Applying the Vulnerability Stress Adaptation Model to Romantic Relationships of Couples Raising a Child with ASD

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APPLYING THE VULNERABILITY STRESS ADAPTATION MODEL TO ROMANTIC RELATIONSHIPS OF COUPLES RAISING A CHILD WITH ASD

by

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ABSTRACT
APPLYING THE VULNERABILITY STRESS ADAPTATION MODEL
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Cross-sectional evidence indicates that raising a child with autism spectrum disorder (ASD) is associated with strain on caregivers' romantic couple relationship, yet many couple relationships thrive (Hock et al., 2012; Markoulakis et al., 2012). Research on general population samples highlights changes in couple romantic relationships across short and longer periods of time (e.g., Karney & Bradbury, 1997); little is known, however, about how the relationships of couples raising a child with ASD unfold and which couples are at greater risk for deterioration than others. According to the Vulnerability Stress Adaptation (VSA) Model, couple romantic relationships are directly shaped by how couples work together to solve problems (i.e., adaptive processes); vulnerabilities brought into the relationship and stressors faced by each partner impact adaptive processes. In the present study, longitudinal growth curve models examined changes (four time points across three years) in observed problem-solving interactions among 189 couples (378 parents) raising a child (aged 5-12) with ASD. Each partner completed questionnaires assessing the broader autism phenotype (BAP; vulnerability) as well as their own parenting stress and their child's ASD symptoms and emotional and behavioral problems (i.e., stressors) at the first time point. Results revealed declines, on average, in the responsiveness of partners (Sensitivity), ability to work together (Cooperation) to come to a satisfying resolution (Conflict Resolution), and positivity (Enjoyment). Composite scores (Solution Focused Reciprocity and Positive Togetherness) also demonstrated declines across time. The sharing of the interaction (Balance), partner-directed behaviors (Engagement), and hostility (Irritation) remained stable. Growth mixture modeling revealed no unique subgroups of couples. Stressors were not significant predictors of the intercept or slope of Solution Focused Reciprocity and Positive Togetherness. Couples with higher Father BAP demonstrated steeper declines in couple adaptive processes over time, especially in the context of low initial levels of mother-reported stress. Mother BAP, however, appeared to be protective against declines in Positive Teamwork in the context of a high initial level of father-reported stress. Findings highlight areas of strength and weaknesses that can be leveraged or supported to promote healthy and long-lasting couple relationships, and in turn, well-adjusted families.

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Introduction

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental disorder defined by the current Diagnostic and Statistical Manual of Mental Disorders as challenges in social communication and the presence of restricted and repetitive behaviors that affect functioning across life domains (Americal Psychiatric Association, 2013). Raising a child with ASD can place unique demands on the family system (Hayes & Watson, 2013) and, in turn, it has been proposed that these demands may strain parents' romantic couple relationships[1] (Sim et al., 2016). Parents who have a child with ASD have been found to be at increased risk for couple relationship dissolution and conflict (Hartley et al., 2010; Hartley, Papp, et al., 2017). Yet, these group-based averages obscure important within-group variability. For example, some parents report feeling more closely connected to their partner through the experience of raising their child with ASD (Markoulakis et al., 2012) with a subset of couples endorsing a high level of couple relationship satisfaction (e.g., Sim et al., 2017). The majority of existing studies on the romantic couple relationship of parents of a child with ASD have relied on self-reported measures of global relationship functioning using cross-sectional designs (Saini et al., 2015; Sim et al., 2016). This approach does not fully capture the dynamic nature of the couple relationship across time, nor does it offer insight into the specific aspects of the couple relationship that may go awry in the context of raising a child with ASD. As such, a clear gap in current literature is evident; specifically, there is a need to understand variability and change across time in objective measures of problematic and adaptive

[1]In the present paper, the phrase "couple relationship" is used to encompass both romantic partnerships and marital relationships.

couple behaviors in families who have a child with ASD. Given the important implications of the parent couple relationship for long term health and well-being of both parents (Proulx et al., 2007; Robles et al., 2014) and their children (Grych & Fincham, 2001; Zimet & Jacob, 2001) in general population samples, understanding the specific ways that the parent couple relationship may deteriorate across particular periods of their child's development (e.g., infancy, school-aged, adolescence) can inform preventative efforts to bolster positive individual- and family-level outcomes in ASD. This study aims to begin to close this gap in the literature. In order to provide a foundation for the goals of the study, evidence on couple relationships in the general population will be reviewed, including outcomes, longitudinal trajectories, and measurement of couple relationship quality. Then, a brief overview of empirical research on parent couple relationships in the context of child ASD will be provided.

Couple Relationships in the General Population

Why Study Couple Romantic Relationships?

Humans are innately social beings that thrive in supportive, sensitive, and warm relationships. While this is true for many types of social relationships throughout development (i.e., parents with infants, Bowlby, 2008; peers with adolescents, Rubin, Bukowski, & Bowker, 2015), romantic bonds are particularly salient among adults. This is in part due to the central role of romantic partners in adulthood; partners can provide a source of security and support, especially during times of distress (Feeney, 2004; Hazan & Zeifman, 1999; Mikulincer & Shaver, 2003). Marriages are not uncommon in today's society (U.S. Census Bureau), and a large body of research illuminates the role of healthy

couple relationships for a range of individual, dyadic, and family system outcomes. Higher couple relationship quality is linked to better mental and physical health (Proulx et al., 2007; Robles et al., 2014), while more couple relationship problems are related to psychopathology (Kouros et al., 2008; Overbeek et al., 2006; Whisman & Baucom, 2012; Whisman & Uebelacker, 2009). While marriage is not uncommon, neither is divorce and separation (Kennedy & Ruggles, 2014); it is estimated that approximately 39% of marriages end in divorce with an estimated divorce rate of 7.6/1000 (aged 15 or older) in the U.S. in 2019 (*U.S. Marriage and Divorce Rates by State: 2009 & 2019*, 2020). Just as dysfunction in couple relationships can have negative consequences, divorce and separation are also frequently associated with poor health outcomes (Sbarra & Coan, 2017; Wong et al., 2018), although there are exceptions (e.g., in cases of intimate partner violence; Watkins et al., 2014; Wong et al., 2018).

Experiences within romantic partnerships not only have implications for each partner, but also for subunits within the family. According to the family systems perspective (Brown, 1999; Minuchin, 1985), the experiences and psychological well-being of one family member or one family subsystem (e.g., parent couple relationship) affect other family members and family subsystems (e.g., parent-child relationship). Maladaptive parent couple relationship can impact child functioning through direct exposure to parent couple conflict (e.g., Zimet & Jacob, 2001). However, even when children do not observe parents arguing, there is evidence of spillover of tension from the couple relationship into parenting behavior (Stroud et al., 2011). Parents who report a higher level of couple relationship satisfaction are found to have children with lower levels of internalizing and externalizing symptoms (Knopp et al., 2017). Even within

families, fluctuations in quality of partner communication is related to changes in child well-being over time (Knopp et al., 2017). Likewise, higher levels of couple relationship conflict are related to poorer child outcomes, with differential effects on the child dependent on the intensity, frequency, content, and resolution of couple relationship conflict (Grych & Fincham, 1990). For example, constructive couple relationship conflict, characterized by supportive behaviors, displaying affection, and coming to a resolution, has been related to warm parenting (McCoy et al., 2013) and positive emotional reactions from children (Cummings et al., 2003). In contrast, destructive conflict, including displays of hostility, aggression, and withdrawal, has been related to inconsistent discipline (McCoy et al., 2013) and child behavioral dysregulation (Cummings et al., 2003). Robust evidence also shows that divorce can have negative effects on children's long term health and well-being (Auersperg et al., 2019; Sands et al., 2017). Given these potentially detrimental effects of couple relationship dysfunction and dissolution on partners and their children, a thorough understanding of the emergence of adaptive and maladaptive couple relationship outcomes over time can help to promote couples and relationships that are happier, live longer, and foster well-adjusted children.

Do Couple Romantic Relationships Change Over Time?

Researchers have long recognized the importance of studying and understanding couple relationships, as the first research study on marriage was published over 80 years ago (Terman et al., 1938). Much of this initial work was cross-sectional. Romantic couple relationships, however, are not static. Therefore, this raised the question: do couple relationships change over time (both short and longer periods of time) and if so, in what

way? Multiple researchers called for longitudinal studies (e.g., Hicks & Platt, 1970) and, as such, decades of theory and research have sought to answer this question.

Theoretical Frameworks. Multiple models have been posed to explain changes (or lack thereof) of couple relationships over time. Some suggest that most couple relationships change in the same way (e.g., decline over time; Gradual Disillusionment), while others pose stability that is driven by pre-existing personality traits (e.g., Enduring Dynamics Model). One comprehensive and robustly empirically supported model, the Vulnerability Stress Adaptation Model (VSA Model), posits that longitudinal quality and stability of couple romantic relationships is directly affected by the *quality of the interaction between partners* (e.g., how they work together to solve problems and support each other). The quality and nature of these adaptive processes result from both vulnerabilities brought into the relationship by each partner and external sources of stress (i.e., stress generated from outside of the couple relationship) that one or both partners in the couple face (Karney & Bradbury, 1995b). From this perspective, certain partner characteristics, coupled with enduring high levels of distress from external sources (e.g.., work stressors, health stressors, conflict with friends or other family members), can propel couples on a downward path of relationship deterioration by affecting the interactions between partners. Previous research has aimed to characterize the ways in which couple relationships change across a range of timeframes (both short-term [e.g., over 2 to 5 yrs.] and longer-term [e.g., 5-25 yrs.] in order to empirically test these theoretical models and better understand the evolution of couple relationships over time.

Empirical Findings. Studies have identified multiple average patterns of change in romantic relationships. Many early cross-sectional studies found evidence for a U-

shaped curve of couple relationship satisfaction when thinking about life course of relationships, with initial declines in satisfaction (i.e., across first few years of relationship, especially after birth of first child), followed by stability (e.g., across child's preschool to adolescence), and then a slight up-turn in later years (after child reaches adolescence/young adulthood) (Rollins & Cannon, 1974; Spanier & Lewis, 1980). Later longitudinal work then suggested a pattern characterized by an average linear decline in relationship satisfaction or happiness over time, with declines being steepest in the first few years of the relationship but continuing at smaller rates throughout the course of the relationship (Karney & Bradbury, 1997; Kurdek, 1999; Umberson et al., 2005; VanLaningham et al., 2001). Researchers, however, have called into question the idea that average longitudinal change is the best way to understand trajectories of couple relationships; mounting evidence alternatively indicates that distinct groups of couples change in different ways (Karney & Bradbury, 2020; Lavner & Bradbury, 2019; Proulx et al., 2017).

The person-centered versus variable-centered approach has led researchers to identify latent classes of couples demonstrating varied relationship satisfaction or happiness across long-term longitudinal studies (i.e., 16 to 20 years) (Anderson et al., 2010; Birditt et al., 2012; Kamp Dush et al., 2008) and shorter term studies (i.e., 2 to 5 years) focused on newlyweds and parents of young children (Foran et al., 2013; Lavner et al., 2012; Lavner & Bradbury, 2010; Lorber et al., 2015; Williamson & Lavner, 2019). Although the quantity of distinct classes of couples has varied across long-term studies, with studies identifying two classes (Foran et al., 2013), three classes (Birditt et al., 2012; Kamp Dush et al., 2008; Lavner et al., 2012; Lavner & Bradbury, 2010; Lorber et al.,

2015; Williamson & Lavner, 2019), four classes (Birditt et al., 2012), and five classes (Anderson et al., 2010), a relatively consistent pattern has emerged such that groups with lower initial levels of couple happiness or satisfaction tend to experience greater declines across time.

