't get along with other kids	52. Feels too guilty	0	1	2
0	1	2	26. Doesn't seem to feel guilty after misbehaving	53. Overeating	0	1	2
0	1	2	27. Easily jealous	54. Overtired without good reason	0	1	2
0	1	2	55. Overweight	79. Speech problem	0	1	2
0	1	2	56. Physical problems without known medical cause:	80. Stares blankly	0	1	2
0	1	2	a. Aches or pains (not stomach or headaches)	81. Steals at home	0	1	2
0	1	2	b. Headaches	82. Steals outside the home	0	1	2
0	1	2	c. Nausea, feels sick	83. Stores up too many things he/she doesn't need	0	1	2
0	1	2	d. Problems with eyes (not if corrected by glasses)	84. Strange behavior	0	1	2
0	1	2	e. Rashes or other skin problems	85. Strange ideas	0	1	2
0	1	2	f. Stomachaches	86. Stubborn, sullen, or irritable	0	1	2
0	1	2	g. Vomiting, throwing up	87. Sudden changes in mood or feelings	0	1	2
0	1	2	h. Other (describe): _____	88. Sulks a lot	0	1	2
0	1	2	57. Physically attacks people	89. Suspicious	0	1	2
0	1	2	58. Picks nose, skin or other parts of body	90. Swearing or obscene language	0	1	2
0	1	2	59. Plays with own sex parts in public	91. Talks about killing self	0	1	2
0	1	2	60. Plays with own sex parts too much	92. Talks or walks in sleep	0	1	2

0	1	2	61. Poor school work	93. Talks too much	0	1	2
0	1	2	62. Poorly coordinated or clumsy	94. Teases a lot	0	1	2
0	1	2	63. Prefers being with older kids	95. Temper tantrums or hot temper	0	1	2
0	1	2	64. Prefers being with younger kids	96. Thinks about sex too much	0	1	2
0	1	2	65. Refuses to talk	97. Threatens people	0	1	2
0	1	2	66. Repeats certain acts over and over; compulsions	98. Thumb-sucking	0	1	2
0	1	2	67. Runs away from home	99. Smokes, chews, or sniffs tobacco	0	1	2
0	1	2	68. Screams a lot	100. Trouble sleeping	0	1	2
0	1	2	69. Secretive, keeps things to self	101. Truancy, skips school	0	1	2
0	1	2	70. Sees things that aren't there	102. Underactive, slow moving, or lacks energy	0	1	2
0	1	2	71. Self-conscious or easily embarrassed	103. Unhappy, sad, or depressed	0	1	2
0	1	2	72. Sets fires	104. Unusually loud	0	1	2
0	1	2	73. Sexual problems	105. Uses drugs for nonmedical purposes (don't include alcohol or tobacco)	0	1	2
0	1	2	74. Showing off or clowning	106. Vandalism	0	1	2
0	1	2	75. Too shy or timid	107. Wets self during the day	0	1	2
0	1	2	76. Sleeps less than most kids	108. Wets the bed	0	1	2
0	1	2	77. Sleeps more than most kids during day and/or night	109. Whining	0	1	2
0	1	2	78. Inattentive or easily distracted	110. Wishes to be of opposite sex	0	1	2
0	1	2	111. Withdrawn, doesn't get involved with others				
0	1	2	112. Worries				
0	1	2	113. Please write in any problems your child has that were not listed above:  _____				

## Appendix G

## The Zarit Burden Interview

Circle the number that corresponds to the answer that best describes your response to each question.

	<b>Not At All</b>	<b>Somewhat</b>	<b>Extremely</b>
1. I feel resentful of other relatives who could, but who do not, do things for my child.	0	1	2
2. I feel that my child makes requests which I perceive to be over and above what he/she needs.	0	1	2
3. Because of my involvement with my child, I don't have enough time for myself.	0	1	2
4. I feel stressed between trying to give to my child as well as to other family responsibilities, job, etc.	0	1	2
5. I feel embarrassed over my child's behavior.	0	1	2
6. I feel guilty about my interactions with my child.	0	1	2
7. I feel that I don't do as much for my child as I could or should.	0	1	2
8. I feel angry about my interactions with my child.	0	1	2
9. I feel that in the past, I haven't done as much for my child as I could have or should have.	0	1	2
10. I feel nervous or depressed about my interactions with my child.	0	1	2
11. I feel that my child currently affects my relationships with other family members and friends in a negative way.	0	1	2
12. I feel resentful about my interactions with my child.	0	1	2
13. I am afraid of what the future holds for my child.	0	1	2
14. I feel pleased about my interactions with my child.	0	1	2
15. It's painful to watch my child age.	0	1	2
16. I feel useful in my interactions with my child.	0	1	2
17. I feel my child is dependent.	0	1	2
18. I feel strained in my interactions with my child.	0	1	2
19. I feel that my health has suffered because of my involvement with my child.	0	1	2

	<b>Not At All</b>	<b>Somewhat</b>	<b>Extremely</b>
20. I feel that I am contributing to the well-being of my child.	0	1	2
21. I feel that the present situation with my child doesn't allow me as much privacy as I'd like.	0	1	2
22. I feel that my social life has suffered because of my involvement with my child.	0	1	2
23. I wish that my child and I had a better relationship.	0	1	2
24. I feel that my child doesn't appreciate what I do for him/her as much as I would like.	0	1	2
25. I feel uncomfortable when I have friends over.	0	1	2
26. I feel that my child tries to manipulate me.	0	1	2
27. I feel that my child seems to expect me to take care of him/her as if I were the only one he/she could depend on.	0	1	2
28. I feel that I don't have enough money to support my child in addition the rest of our expenses.	0	1	2
29. I would like to be able to provide more money to support my child than I am able to now.	0	1	2

## Appendix H

## Center for Epidemiologic Studies Depression Scale (CES-D)

Below is a list of the ways you might have recently felt or behaved. Please check the box describing how often you have felt this way during the **past week**.

	<b>Rarely or none of the time (less than 1 day)</b>	<b>Some or a little of the time (1-2 days)</b>	<b>Occasionally or a moderate amount of time (3-4 days)</b>	<b>Most or all of the time (5-7 days)</b>
1. I was bothered by things that don't usually bother me.				
2. I did not feel like eating; my appetite was poor.				
3. I felt that I could not shake off the blues even with help from my family or friends.				
4. I felt I was just as good as other people.				
5. I had trouble keeping my mind on what I was doing.				
6. I felt depressed.				
7. I felt that everything I did was an effort.				
8. I felt hopeful about the future.				
9. I thought my life had been a failure.				
10. I felt fearful.				
11. My sleep was restless.				
12. I was happy.				
13. I talked less than usual.				
14. I felt lonely.				
15. People were unfriendly.				
16. I enjoyed life.				
17. I had crying spells.				
18. I felt sad.				
19. I felt that people dislike me.				
20. I could not get "going".				