In addition to characterizing longitudinal changes in positive global perceptions of couple relationships, researchers have also emphasized the importance of exploring changes in couple experiences (Karney, 2015) and negative aspects of relationship functioning (Lavner & Bradbury, 2019). While evidence indeed indicates strong associations between adaptive and maladaptive couple relationship functioning, negative and positive aspects of relationship quality are not necessarily unidimensional (Heyman et al., 1994). As such, consideration of both adaptive and maladaptive aspects of couple relationships may help to provide a more nuanced and accurate depiction of relationship changes over time (Lavner & Bradbury, 2019). Therefore, although few, studies have explored trajectories of couple relationship conflict across longer-term (i.e., 20 years; Dush & Taylor, 2012) or shorter-term time-frame (i.e., 4 years Madigan et al., 2017) drawing on samples from the general population. Both longer-term and short-term studies found evidence for 3 latent classes with distinct intercepts and slopes (Dush & Taylor, 2012; Madigan et al., 2017). In a 20 year study of couples in the general population (Dush & Taylor, 2012), a 'high conflict' group composed 23% of the sample and demonstrated a subtle upside-down U-shape pattern of couple conflict with a slight increase in couple conflict across the first year, followed by a decrease in couple conflict for the remaining years. The second group was labeled the 'middle conflict' group (61% of the sample); this group evidenced a pattern of stability in the first few years, followed

by a slight decline towards the end of the study. The final group was labeled the ‘low conflict’ group and consisted of 17% of the sample. The ‘low conflict’ group demonstrated stable low levels of conflict across the 20 years. In a 4-year study of mothers of infants (aged 2 months to 54 months), a ‘high conflict’ group (7% of sample) also emerged and demonstrated a sizeable decline over time (average slope of -2 on a scale ranging from possible values of 3 – 18; initial average starting level of 12). There was also a ‘moderate conflict’ group (21.8% of sample) that evidenced a slight increase in conflict across the 4 years. Finally, the ‘low conflict’ group (71.2% of the sample) remained stable over the 4 years.

In addition to assessing frequency of couple relationship conflict over time, observed couple problem-solving behavior has also been explored longitudinally. One study followed newlyweds for the first decade of marriage and found increases in observed positive (communication skills, support/validation, problem-solving, and positive affect) and negative (denial, conflict, dominance, negative affect) aspects of couple interactions during problem-solving tasks (Lindahl et al., 1998). As subgroups were not explored, it may be that interpretation of the overall pattern of change is compromised by the existence of subgroups that change in meaningfully different ways.

In sum, there is evidence that couple romantic relationships evolve across both short-term [e.g., over 2 to 5 yrs.] and longer-term [e.g., 5-25 yrs.] timeframes in the general population. While most of the research on romantic couple relationships has focused on average change of couple relationship satisfaction or happiness, recent studies have noted the importance of testing for unique subgroups of couples and examining how both positive and negative aspects of the couple relationship change over time.

How Do We Measure High-Quality Couple Relationships? Research on couple relationships often uses relationship satisfaction as a proxy for relationship quality. In forming a global perception of couple relationship satisfaction, Karney (2015) poses that partners develop separate evaluations or judgements of various aspects of their relationship. These evaluations are organized into a cognitive hierarchy in support of an overall perception of the couple relationship. Measures of couple relationship satisfaction, however, are limited by the following: 1) assumption that satisfying relationships are characterized by lack of dissatisfaction, 2) conceptualization of couple relationship satisfaction as along a continuum, from positive evaluation to negative evaluation, 3) interpretation of couple relationship satisfaction at one moment in time, rather than in comparison to earlier time points, 4) dependence upon the partners' attitude accessibility or degree to which the person associates the evaluation (satisfaction) and the object of evaluation (partner/relationship) (Bradbury et al., 2000). Additionally, issues with common methods variance emerge when using self-reported metrics of relationship satisfaction (Bank, Dishion, Skinner, & Patterson, 1990; Gottman, 1998). As such, the field of romantic relationship research in psychology often employs observational methods (Gottman & Notarius, 2000). Observational methods allow for more precise and objective measurement of inter-partner processes with added "depth and richness" that allows researchers to capture the "complex social interaction that lies beyond the natural awareness of even the most keenly sensitive spouse or partner" (Gottman & Notarius, 2000, p. 927). Therefore, observational methods can be used to respond to the call for more nuanced metrics of couple relationship quality that focus more on specific aspects of couple relationship functioning (Bradbury et al., 2000).

Observational methods and coding schemes often focus on specific processes that are thought to underly couple relationship functioning. According to the VSA Model, adaptive processes are the hinge connecting stressors and vulnerabilities with long-term couple relationship outcomes (Karney & Bradbury, 1995b). One such adaptive process centers upon the ways couples interact during problem-solving and conflict. Conflict is an inevitable part of most relationships, with the behavior exchanged during conflict having long term implications for quality, satisfaction (Heavey et al., 1995), and stability of couple relationships (Gottman, 1993). In studies on the general population, particular patterns of behavior during problem-solving are related to concurrent relationship satisfaction and longitudinal change in relationship functioning over time (Gottman & Krokoff, 1989). In particular, disagreement and anger are linked with concurrent levels of low couple relationship satisfaction, while defensive, stubborn, and withdrawn behaviors are related to longitudinal relationship deterioration (Gottman & Krokoff, 1989). Furthermore, even for couples with high stable levels of couple relationship satisfaction, observed negative affect (e.g., anger, whining, sadness), negative problem-solving skills (e.g., denial of responsibility, disagreement, devaluation of partner), and negative support behavior (e.g., criticism, blaming) during problem-solving interactions distinguish couples who remain married from those who eventually go on to divorce (Lavner & Bradbury, 2012).

Taken together, these studies highlight that observational methodology offers many strengths that are particularly well suited for capturing the complex dyadic processes involved in couple romantic relationships. This may be especially true in the

context of conflict or problem-solving, as these processes are thought to be at the heart of couple relationship quality.

Couple Relationships and Raising a Child with ASD

Some couples are at greater risk for maladaptive couple relationship outcomes than others. Parents of children with ASD are especially susceptible to tension and strain in their couple relationship. Early on, some researchers commented that "marital strife, separation, and divorce are almost expected outcomes because an autistic child places an 'impossible stress' on a marriage" (Yahraes, 1978, pp 747). Today, researchers have recognized that maladaptive couple outcomes are certainly not inevitable for all couples, yet there are measurable differences (adaptive and maladaptive) between the relationships of couples raising a child with ASD compared to those without (Hartley, Papp, et al., 2017; Hock et al., 2012; Myers et al., 2009). Many quantitative and qualitative studies point to challenges in maintaining healthy romantic relationships for couples raising a child with ASD, including feeling less satisfied in the relationship (Sim et al., 2016), spending less time with their partner relative to their peers who have children without disabilities (Hartley, DaWalt, et al., 2017; Marciano et al., 2015), and being physically intimate less frequently than desired (Aylaz et al., 2012). Coinciding with these relationship challenges, some evidence has found increased risk for separation/divorce relative to a comparison group (Hartley et al., 2010; Kousgaard et al., 2018); evidence has indicated that the higher risk for divorce emerges starting when the child with ASD is 8 years old, highlighting the school-aged years as a potential critical period for these couples.

Romantic relationship experiences and quality vary across couples, and the impact of having a child with ASD on couple relationship functioning is likely not static across time. Based on a cross-sectional qualitative study, some parents raising a child with ASD have retrospectively described their couple relationship as shifting from stress and conflict to greater closeness and intimacy (Hock et al., 2012). Parents have also endorsed feeling fulfilled, understanding life's purpose, experiencing personal growth including more patience, open-mindedness and tolerance, and developing a social network of other families (Kayfitz et al., 2010; Markoulakis et al., 2012); these positive effects likely bolster couples' capacity for building and maintaining a strong romantic relationship. Beyond individual level effects, some couples who have a child on the spectrum report feeling more connected to one another, with an increased sense of unity from working towards a shared goal (i.e., raising their child with ASD) (Markoulakis et al., 2012). The mix of couple relationship experiences gives rise to a nuanced and evolving picture of relationship functioning for couples who have a child with ASD that can be better understood by exploring factors that shape relationships over critical periods of time (e.g., school-aged years).

How Do Stressors Play a Role in Couple Relationships? As described by the VSA Model (Karney & Bradbury, 1995b), poorer couple relationship outcomes of parents of children with ASD are likely partly driven by stressors experienced by one or both partners. Within this model, these stressors can originate from sources outside of the couple relationship (e.g., financial stress, workplace stress, or health stress), but then lead to stress within the couple relationship. In the context of raising a child with ASD, parenting stress is a central source of stress experienced by one or both parents (Hayes &

Watson, 2013). In support of the VSA Model, it is well documented that stress can significantly impact couple relationship functioning, with evidence that high levels of chronic stress drain couples' resources to devote to their relationship and adversely affect each partner's cognitions, emotions, and behaviors, leaving enduring negative effects on their relationship across time (Karney et al., 2005).

Correlational, cross-sectional findings point to a host of stressors that are thought to impact romantic relationship quality of parents raising a child with ASD. Proximal stressors may include managing challenging behaviors (Jang et al., 2011; Schiltz et al., 2018) and co-occurring internalizing and externalizing symptoms (Rodriguez et al., 2019), accessing and coordinating treatment (Thomas et al., 2007), high financial burden (Kogan et al., 2008), and altered parent-child interactions related to the social communication challenges of ASD (Beurkens et al., 2013). A number of more distal sources of stress also exist. For example, heightened levels of parenting stress may also be related to stigma faced by parents of children with ASD (Kinnear et al., 2016), as well as frequent lack of social support and social isolation (Myers et al., 2009).

High levels of parenting stress have been shown to spill over into couple relationship dynamics of parents raising a child with ASD (Hartley et al., 2016). For example, based on a daily diary study of couples raising a child with ASD, a greater level of parenting stress (relative to own average level of stress) was related to more negative couple relationship interactions (e.g., making critical comments, being impatient or short tempered) within the same day for both mothers and fathers, and fewer positive interactions (e.g., gave a compliment, shared a funny story) for mothers. Additionally, these effects were also bidirectional and time-lagged for mothers, such that a higher level

of parenting stress predicted fewer positive couple relationship interactions on the following day, and a greater number of negative couple relationship interactions predicted more parenting stress on the following day. Moreover, many of the factors that place parents of a child with ASD at risk for higher levels of chronic stress have been directly linked with couple relationship dysfunction. For example, child characteristics such as higher levels of behavior problems have been related to lower couple relationship satisfaction (Hartley et al., 2012; Langley et al., 2017). While many stressors have been identified among couples raising a child with ASD and linked concurrently with couple relationship functioning, it remains unclear how such stressors may shape changes in couple relationship functioning.

How Do Vulnerabilities Impact Couple Relationships? Through the lens of the VSA Model, parents of children with ASD may bring their own set of vulnerabilities into their romantic relationship, placing them at risk for couple relationship dysfunction (Karney & Bradbury, 1995b). For example, parental well-being is found to be poorer in these families, with high levels of anxiety (33%) and depression (31%) (Schnabel et al., 2020). Likely as both cause and consequence of parenting stress and romantic relationship strain in these families, mental health concerns may pose vulnerability for lower couple relationship satisfaction (Dehle & Weiss, 2002; Mamun et al., 2009). Additionally, parents of children with ASD are at higher risk for a set of personality characteristics referred to as the broader autism phenotype (BAP) (Ingersoll & Wainer, 2014), with estimates that 23.2% of mothers and 19.0% of fathers of children with ASD display the BAP, compared to 8.1% and 8.9%, respectively, in the general population (Sasson, Lam, Childress, et al., 2013). Additionally, nearly one third of families of

children with autism include at least one parent with the BAP (Sasson, Lam, Parlier, et al., 2013). The BAP is characterized by subclinical features of ASD including rigidity, aloofness, and difficulties interacting socially (Hurley et al., 2007; Ingersoll & Wainer, 2014). Such features affect interpersonal interactions, and in turn, the development and maintenance of social connections (Wainer et al., 2013). Parent vulnerabilities in this population have also been directly linked to couple romantic relationship functioning. For instance, higher parental BAP has been cross-sectionally linked with poorer self-reported, observed, and physiological indicators of relationship functioning (Hartley et al., 2019). Likewise, higher parental depressive symptoms have been associated with fewer positive (e.g., offering helpful advice, doing favors, saying considerate things) and more negative (e.g., offering intrusive advice, not providing assistance, acting unsympathetic or critical) social exchanges with romantic partners (Hickey et al., 2018). Collective existing research indicates that caregivers raising a child with ASD are at high risk for vulnerability factors that have been cross-sectionally linked with dimension of the couple relationship. To date, however, little is known about how parent vulnerabilities predict changes in the couple relationship; the effect of such vulnerabilities on the couple relationship may be especially important to examine within the school-aged years when rates of divorce are found to be higher than comparison groups (Hartley et al., 2010)

What is Known About Adaptive Processes in These Couples? As posited by the VSA Model, partner vulnerabilities and stressors shape the couple relationship by hindering some couple's ability to cope, adapt, or work together (i.e., adaptive processes) (Karney & Bradbury, 1995b). Although little is known about adaptive processes in these couples (Schiltz & Van Hecke, 2020), one line of research has explored aspects of

adaptive processes among parents who have a child with ASD, namely the nature of couple relationship conflict and problem-solving. An analysis of cross-sectional self-reported and observational data from the same sample as the current study revealed differences between couples who have a child with ASD compared parents of a child without a disability (Hartley, Papp, et al., 2017). Based on self-reported data, parents of a child with ASD indicated more frequent (father) and severe (mothers and fathers) couple conflict that is less likely to be resolved (mothers) relative to parents of children who were typically developing. No differences in terms of emotional resolutions (i.e., degree to which parents experience positive and negative emotional outcomes after problem-solving, such as feeling closer to one another) of problem-solving attempts were found. In terms of conflict resolution strategies, fathers of children with ASD reported the use of more stalemates than the comparison group. Observed findings indicated that parents of children with ASD displayed higher levels of positive affect and sensitivity, but lower levels of engagement, balance, and cooperation than parents of typically developing children. The most common topics of couple conflict during the observed interaction were the target child with ASD (e.g., disagreements about how to manage a challenging child behavior), communication (e.g., not liking how one another communicates their feelings or feeling as if no communication is happening), and chores (e.g., who takes on more household responsibilities). A daily diary study also involving the same sample as the current study revealed a greater average number of child-present (i.e., child observed parents disagreeing) and child-themed (i.e., disagreement was about the child) couple relationship conflicts for both mothers and fathers of a child with ASD across a two week period, relative to a comparison group (Papp & Hartley, 2019). Child presence during

couple relationship conflict was not only related to qualities of the interaction (i.e., lower positivity and higher anger), but also to higher average levels of child behavior problems (Papp & Hartley, 2019). Taken together, these findings suggest that parents of school-aged children with ASD may experience more couple conflict that is often unresolved and centered upon the child with ASD than comparison groups. As such, adaptive processes may be particularly relevant for these couples, yet little research has focused on these aspects of couple relationships in this population.

Summary and Identified Gaps

Quality and stability of romantic couple relationships have implications for mental and physical health, well-being, and quality of life of individual partners (Proulx et al., 2007; Robles et al., 2014) and functioning of the broader family system (e.g., Grych & Fincham, 1990). According to the VSA Model, some couples, however, may struggle to maintain satisfying relationships due to the confluence of multiple stressors and vulnerability factors that impede couples ability to adapt to challenges (Karney & Bradbury, 1995a). In particular, parents of youth with ASD are especially susceptible to strain and dissatisfaction in their romantic relationship (Saini et al., 2015; Sim et al., 2016). While raising a child with ASD can be trying on a couple relationship, some couples successfully navigate such challenges and in fact thrive (Hock et al., 2012; Markoulakis et al., 2012). Cross-sectionally, caregivers raising a child with ASD demonstrate strengths and challenges in their romantic relationship quality compared to those of parents raising a neurotypical child (Hartley, DaWalt, et al., 2017; Hartley, Papp, et al., 2017). Decades of research have illuminated that couple romantic relationships evolve over both short and longer periods of time (e.g., Karney & Bradbury, 1997), and

that not all couple relationships change in the same way (Karney & Bradbury, 2020; Proulx et al., 2017), yet little is known about changes in the relationships of couples raising a child with ASD. Taking a longitudinal approach can help to elucidate the emergence of positive and negative relationship changes over time for this population at high risk for poor couple relationship outcomes, and inform prevention and intervention efforts related to couple relationship dysfunction (Bradbury & Fincham, 1990b). Furthermore, many studies are limited to measuring global relationship functioning, with very few studies exploring the way in which couples work together to overcome challenges (e.g., Hartley, Papp, et al., 2017); based on the VSA Model, these couple interactions or "adaptive processes" are at the core of couple relationship dysfunction (Karney & Bradbury, 1995b) that may be shaped by stressors and vulnerabilities over time.

The present study sought to build on the existing literature of romantic relationships among couples raising a child with ASD in the following ways: 1) characterize *change over time* rather than cross sectionally, 2) focus on various dimensions of *observed behavior* (e.g., cooperation, balance, etc.) tapping into adaptive processes between couples instead of global self-reported relationship satisfaction, 3) test for *unique subgroups* of couples in addition to average change of the entire sample, and 4) explore stressors and vulnerability *in relation to couple behavior change over time*.

Study Aims and Hypotheses

The aims and the hypotheses of the present study were as follows:

I. **Average Longitudinal Change in Couple Behaviors** To characterize the average change or stability in multiple dimensions (e.g., engagement, cooperation, enjoyment) of observed couple problem-solving behavior (i.e., VSA Model adaptive processes) among caregivers of a child with ASD across a period of three years (four time points) (Figure 1).

   a. It was hypothesized that on average, particular dimensions of couple behavior will increase, decrease, or remain stable across three years. More specifically, based on longitudinal work in the general population that shows a slow general decline in positive couple relationship aspects (e.g., happiness and satisfaction) over time (eg., Karney & Bradbury, 1997), dimensions tapping positive aspects of the couple interaction, including enjoyment, cooperation, balance, and sensitivity, were predicted to decline linearly across three years. Overall conflict resolution was expected to follow a similar pattern (linear decline). In contrast, it was anticipated that irritation would increase linearly. The degree to which couples are engaged in the problem-solving task with their partner, and not necessarily the positive or negative quality of the interaction, was anticipated to remain stable.

II. **Latent Classes of Couples** To explore if there are latent classes or groups of couples who display meaningfully distinct intercepts and trajectories across time (Figure 1).

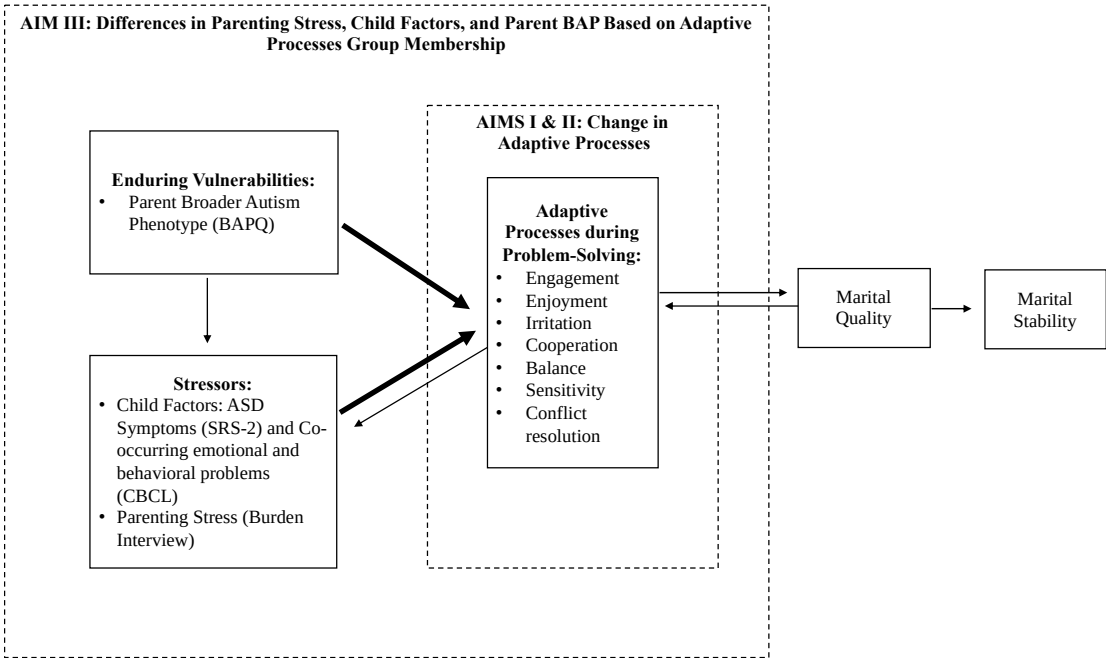
a. It was hypothesized that multiple, distinct, latent groups of couples would emerge. Studies have found a range in the number of latent classes (from 2 to 5), and therefore, a particular number of classes has not been consistently identified. As such, drawing on the limited evidence among couples in a similar phase of their couple relationship (i.e., parenthood) and for a similar length of time (i.e., 4 years) (Foran et al., 2013) compared to the current study, 2 classes were tentatively hypothesized. Collectively, studies have found that groups beginning at lower levels of adaptive factors demonstrate declines over time (Foran et al., 2013; Williamson & Lavner, 2019). Therefore, it was expected that a *high-stable* group would show high levels of enjoyment, cooperation, sensitivity, balance, and conflict resolution, and low levels of irritation that remain constant across the four time points. A *low-declining* group was predicted to show low levels of enjoyment, cooperation, sensitivity, balance, and conflict resolution that decline across time, and high levels of irritation that would increase across the four time points.

III. **Links with Stressors and Vulnerabilities** Based on domains specified in the VSA Model, to test if groups differing in adaptive processes (based on longitudinal observed couple problem-solving behaviors) have significantly different levels of stressors including parenting stress and child factors (i.e., ASD symptoms and co-occurring emotional and behavioral problems) and parent vulnerability factors (i.e., broader autism phenotype) (Figure 1).

a. It was hypothesized that group membership (based on observed couple problem-solving behaviors) would be related to stressors including parenting stress and child factors and vulnerability in the form of the BAP measured at the outset of the study. More specifically, the *high-stable* group was predicted to display the lowest levels of parenting stress, as well as lower levels of child ASD symptoms and co-occurring emotional and behavioral problems, and lower parent BAP. The *low-declining* group was anticipated to show a higher level of parenting stress, as well as higher levels of child ASD symptoms and co-occurring emotional and behavioral problems, and parent BAP.

Figure 1

VSA Model in the Proposed Study



Note. Bolded arrows represent connections investigated in the present study. BAPQ = Broad Autism Phenotype Questionnaire. SRS-2 = Social Responsiveness Scale, 2nd edition. CBCL = Child Behavior Checklist.

Method

Participants

The present study involves existing longitudinal data from 189 couples (378 parents) raising a child with ASD. Participants were recruited by posting fliers at ASD clinics, mailing study information to schools and childcare programs, and using established research registries. Inclusion criteria for the study was: being aged 21 years or older and having a child between the ages of 5 and 12 years with diagnosed ASD. Parents had to provide documentation of the diagnosis of ASD from a medical or educational professional, and the diagnostic evaluation had to include the Autism Diagnostic Observation Schedule (Lord et al., 2001; Lord et al., 2012). Children's scores on a questionnaire measure of ASD symptoms (Social Responsiveness Scale, 2nd edition, described below) were above the threshold indicative of ASD (score of 60); five children with scores below threshold were retained in analyses as they were determined to meet criteria for ASD based on teacher SRS-2 scores (above 60) and review of medical records. To be involved in the study, parents also had to be in a longstanding cohabiting couple relationship (at least three years) and both partners in the couple had to agree to participate in the study. Table 1 displays the demographic characteristics of the parents and families included in the present study. Mothers had an average age of 38.69 years and fathers had an average age of 40.76 years at the study outset. A majority of the sample was married at the first time point (95.8%). On average, the household income was $80,000 to $89,000 (*SD* = $30,000). The majority of parents were White, non-

Hispanic. Most children were male (85.7%) and were an average of 7.9 years old at the first time point.

Table 1

Sample Demographic Characteristics

Characteristic	M(SD)	n(%)
Couples		
Married		(181) 96%
Relationship Length (years)	15.05 (5.60)	
Household Income		
10,000 - 19,999		2 (1)
20,000 – 29,999		5 (3)
30,000 – 39,999		8 (4)
40,000 – 49,999		10 (5)
50,000 – 59,999		17 (9)
60,000 – 69,999		18 (10)
70,000 – 79,999		15 (8)
80,000 – 89,999		17 (9.)
90,00 – 99,999		17 (9.)
100,000 – 119,000		26 (14)
120,000 – 139,999		23 (12)
140,000 – 159,999		6 (3)
160,000+		17 (9)
Parents		
Mother age in years	38.69 (5.62)	
Father age in years	40.76 (6.19)	
Mother Race/Ethnicity		
White		164 (87)
African-American		1 (1)
Hispanic		9 (5)
American Indian		1 (1)
Asian or Pacific Islander		5 (3)
More than one race/ethnicity		5 (3)
Father Race/Ethnicity		
White		162 (86)
African-American		2 (2)
Hispanic		15 (8)
American Indian		3 (2)
Asian or Pacific Islander		2 (1)
More than one race/ethnicity		7 (4)
Child		
Child Biological Sex (N, [%])		
Male		162 (86)

	Female	27 (14)
Child Age in years	7.90 (2.25)	

Procedures

Couples completed a research appointment at four time points spaced approximately 12 months apart (M = 12.32, SD = 1.01). During the visit, they completed questionnaires about their family, child with ASD, and couple relationship. Couples also engaged in a 7-minute videotaped couple conflict interaction task that is a modified version of that described previously (Carstensen et al., 1995; Levenson & Gottman, 1983). Each partner independently listed topics that the couple disagreed on (i.e., did not see eye-to-eye on). Partners then came together and jointly generate a list of couple disagreements, with guidance from a research staff. For each topic, couples indicated if the disagreement was current (as opposed to having been resolved) and how much distress the conflict caused from 1 (*none*) to 7 (*severe*). The couple was then asked to engage in a 7-minute couple problem-solving interaction related to the disagreement that was rated as being most distressing and was current (i.e., hadn't been resolved). Couples were given the option of eliminating a topic for the observed interaction. This option was used by three couples; for these couples, the next most distressing topic was selected for the videotaped interaction. In guiding couples through this process, research assistants followed the same script for all couples to ensure standardization.

Measures

Parent and Child Demographics

Parents each reported on multiple sociodemographic characteristics. These included income, race/ethnicity, education, age, and couple relationship status, among others. Household income was coded 0 to 14, starting ≤ $9,999 and increasing in increments of 10,000 or 20,000 ranging to ≥ $160,000. Race/ethnicity response options included White non-Hispanic, African American, Hispanic, American Indian, Asian or Pacific Islander, and other ethnicity. Parent education was coded 1 to 5 with corresponding categories including less than high school, high school graduate or General Educational Development certification, some college, undergraduate college degree (e.g., Bachelor of Science), and graduate degree or above (e.g., Doctor of Philosophy). Parents also reported on their child's gender (coded: 0 for male and 1 for female) and age in years. Divorce/separation during the study was also reported and coded dichotomously; once couples separated or divorced, measures of observed couple conflict were no longer collected. Two same-sex couples were retained in analyses and assigned as mother and father based on random assignment in order to conduct the dyadic analyses.

Stressors

Parenting Stress. The Burden Interview is a 29-item self-report measure used to assess stress related to caregiving demands (Zarit et al., 1980). Mothers and fathers independently completed this measure at the first time point. Response options for each item are presented on a 4-point Likert scale from 0 (*not at all*) to 3 (*extremely*). A sample item is "I feel stressed between trying to give to my child as well as to other family responsibilities, job, etc." A total score is calculated by summing responses, with higher scores representing a greater degree of parenting stress. The Burden Interview has shown robust psychometric properties (Bachner & O'rourke, 2007; Yap, 2010) and has been

used in studies of children with ASD (Hartley et al., 2011). Interitem correlation (i.e., internal consistency/reliability) in the current study was excellent for mothers (chronbach's alpha = 0.91) and good for fathers (chronbach's alpha = 0.88).

Child Factors. Two dimensions of child factors were measured including ASD specific symptoms and additional co-occurring emotional and behavioral problems (detailed below). A composite was created by z-scoring and averaging these two variables to capture overall level of child-related difficulties.

Child ASD Symptoms. The Social Responsiveness Scale, 2nd edition (SRS-2) is a parent-report questionnaire that measures features characteristic of ASD including communication challenges, restricted and repetitive behaviors, and lack of reciprocal social interaction (Constantino & Gruber, 2012). Both mothers and fathers independently completed the SRS-2 at the first time point. The SRS-2 consists of 65-items, each with a 4-point Likert scale of responses from 0 (*Not true*) to 3 (*Almost always true*). A sample item is "Is able to understand the meaning of other people's tone of voice and facial expressions". The SRS-2 yields a total score along a continuum with higher scores indicating greater with ASD symptom severity. Raw values are recommended for use in research (Constantino & Gruber, 2012). The SRS-2 has been found to have good reliability (Booker & Starling, 2011), discriminant validity (Constantino et al., 2000), and convergent validity with other commonly used measures of ASD features (e.g., the Autism Diagnostic Interview-Revised) (Constantino et al., 2003) . The raw total score was used to create the composite. Interitem correlation (i.e., internal consistency/reliability) on the SRS-2 raw total score in the present sample was good for mothers' (cronbach's α =.862) and fathers' (cronbach's α = .874) report.

Child Emotional and Behavioral Problems. The Achenbach System of Empirically Based Assessment Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001, 2000) is a broad-band measure of emotional and behavioral concerns completed by parents. Mother and fathers independently completed the CBCL at time point 1. The CBCL has 120- problem items for school aged children (age 6 and older) and 99-problem items for preschool aged children (age 5.5 and younger) with responses on a 3-point Likert scale from 0 (*not true*) to 2 (*very true or often true*). The CBCL shows acceptable psychometric properties in neurotypical and ASD samples (Achenbach, 1994; Pandolfi et al., 2012). Raw scores are transformed into *t* scores with higher values reflecting a higher level of problems. The total score *t* values was used to create the composite. Interitem correlation (i.e., internal consistency/reliability) for the CBCL total score for the present sample was good (cronbach's $\alpha = 0.80$) and for mother and acceptable (cronbach's $\alpha = 0.78$) for father report on the school aged-form, and excellent on the preschool-aged form (mother cronbach's $\alpha = 0.95$; father cronbach's $\alpha = 0.96$).

Vulnerabilities

Parent Broad Autism Phenotype. The Broad Autism Phenotype Questionnaire (BAPQ; Hurley et al., 2007) is a 36-item questionnaire with 6-point Likert scale response options from 1 (*very rarely*) to 6 (*very often*) intended to measure the broader autism phenotype. Mothers and fathers each completed the BAPQ at the first time point. A sample item is "*I am comfortable with unexpected changes in plans*". Fifteen items are reverse coded. The BAPQ consists of three subscales including aloof (12 items), pragmatic language difficulties (12 items), and rigidity (12 items). The BAPQ has been found to have good internal consistency and convergent (Ingersoll et al., 2011), as well as

measurement invariance across gender (Broderick et al., 2015). A mean is calculated with higher scores representing higher levels of the BAP. The total score was used in the current analyses. Interitem correlation (i.e., internal consistency/reliability) in the current study was excellent for mothers (chronbach's alpha = 0.93) and fathers (chronbach's alpha = 0.92).

Adaptive Processes

Observed Couple Problem-Solving Behaviors. An observational coding scheme (Frosch et al., 1998, 2000) was used to code the video-recorded interactions of couples in the paradigm described in the procedure above. This coding scheme was initially developed based on dimensions of couple behavior identified as important for relationship functioning by prior work (Cox et al., 1989; Easterbrooks & Emde, 1988) and based on recommendations put forth by Markman and Notarius (1987). In terms of validity, the coding scheme revealed expected associations with martial adjustment such that more positive and less negative engagement was related to greater levels of self-reported marital adjustment (Frosch et al., 1998) and with less secure parent-child attachment (Frosch et al., 2000). Coding training consisted of reviewing the coding manual, coding videos alongside the study's principal investigator (S. Hartley), and discussing codes with an expert consultant who trained with the developers of the coding system. Regular conferences were held to discuss discrepancies between coders greater than 1-point. Each video was independently coded by two to three trained researchers. A two-way mixed absolute agreement single-rater interclass correlation coefficient (ICC) at a 95% confidence interval indicated that reliability was adequate in the current study (ranging from .58 to .77).

Scores range from 1 (*very low*) to 7 (*very high*). Analyses were based on the rating from one researcher who coded interactions across all families, although each video was coded by at least two coders. Codes used in the present analyses covered a range of couple behaviors. **Engagement/ interpersonal involvement** captures persistence (i.e., duration and frequency) of partner-directed behaviors, which can be either positive or negative. Example behaviors include bodies' positioning, visual regard, and initiation and maintenance of conversation. **Enjoyment/fun** taps into the overall tone of the interaction, especially whether is it enthusiastic. For example, behaviors included in this code can be mutual laughing and smiling. **Irritation** taps into the overall tone of the interaction, as well, but primarily focuses on negative tone. Irritation can be displayed through hurtful comments, criticism, and negative voice tone. **Cooperation/joint task involvement** is in essence the "we-ness" of the interaction, involving the mutual participation of each partner, joint task focus, and the acceptance of opinions and suggestions put forth by the other partner. **Balance/reciprocity** encompasses the contribution of each partner to the interaction, which includes each partner's control and turn-taking and the equity of the interaction. **Sensitivity/support** captures the listening, perceiving and responding to the partner's signals. Coding of this dimension considers the frequency, latency, and appropriateness of the response. **Conflict resolution/satisfaction** is coded as the degree that conflict is settled in a mutually satisfying way by the end of the discussion. In addition to the codes described above, the coding system includes individual partner codes of negative and positive affect that will not be explored in the present study in order to focus on couple-level scores (i.e., scores for which there was a single observed rating based on couple rather than individual

partner ratings). Refer to Appendix A for an abbreviated summary of observational codes and ratings and Appendix B for the couple interaction rating form.

Data Analytic Plan

Power Analysis: Monte Carlo Simulation

In order to determine whether the current sample size was sufficient to achieve adequate power for the analyses, Monte Carlo simulations were conducted in M*plus* version 8.1. Based on the recommendations of Muthén & Muthén (2002), the following criteria were considered in determining appropriate sample size: 1) parameter and standard error biases are not greater than 10%, 2) the standard error bias for the parameter for which power is being assessed is not greater than 5%, and 3) coverage remains between 0.91 and 0.98. After satisfying these conditions, power is inspected and must reach at least 0.80. The model calculates the proportion of replications in which the null hypothesis of parameter estimates being equal to zero is rejected at an alpha level of 0.05 (i.e., power). When population parameter estimates are equal to zero, this value represents Type I error or the probability of rejecting the null hypothesis when it is true (i.e., claiming there is an effect significantly different than zero when it isn't).

Monte Carlo simulations were run with 500 replications (number of samples to draw from a specified population) for growth models and growth mixture models. Refer to Table 2 for specified means, variance, and covariance of population latent intercepts and slopes and residual variance of outcomes, as well as parameter and standard error bias, coverage, and power. Population parameters were selected based on results from previous studies. In particular, for the overall latent growth model, an estimated decline of 3-4% has been found with initial levels beginning at approximately 75% of the maximum score (Karney & Bradbury, 1997). For growth mixture models, population

parameters are specified separately for each hypothesized class. An estimated 0% decline has been found for high adjustment group with approximately 5% decline for low adjustment group (Foran et al., 2013). It was determined that the present sample size of 189 would achieve adequate power (minimum 0.80) to detect hypothesized parameter estimates using growth modeling and growth mixture modeling. Of note, power estimates would change if a different number of classes or different estimates were used.

Table 2

Monte Carlo Simulation Results – Power Analysis

	Specified Population Parameter	Average Estimate	Parameter Bias	Standard Deviation	Average Standard Error	Standard Error Bias	Coverage	Power
Linear Growth Model								
Latent Intercept Mean	5.250	5.248	0.000	0.044	0.044	0.000	0.948	1.000
Latent Slope Mean	-0.250	-0.250	0.000	0.023	0.023	0.000	0.954	1.000
Latent Intercept Variance	0.010	0.011	0.100	0.054	0.053	-0.019	0.942	0.066
Latent Slope Variance	0.002	0.003	0.500	0.016	0.016	0.000	0.954	0.062
Covariance Intercept and Slope	0.200	0.200	0.000	0.023	0.023	0.000	0.950	1.000
Residual Variances								
1	0.500	0.499	-0.002	0.067	0.064	-0.045	0.930	1.000
2	0.500	0.501	0.002	0.060	0.058	-0.033	0.938	1.000
3	0.500	0.494	-0.012	0.068	0.069	0.015	0.942	1.000
4	0.500	0.495	-0.010	0.089	0.087	-0.022	0.942	1.000
Growth Mixture Model								
Class 1 (high stable)								
Latent Intercept Mean	6.000	5.994	-0.001	0.069	0.068	-0.019	0.950	1.000
Latent Slope Mean	0.000	0.000	0.000	0.033	0.034	0.024	0.954	0.046

Latent Intercept Variance	0.010	0.010	0.000	0.058	0.055	-0.037	0.938	0.064
Latent Slope Variance	0.002	0.003	0.400	0.017	0.016	-0.036	0.942	0.064
Covariance Intercept and Slope	0.200	0.200	0.000	0.026	0.025	-0.042	0.946	1.000
Residual Variances								
1	0.500	0.498	-0.003	0.070	0.066	-0.057	0.934	1.000
2	0.500	0.501	0.002	0.061	0.058	-0.046	0.928	1.000
3	0.500	0.494	-0.013	0.069	0.069	-0.009	0.932	1.000
4	0.500	0.495	-0.010	0.090	0.087	-0.038	0.938	1.000
Class 2 (low declining)								
Latent Intercept Mean	3.500	3.499	0.000	0.068	0.068	0.010	0.952	1.000
Latent Slope Mean	-0.300	-0.300	0.000	0.033	0.034	0.021	0.942	1.000
Latent Intercept Variance	0.010	0.010	0.010	0.058	0.055	-0.037	0.938	0.064
Latent Slope Variance	0.002	0.003	0.400	0.017	0.016	-0.036	0.942	0.064
Covariance Intercept and Slope	0.200	0.200	-0.001	0.026	0.025	-0.042	0.946	1.000
Residual Variances								
1	0.500	0.498	-0.003	0.070	0.066	-0.057	0.934	1.000
2	0.500	0.501	0.002	0.061	0.058	-0.046	0.928	1.000
3	0.500	0.494	-0.013	0.069	0.069	-0.009	0.932	1.000
4	0.500	0.495	-0.010	0.090	0.087	-0.038	0.938	1.000

Preliminary Data Inspection

All variables were screened for outliers (within 3 standard deviations of the mean), normal distribution of data (Skew between -1 and 1; Kurtosis between -3 and 3), and homoscedasticity; data were found to be within normal limits and appropriate for the proposed analyses. Missing data were handled using Full Information Maximum Likelihood (FIML) as implemented in M*plus*. Data were organized in wide format for all longitudinal analyses (i.e., one case per couple with four repeated columns for each

variable). Covariates included in the following models are family income, separation/divorce during study, and relationship length at study outset and are mean centered as appropriate (i.e., for income and relationship length) for sake of interpretability. Thus, latent intercepts and slopes are estimated for couples with an average relationship length, average family income, and who remained together during the study (i.e., when covariates are at zero).

Data Reduction

An exploratory factor analysis (EFA) was run for the sake of data reduction and parsimony on the 7 observational codes from the first timepoint. Geomin rotation was used. The final EFA model was selected based on a combination of eigenvalues and scree plot, model fit indices (CFI, TLI, RMSEA), model comparisons using chi-square difference test, factor loadings, and parsimony. Based on the results of the EFA, composite scores were created scores. All subsequent analyses were run on the seven individual couple codes and the composites.

Aim I: Growth Curve Models

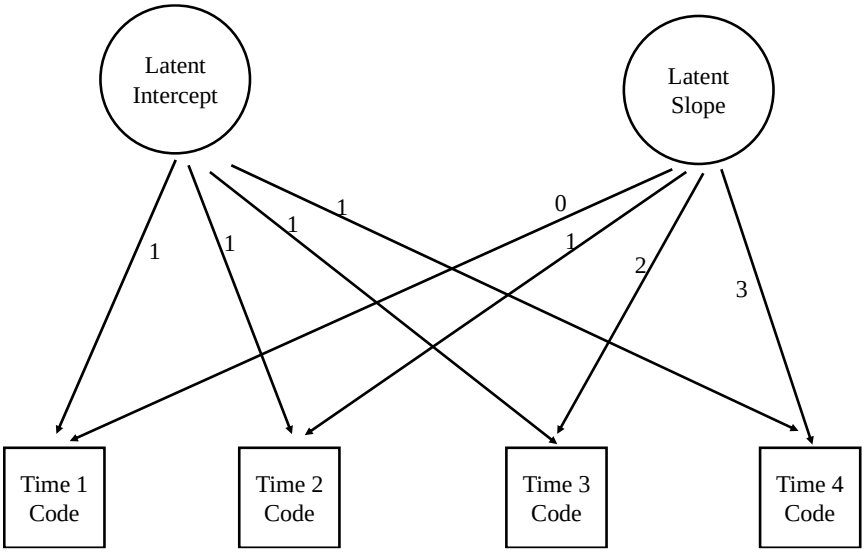
In order to explore average change across time in observed couple relationship interactions, growth curve models were tested from a structural equation modeling (SEM) framework in M*plus* v8.1 with the maximum likelihood estimation with robust standard errors (MLR). Model fit was evaluated using a combination of goodness of fit indicators including the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis Index (TLI); generally, good fit is indicated by a RMSEA < 0.06 and CFI/TLI > 0.95 (Hu & Bentler, 1999). Changes in chi-square

computed using the Satorra-Bentler scaled chi-square difference were used to compare models. Models with large negative residual variance are misspecified and therefore were not considered further.

The following sequence of latent growth curve models was fit for each individual code and composites; latent slope and intercept were regressed on covariates to control for these potentially confounding factors in each model. First, a no-growth model (intercept-only) was fit with all factor loadings fixed to one. Intercepts of the observed measures were set to zero. Latent variable mean and variance were specified. Then, a linear growth model was fit. The first factor loading for slope was set to zero (i.e., time 1 serves as the intercept) and increased by increments of one. Residual variances were constrained across time points, and measurement intercepts were fixed to zero. The mean, variance, and covariance for latent intercept and slope were estimated. A quadratic model with quadratic slope loadings was also fit. A final model shape was selected based on both global fit (indices described above) and change in chi square. For models with sub-optimal fit, model adjustments were made including removing non-significant covariates and allowing residual covariance to be freely estimated at each time point in attempts to improve fit of the model. After these adjustments, in the case that neither the no-growth, linear, or quadratic model demonstrate adequate fit, a model was tested allowing two of the four factor loadings on latent slope to be freely estimated; one factor loading was fixed to zero for centering purposes and another fixed to one for identification. Refer to Figure 2 for depiction of linear growth model.

Figure 2

Linear Growth Model in SEM



Aim II: Multivariate Growth Mixture Model

In order to explore whether there are latent classes or groups of couples with similar trajectories of couple relationship interactions, multivariate growth mixture modeling (GMM) was implemented using the mixture command in M*plus* v8.1. GMM uncovers normal distributions of parameters (latent intercept and slope) for separate groups within the sample, estimates those parameters, and determines the probability of individuals in the sample belonging to each group. Two multivariate growth mixture models were run: one was tested considering all couple observational codes simultaneously and another was examined using the two composites.

First, models were specified in a manner similar to those described above for the growth models. That is, factor loadings for the observed variables were fixed to one for the latent intercept and factor loadings for slope will start at zero and increase linearly (1,

2, 3) and, if necessary, quadratic latent slope will also be included. Latent slope and intercept mean, variance, and covariance were specified. Residual variances were constrained to be equal across time and measurement intercepts were fixed to zero.

For the class specific model statements, classes may differ in the means of latent slope and intercept. That is, classes are allowed to have different initial levels and trajectories over time. Then subsequent models were tested allowing latent variable variances and covariates, in addition to means, to be class specific, and finally, a model with class specific latent variable means, variances, covariances, and residual variances. Models with varying numbers of classes were estimated and compared, as number of classes is not known *a priori.* In particular, models with 2, 3, 4, and 5 classes were tested based on prior empirical work demonstrating up to 5 different trajectories (e.g., Anderson et al., 2010). Covariates were allowed to be class specific for all models.

Following recommendation of Grimm and colleagues, multiple criteria were considered for model selection of GMMs (2016). First, model convergence was considered, and models that did not converge or had estimates outside of bounds (e.g., negative variance) were excluded from final model selection. Then, the Bayesian information criterion (BIC), Akaike information criterion (AIC) and sample size adjusted BIC were considered and plotted against the number of classes in order to identify relative change in these indices between models. Smaller values for the information criterion statistics are better. Next, likelihood ratio tests were conducted within model type (i.e., within models with varying number of classes but all have class specific means). These include the Lo-Mendell-Rubin adjusted likelihood ratio test (LMRa LRT), Vuong-Lo-Mendel-Rubin likelihood ratio test (VLMR LRT), and bootstrap likelihood

ratio test (BLRT). Then, entropy statistics were examined, with entropy >0.8 being acceptable, and values closer to 1 being preferable. Lastly, all the statistical fit information was considered together along with substantive interpretations for the remaining potential models.

Aim III Repeated-Measures Multivariate Analysis of Variance and Regression

The third aim of the study was to determine whether latent trajectory groups differ based on initial level of parenting stress and child factors (i.e., composite score of ASD symptoms and emotional/behavioral problems) and parent BAP. Given the multiple related variables of interest and repeated measurements across reporters (i.e., each parent), repeated-measures multivariate analyses of variance were planned to be used to test for differences in these variables across the latent classes. An alpha level of 0.05 was to be used for hypothesis testing, unless otherwise noted. Box's M was planned to be used to confirm the assumption of homogeneity of covariances. The sequence of planned tests included an omnibus test using either Wilks Lambda (equal sample sizes) or Pillai's trace (unequal sample sizes), followed by univariate tests using a Bonferroni-corrected alpha level of 0.0125 to control for family-wise error, and finally, pairwise comparisons using Tukey's *post hoc* analyses.

Multiple linear regression was used as a supplement to the group-based analyses that were originally planned to address Aim III – exploring stressors and vulnerabilities in relation to adaptive processes (i.e., observed couple behaviors). These analyses consisted of regressing vulnerabilities (parent BAP), stressors (parenting stress and child factors including level of ASD features and emotional/behavioral functioning), and the interaction between vulnerabilities and stressors on the latent slope and intercept of each

observed couple behavior composite. Not only does this approach retain the continuous nature of the data, but it also allows more direct testing of the VSA Model with respect to the interaction between stressors and vulnerabilities. Interactions were probed by examining simple slopes at one standard deviation above and below the mean of the moderator; these were calculated using an online calculator. Given the two dimensions of stressors included in the study (i.e., parenting stress and child factors), separate models were run for each of these stressors to avoid issues with collinearity. Additionally, models were run once using mother-reported stressors and again using father-reported stressors. An alpha level of 0.05 was used for the null hypotheses significance testing.

Results

Data Reduction

An exploratory factor analysis was performed for the sake of data reduction. A two-factor solution demonstrated good to excellent model fit (CFI = 0.98; TLI = 0.94; RMSEA = 0.11) and was significantly improved over a one-factor solution (Chi-square difference = 88.70, $p < .01$). Although the three factor solution demonstrated improved model fit compared to the two factor (Chi-square difference = 23.98, $p < .01$), exploration of eigenvalues and the scree plot indicated that the addition of a third factor explained little additional variance (i.e., eigenvalue = 0.57) and therefore supports selection of a two-factor solution. Additionally, in the three-factor solution, multiple items substantially cross-loaded with comparable magnitudes, which indicates over-factoring. For the two-factor solution, items that loaded on both factors demonstrated clearly stronger loadings on one of the two. Thus, the two factor solution was selected as the final, and most parsimonious, model. The first factor consisted of Enjoyment, Cooperation, Engagement, and Balance and was labeled “Positive Teamwork”. The second factor consists of Sensitivity, Conflict Resolution, and Irritation (reverse-coded) and was labeled “Solution-Focused Reciprocity”. These two factors were significantly positively correlated ($r = 0.47$, $p < .05$); the magnitude of this correlation indicated that they are indeed capturing related yet distinct constructs. Factor loadings are presented in Table 3. Composites were calculated by summing individual codes and used, in addition to the seven individual codes, in subsequent analyses.

Table 3

Standardized Factor Loadings for 2-Factor EFA

	Factors	
Code	1	2
Enjoyment	**0.60**	0.31
Sensitivity	0.25	**0.68**
Conflict Resolution	0.38	**0.65**
Cooperation	**0.62**	0.34
Engagement	**0.69**	0.001
Balance	**0.78**	-0.06
Irritation	0.01	**-0.91**

Note. Factor 1 named Positive Teamwork; Factor 2 named Solution-Focused Reciprocity; Bolded factor loadings indicate codes ultimately loaded on each factor.

Aim I: Growth Curve Models

Results of univariate growth models are presented in Table 4 including model fit indices as well as the mean and variance of latent intercept and slope estimates.

Table 4

Longitudinal Growth Models – Seven Individual Observational Couple Codes and Composite Scores

										Intercept		Linear Slope		Quadratic Slope	
	χ^2	*df*	TRd	TLI	CFI	RMSEA	AIC	BIC	SSA BIC	*M* (*SE*)	σ^2 (*SE*)	*M* (*SE*)	*M* (*SE*)	σ^2 (*SE*)	*M* (*SE*)
Engagement															
No Growth	**25.89**	**20**		**0.95**	**0.95**	**0.04**	**1520.40**	**1539.52**	**1520.52**	**4.62* (0.07)**	**0.49* (0.07)**	-	-	-	-
Linear^	21.39	14	4.79	0.92	0.93	0.05	1527.73	1566.04	1528.04	4.59* (0.07)	0.34* (0.10)	0.02 (0.03)	-0.02 (0.02)	-	-
Quadratic^	4.56	7	18.71*	0.84	0.94	0.09	1527.44	1588.11	1527.93	4.59* (0.08)	0.25 (0.15)	0.03 (0.31)	-0.48 (0.34)	-0.003 (0.03)	-0.07* (0.03)
Enjoyment															
No Growth	53.08	**20**		0.85	0.83	0.10	1682.54	1701.70	1682.70	3.08* (0.08)	0.82* (0.11)	-	-	-	-
Linear^	22.66	14	31.67*	0.94	0.96	0.06	1669.12	1707.43	1669.43	3.29* (0.10)	0.92* (0.14)	-0.17* (0.04)	-0.01 (0.02)	-	-
Linear	**23.91**	**16**	**-**	**0.95**	**0.96**	**0.05**	**1666.06**	**1697.99**	**1666.32**	**3.29* (0.10)**	**0.86* (0.11)**	**-0.17* (0.04)**	**0.00 (0.00)**	**-**	**-**
Quadratic	14.68	7	8.17	0.94	0.96	0.06	1669.12	1707.43	1669.43	3.34* (0.10)	1.10* (0.18)	-0.35* (0.12)	0.26 (0.38)	0.06 (0.04)	0.02 (0.04)
Irritation															
No Growth	**37.35**	**20**	**-**	**0.91**	**0.90**	**0.07**	**1526.20**	**1545.36**	**1526.36**	**3.02* (0.22)**	**0.94* (0.04)**	-	-	-	-
Linear	33.47	14	4.77	0.86	0.89	0.09	1533.25	1571.57	1533.56	2.45* (0.08)	0.68* (0.14)	0.02 (0.03)	0.01 (0.03)	-	-
Quadratic	17.72	7	15.98*	0.84	0.94	0.092	1530.75	1591.41	1531.24	2.89* (0.36)	0.77* (0.18)	-0.08 (0.40)	0.14 (0.34)	0.11 (0.12)	0.00 (0.03)
Cooperation															
No Growth	65.88	**20**	-	0.62	0.58	0.11	1608.66	1627.82	1608.81	4.38* (0.06)	0.39* (0.08)	-	-	-	-
Linear^	41.37	14	22.96*	0.68	0.75	0.10	1594.30	1632.65	1594.64	4.55* (0.07)	0.19* (0.10)	0.14* (0.04)	-0.004 (0.03)	-	-
Linear	50.12	16	-	0.65	0.69	0.11	1598.18	1630.11	1598.44	4.55* (0.07)	0.41* (0.08)	-0.14* (0.04)	0.00 (0.00)	-	-

Linear†	33.55	12	-	0.81	0.77	0.10	1597.10	1616.26	1597.26	4.54* (0.07)	0.38* (0.08)	-0.13* (0.04)	0.04 (0.02)	-	-
Linear††	**24.64**	**9**	**-**	**0.81**	**0.83**	**0.10**	**1594.71**	**1623.45**	**1594.95**	**4.51* (0.07)**	**0.39* (0.09)**	**-0.13* (0.04)**	**0.05 (0.02)**	-	-
Quadratic^	9.92	7	35.83*	0.97	0.93	0.05	1585.36	1646.03	1585.86	4.48* (0.07)	-0.05 (0.14)	0.12 (0.11)	-0.63 (0.40)	-0.09 (0.04)	-0.06 (0.04)
Balance															
No Growth	34.45	20	-	0.84	0.83	0.06	1323.16	1342.32	1323.31	4.92* (0.05)	0.21* (0.04)	-	-	-	-
No Growth†	23.79	14	-	0.90	0.86	0.06	1320.15	1332.92	1320.26	4.92* (0.05)	0.21* (0.04)	-	-	-	-
No Growth††	**17.53**	**11**	**-**	**0.91**	**0.91**	**0.06**	**1316.82**	**1339.17**	**1317.00**	**4.93* (0.05)**	**0.23* (0.05)**	-	-	-	-
Linear	27.36	14	7.04	0.84	0.79	0.07	1329.00	1367.31	1329.31	4.93* (0.06)	0.31* (0.08)	0.00 (0.03)	0.03 (0.02)	-	-
Quadratic	13.00	7	14.38*	0.93	0.81	0.07	1330.42	1391.09	1330.92	4.89* (0.07)	0.34* (0.10)	0.15 (0.10)	0.25 (0.20)	-0.05 (0.03)	0.03 (0.02)
Sensitivity															
No Growth	69.41	**20**	-	0.70	0.66	0.12	1607.75	1626.91	1607.91	3.48* (0.07)	0.57* (0.08)	-	-	-	-
Linear	29.86	14	31.07*	0.86	0.89	0.08	1576.88	1615.20	1577.20	3.73* (0.35)	0.56* (0.11)	-0.21* (0.04)	0.04 (0.03)	-	-
Linear†	**12.38**	**8**	**-**	**0.98**	**0.97**	**0.05**	**1613.16**	**1632.52**	**1613.51**	**3.73 (0.08)**	**0.58* (0.12)**	**-0.21* (0.04)**	**0.03 (0.03)**	-	-
Quadratic^	7.96	7	23.89*	0.98	0.99	0.03	1575.11	1635.77	1575.60	3.77* (0.08)	0.45* (0.15)	-0.34* (0.10)	-0.34 (0.37)	0.04 (0.03)	-0.05 (0.04)
Conflict Resolution															
No Growth	71.55	20	-	0.74	0.71	0.12	1493.72	1512.88	1493.88	4.00* (0.06)	0.49* (0.08)	-	-	-	-
Linear^	31.10	14	31.18*	0.88	0.90	0.08	1464.00	1502.28	1464.28	4.23* (0.07)	0.40* (0.10)	-0.19* (0.03)	-0.004 (0.02)	-	-
Linear	33.80	16	-	0.89	0.90	0.08	1464.06	1495.99	1464.32	4.22* (0.07)	0.54* (0.08)	-0.18* (0.03)	0.00 (0.00)	-	-
Linear†	**17.51**	**10**	**-**	**0.97**	**0.95**	**0.06**	**1502.22**	**1515.13**	**1502.46**	**4.22* (0.07)**	**0.57 (0.09)**	**-0.18* (0.03)**	**0.00 (0.00)**	-	-
Quadratic^	9.52	7	22.88*	0.88	0.90	0.08	1463.97	1502.28	1464.28	4.19* (0.07)	0.30* (0.13)	-0.06 (0.10)	-0.25 (0.28)	-0.05 (0.03)	-0.03 (0.03)

Positive Teamwork																
No Growth	28.29	20	-	0.96	0.96	0.05	2753.14	2772.29	2753.29	16.98* (0.22)	5.99* (0.86)	-	-	-	-
Linear	**14.38**	**14**	**12.89***	**1.00**	**1.00**	**0.01**	**2752.72**	**2791.04**	**2753.03**	**17.34* (0.24)**	**5.97* (1.11)**	**-0.31* (0.10)**	**0.10 (0.20)**	**-**	**-**
Quadratic^	5.24	7	9.47	1.02	1.00	0.00	2759.90	2820.67	2760.39	17.28* (0.26)	5.50 (1.43)	-0.07 (0.31)	-2.33 (2.71)	-0.08 (0.10)	-0.31 (0.27)
Solution-Focused Reciprocity																
No Growth	55.55	20	-	0.85	0.83	0.10	2580.98	2600.14	2581.13	13.00* (0.19)	4.95* (0.69)	-	-	-	-
Linear	**26.15**	**14**	**24.42***	**0.93**	**0.94**	**0.05**	**2561.54**	**2599.86**	**2561.85**	**13.50* (0.21)**	**4.86* (0.90)**	**-0.43* (0.09)**	**0.10 (0.16)**	**-**	**-**
Quadratic^	8.94	7	17.32*	0.98	0.99	0.04	2562.14	2622.81	2562.64	13.56* (0.22)	4.45* (1.09)	-0.63* (0.26)	-1.33 (2.22)	0.07 (0.08)	-0.21 (0.21)

Notes. Time-invariant covariates included in all models include relationship length in years, divorce/separation, and household income regressed on latent intercept and slope parameters; Final model selection is bolded; *p ≤ 0.05; ^misspecified model; †model run without non-significant covariates; ††model run without non-significant covariates and allowing residual variance to be freely estimated; †††model with two factor loadings freely estimated. df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = root mean square error of approximation; TRd = Satorra-Bentler scaled chi-square difference test; AIC = Akaike information criterion; BIC = Bayesian information criterion; SSA BIC = sample size adjusted BIC.

Stable Couple Behaviors

Engagement, Irritation, and Balance demonstrated stable trajectories across time (i.e., no growth/intercept only model). Model fit was good to excellent for Engagement, excellent for Irritation, and adequate to poor for Balance (Table 4). Addition of a latent linear slope parameter to these models did not significantly improve model fit and estimated linear slope parameters were near zero (Table 4). Similarly, quadratic models either did not demonstrate improved model fit, evidenced misspecification, and/or quadratic parameter estimates were nonsignificant (Table 4). Controlling for divorce/separation, income, and relationship length (i.e., for couples at the mean), the average Engagement across time was at a Moderate to Moderately High level (Intercept = 4.62), Irritation was at a Mild level (Intercept = 3.02), and Balance was at a Moderately High level (Intercept = 4.92) (Table 4). The variance of the Intercept parameters were significant for all three outcomes indicating significant inter-individual variability in Engagement, Irritation, and Balance within the sample (Table 4). Examination of covariates indicated that couple relationship length had a negative effect on the Intercept of Irritation (B = -0.03, p = .03); couples in longer relationships demonstrated less irritation. Income had a positive effect on the Intercept of Balance (B = 0.04, p = .01); couples with higher household income demonstrated higher levels of balance at the first time point. No covariates (relationship length in years, divorce/separation, and household income) were significantly related to the Intercept of Engagement.

Given the sub-optimal model fit for Balance, minor model modifications were made including removal of non-significant covariates and allowing residual variances to

be freely estimated across time. The final model demonstrated adequate fit with nearly identical parameter estimates to the prior poorly fitting model (Intercept = 4.93; Table 4).

Declining Couple Behaviors

Enjoyment, Cooperation, Sensitivity, and Conflict Resolution demonstrated significant linear declines across time (Table 4). For Enjoyment, Cooperation, and Conflict Resolution, estimated Slope variance was negative, albeit very close to zero (Table 4). Therefore, the slope variance was constrained to zero and had little effect on model fit (Table 4). Model fit for was excellent for Enjoyment, was slightly below adequate for Sensitivity and Conflict Resolution, and was poor for Cooperation (Table 4). For couples who remained together during the study with average income and relationship length, Enjoyment began in the Moderately Low range (Intercept = 3.29) and declined 0.17 points (on a 7 point scale) per year (Table 4). Cooperation began in the Moderate to Moderately High range (Intercept = 4.55) and demonstrated an average yearly decline of 0.14 points (Table 4). Sensitivity began in the Moderately Low to Moderate range (Intercept = 3.73) and declined 0.21 points on average per year (Table 4). Conflict Resolution began at a Moderate level (Intercept = 4.22) and declined 0.18 points annually (Table 4). Examination of covariates revealed a positive effect of income on the slope of Cooperation ($B = 0.05$, $p = .03$); couples with higher household incomes demonstrated less decline in Cooperation over time. No covariates were significantly related to the Intercept or Slope of Enjoyment, Sensitivity, or Conflict Resolution. The estimated variance of the Intercept was significant in each model, indicating significant inter-individual variability in starting level of Cooperation, Sensitivity, and Conflict

Resolution across time; variance of slope was nonsignificant for all models (due to constraints) (Table 4).

Given the sub-optimal model fit of Sensitivity, Conflict Resolution, and Cooperation, minor model adjustments were made. First, models were re-run removing non-significant covariates. Findings revealed excellent model fit for both Sensitivity and Cooperation with identical intercept and slope estimates to models that included all covariates (Table 4). Model fit remained sub-adequate for Cooperation (Table 4). Allowing residual variance to be freely estimated for each time point improved model fit, yet it remained sub-adequate (Table 4). Therefore, a model was tested in which two of four slope factor loadings were freely estimated; the model did not converge. The final model for Cooperation (only income as covariate and free residual variances) demonstrated intercept and slope estimates that were highly similar to the original poorly fitting model.

Analyses revealed that both composite scores, Positive Teamwork and Solution-Focused Reciprocity, declined linearly across time; model fit was excellent for Positive Teamwork and good for Solution-Focused Reciprocity. The intercept for Positive Teamwork was 17.35 with significant variance with an estimated annual decline of 0.31. Solution Focused Reciprocity was estimated to begin at 13.50 and decline 0.43 per year; both Intercept and Slope had significant variance. The slope and intercept for both Positive Teamwork and Solution-Focused Reciprocity were not significantly correlated.

Aim II: Multivariate Growth Mixture Model

Tables 5 and 6 presents the results of the multivariate GMMs including the model fit indices for each number of classes from 2 to 5 and with varying degrees of class

specific of constraints. Analyses revealed that all GMMs were either misspecified (due to negative variance estimates) or had convergence issues. Therefore, no GMMs were considered further.

Table 5

Growth Mixture Models – Seven Observational Couple Codes

	M2 (Mean)				M3 (Means, Variances, Covariances)				M4 (Means, Variances, Covariances, Residual Variances)			
Classes	2^	3^	4^	5^	2^	3^	4†	5†	2^	3^	4†	5†
Class Counts	.65/.35	.48/.28/.24	.66/.18/.08/.08	.28/.26/.16/.16/.14	.73/.27	.37/.34/.29	-	-	.55/.45	.46/.39/.16	-	-
AIC	9290.06	9294.57	5070.37	9315.52	9240.12	9217.45	-	-	9262.46	9277.98	-	-
BIC	10,008.48	10,194.99	5322.61	10,579.93	10,293.79	10,788.39	-	-	10,338.49	10,893.59	-	-
SSA BIC	9295.90	9301.89	5072.42	9325.80	9248.68	9230.22	-	-	9271.21	9291.09	-	-
LMRa LRT p-value	0.85	0.89	0.06	0.87	0.76	0.24	-	-	0.82	0.68	-	-
VLMR LRT p-value	0.85	0.89	0.06	0.87	0.76	0.24	-	-	0.82	0.68	-	-
BLRT p-value	0.06	0.36	0.19	0.01	<0.01	<0.01	-	-	<0.01	<0.01	-	-
Entropy	0.71	0.77	0.85	0.83	0.88	0.82	-	-	0.81	0.86	-	-

Note. Time-invariant covariates included in all models include class-specific effects of relationship length in years, divorce/separation, and household income on latent intercept and slope parameters; ^model misspecification and/or convergence issues were encountered.; †model did not terminate normally – no results reported; AIC = Akaike information criterion; BIC = Bayesian information criterion; SSA BIC = sample size adjusted BIC; LMRa LRT = Lo-Mendell-Rubin adjusted likelihood ratio test; VLMR LRT = Vuong-Lo-Mendel-Rubin likelihood ratio test; BLRT = bootstrap likelihood ratio test.

Table 6

Growth Mixture Models – Couple Composite Scores (Positive Teamwork and Solution-Focused Reciprocity)

	M2 (Mean)				M3 (Means, Variances, Covariances)				M4 (Means, Variances, Covariances, Residual Variances)			
Classes	2-^	3^	4^	5^	2^	3^	4^	5^	2^	3^	4^	5^
Class Counts	.86/.14	.67/.17/.16	.66/.18/.08/.08	.38/.28/.17/.11/.05	.89/.11	.53/.38/.09	.66/.16/.13/.06	.54/.14/.11/.11/.11	.80/.20	.78/.16/.07	.52/.25/.14/.08	.36/.21/.20/.16/.08
AIC	5096.95	5078.54	5070.37	5065.57	5074.64	5040.85	5034.36	5026.21	5073.48	5011.54	5025.63	5002.46
BIC	5240.63	5276.50	5322.61	5372.10	5250.26	5302.67	5382.39	5460.45	5255.48	5286.13	5392.82	5462.24
SSA BIC	5098.11	5080.15	5072.42	5068.06	5076.07	5042.98	5037.19	5029.74	5074.69	5013.77	5028.61	5006.19
LMRa LRT p-value	0.04	0.37	0.06	0.39	0.10	0.04	0.24	0.81	0.13	0.24	0.29	0.58
VLMR LRT p-value	0.03	0.37	0.06	0.39	0.10	0.04	0.23	0.81	0.13	0.24	0.28	0.58
BLRT p-value	<0.01	0.03	0.19	1.00	<0.01	<0.01	0.02	0.67	<0.01	<0.01	0.24	0.05
Entropy	0.79	0.71	0.85	0.79	0.91	0.74	0.82	0.78	0.82	0.88	0.80	0.74

Note. Time-invariant covariates included in all models include relationship length in years, divorce/separation, and household income regressed on latent intercept and slope parameters and are class specific; ^model misspecification and/or convergence issues were encountered; AIC = Akaike information criterion; BIC = Bayesian information criterion; SSA BIC = sample size adjusted BIC; LMRa LRT = Lo-Mendell-Rubin adjusted likelihood ratio test; VLMR LRT = Vuong-Lo-Mendel-Rubin likelihood ratio test; BLRT = bootstrap likelihood ratio test.

Aim III: Repeated-Measures Multivariate Analysis of Variance and Regression

Given that latent classes were not identified within Aim II, no group comparisons of stressors or vulnerabilities could be made. In lieu of group-based comparisons, however, regression analyses were used to explore stressors, vulnerabilities, and their interaction in predicting the intercepts and slopes of the composites: Positive Teamwork and Solution-Focused Reciprocity. In terms of stressors, results revealed that neither initial level of parenting stress nor initial level of child factors (ASD severity and co-occurring emotional and behavioral problems) had direct effects on the initial level of or change in either couple relationship dimension (Positive Teamwork or Solution-Focused Reciprocity) (Table 7).

Table 7

Multiple Linear Regressions – Predicting Intercept and Slope of Couple Composite Scores

	Outcome: Solution Focused Reciprocity				Outcome: Positive Teamwork			
	Model with Child Factors as Stressor		Model with Parenting Stress as Stressor		Model with Child Factors as Stressor		Model with Parenting Stress as Stressor	
	B on Intercept	*B* on Slope	*B* on Intercept	*B* on Slope	*B* on Intercept	*B* on Slope	*B* on Intercept	*B* on Slope
Vulnerabilities								
Mother BAP	0.19 (0.09)	-0.06 (-0.06)	0.27 (0.17)	-0.01 (-0.04)	0.18 (-0.04)	-0.08 (-0.03)	0.29 (-0.05)	-0.24 (0.02)
Father BAP	-0.14 (-0.20)	-0.32* (-0.30*)	-0.19 (0.14)	-0.37* (-0.27*)	-0.68 (-0.70*)	-0.14 (-0.14)	-0.70 (-0.72*)	-0.03 (-0.11)
Stressor								
Child Factors	-0.14 (0.01)	-0.02 (-0.10)	--	--	-0.12 (-0.03)	-0.03 (-0.07)	--	--
Parenting Stress	--	--	-0.02 (-0.02)	-0.01 (-0.002)	--	--	-0.02 (-0.01)	0.00 (-0.01)
Interactions								

Mother BAP x Stressor	-0.34 (-0.40)	0.19 (0.27*)	-0.02 (-0.04)	0.004 (0.01)	-0.81 (-0.27)	0.45* (0.45*)	-0.06 (0.01)	0.01 (0.01)
Father BAP x Stressor	-0.29 (-0.17)	0.30* (0.17)	0.01 (-0.01)	0.04* (0.02)	-0.17 (-0.50)	0.02 (0.15)	0.02 (-0.05)	0.04* (0.03)

Note. *$p \leq 0.05$; BAP = Broader Autism Phenotype; estimates in parentheses are for models using father-reported stressors; time-invariant covariates included in all models include relationship length in years, divorce/separation, and household income regressed on latent intercept and slope parameters.

Vulnerabilities (i.e., parent BAP), however, demonstrated both direct and interactive effects with initial level of parenting stressors (i.e., parenting stress or composite of child symptoms and behavior) on couple behaviors (Table 7). For the Solution-Focused Reciprocity outcome, significant negative effects of Father BAP on Slope emerged when father-reported stressors (parenting stress or composite of child symptoms and behaviors) were included in the model (Table 7). Additionally, Mother BAP and father-reported child factors interacted in predicting slope of Solution-Focused Reciprocity; simple effects analyses indicated that the effect of Mother BAP on the Slope of Solution-Focused Reciprocity was nonsignificant at both high and low levels of father-reported child factors (Table 8). That is, although the effects are significantly different from one another (i.e., significant interaction), the simple effects themselves are non-significantly different from zero, and thus, should not be interpreted. When mother-reported stressors (parenting stress or child factors) were included in the model in place of father-reported stressors, the effect of Father BAP on Slope of Solution-Focused Reciprocity was further qualified by a significant interaction (Table 7, Figure 3). Simple effects analyses revealed that the effect of Father BAP was large and negative in the context of low mother-reported stressors and nonsignificant in the context of high mother-reported stressors (Table 7). That is, when mother-reported stressors were low,

Solution-Focused Reciprocity is predicted to remain relatively constant (i.e., slope estimated to be approximately zero) across three years for couples with low Father BAP, and decline sharply (i.e., slope estimated to be approximately -0.87) across three years for couples with high Father BAP. However, when mom-reported stressors are high, Solution-Focused Reciprocity is predicted to decline (i.e., slope estimated to be approximately -0.60) irrespective of Father BAP.

Table 8

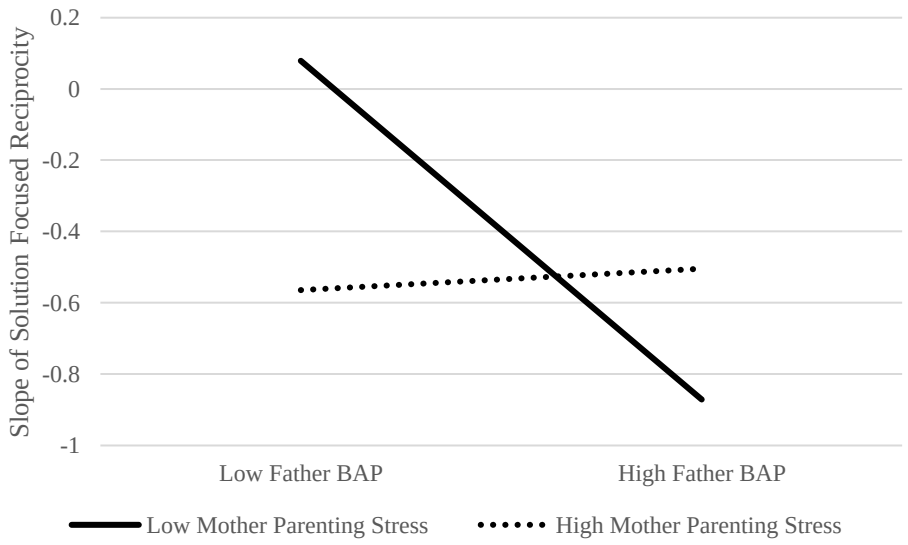
Simple Effects Predicting Slope of Solution Focused Reciprocity

Moderator Levels	*B*	SE	*t*	*p*
Mother BAP Effects				
Low Father Child Factors (-0.92)	-0.30	0.20	-1.49	.137
Mean Father Child Factors (0)	-0.06	0.12	-0.48	.629
High Father Child Factors (0.92)	0.19	0.13	1.41	.161
Father BAP Effects				
Low Mother Parenting Stress (-9.87)	-0.80*	0.22	-3.69	<.001
Mean Mother Parenting Stress (0)	-0.37*	0.12	-3.09	.002
High Mother Parenting Stress (9.87)	0.05	0.10	0.49	.622
Father BAP Effects				
Low Mother Child Factors (-0.93)	-0.60*	0.22	-2.66	.008
Mean Mother Child Factors (0)	-0.32*	0.13	-2.53	.012
High Mother Child Factors (0.93)	-0.04	0.16	-0.28	.782

Note. *$p \leq 0.05$; BAP = Broader Autism Phenotype; time-invariant covariates included in all models include relationship length in years, divorce/separation, and household income regressed on latent intercept and slope parameter; values in parentheses indicate values of the moderator used to estimate simple effect.

Figure 3

Father BAP and Mother Parenting Stress Interact to Predict Slope of Solution Focused Reciprocity



Note. Interaction plotted for average couple relationship length, no divorce/separation, average Mother BAP, and average household income. BAP = Broader Autism Phenotype as measured by the Broad Autism Phenotype Questionnaire (low and high BAP represent 1 standard deviation below and above the mean, respectively); Mother Parenting Stress as measured by the Burden Interview (low and high Parenting Stress reflect 1 standard deviation below and above the mean, respectively). Graphic representation of the interaction between Father BAP and Mother-Reported Child Factors was highly similar.

For the Positive Teamwork outcome, significant negative main effects of Father BAP on intercept emerged when father-reported stressors (parenting stress or child factors) were included in the model (Table 7). Couples with higher Father BAP demonstrated lower Positive Teamwork at the study outset. Additionally, Father BAP interacted with mother-reported parenting stress in predicting Slope of Positive Teamwork (Table 7). However, simple effects analyses indicated that the effect of Father BAP on the slope of Positive Teamwork did not reach significance across high and low

levels of mom-reported parenting stress (Table 9). Additionally, Mother BAP interacted with child factors (mother and father reported) in predicting the Slope of Positive Teamwork (Table 7). However, the only significant simple effect was a positive effect of Mother BAP in the context of high levels of father-reported child factors (Table 9); that is, when the initial level of father-reported child factors is high, couples with lower Mother BAP are predicted to decline in their Positive Teamwork more than couples with higher Mother BAP (Table 9, Figure 4).

Table 9

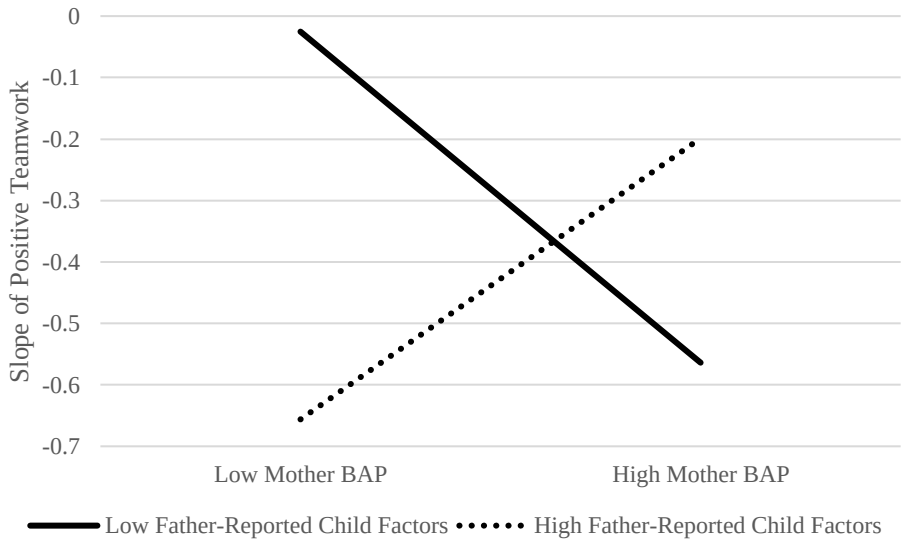
Simple Effects Predicting Slope of Positive Teamwork

Moderator Levels	*B*	SE	*t*	*p*
Father BAP Effects				
Low Mother Parenting Stress (-9.87)	-0.60	0.34	-1.78	.076
Mean Mother Parenting Stress (0)	-0.24	0.18	-1.28	.204
High Mother Parenting Stress (9.87)	0.13	0.16	0.83	.410
Mother BAP Effects				
Low Father Child Factors (-0.92)	-0.44	0.25	-1.78	.077
Mean Father Child Factors (0)	-0.03	0.15	-0.21	.831
High Father Child Factors (0.92)	0.37*	0.18	2.04	.043
Mother BAP Effects				
Low Mother Child Factors (-0.93)	-0.50	0.30	-1.68	.093
Mean Mother Child Factors (0)	-0.08	0.18	0.42	.676
High Mother Child Factors (0.93)	0.35	0.19	1.82	.070

Note. *$p \leq 0.05$; BAP = Broader Autism Phenotype; time-invariant covariates included in all models include relationship length in years, divorce/separation, and household income regressed on latent intercept and slope parameters.

Figure 4

Mother BAP and Father-Reported Child Factors Interact to Predict Slope of Positive Teamwork



Note. Interaction plotted for average couple relationship length, no divorce/separation, average Mother BAP, and average household income. BAP = Broader Autism Phenotype as measured by the Broad Autism Phenotype Questionnaire (low and high BAP represent 1 standard deviation below and above the mean, respectively); Child Factors are measured by a composite of the Child Behavior Checklist and Social Responsiveness Scale (low and high Child Factors reflect 1 standard deviation below and above the mean, respectively).

Discussion

The present study sought to build upon cross-sectional research that has demonstrated varied couple experiences of parents raising a child with ASD, a group at high risk for marital dissolution (Hartley et al., 2010) and couple conflict (Hartley, Papp, et al., 2017). Couple relationships, however, evolve over short and longer periods of time (Fincham & Bradbury, 1993; Kurdek, 1999; Lavner & Bradbury, 2019). Thus, in order to determine which dimensions of the couple relationship may be more or less likely to deteriorate across time in the short-term (i.e., over three years), the current study took a fine-grained approach by longitudinally exploring multiple observed aspects of the couple adaptive processes among caregivers raising a school-aged child with ASD. Particular aspects of the couple interaction were found to remain stable while other dimensions declined over the three years. Through the lens of the VSA Model (Karney & Bradbury, 1995b), couples' ability to handle relationship challenges, and in turn, their relationship satisfaction and quality, are impacted by vulnerabilities that couples bring to the relationship (e.g., personality traits), the stressors faced by the couple, and the interaction between the two. Thus, with the goal to better understand factors that shape couple relationships over time in the context of couples raising a child with ASD, the current study also directly applied the VSA Model by examining parent BAP, child-related stressors, and their interaction in predicting level of and change in observed couple behavior across three years. Parent BAP, especially father's BAP, emerged as the most consistent predictor of change in observed couple adaptive processes over time.

Aim I: Average Longitudinal Change in Couple Behaviors

The first aim of the study was to explore average change across three years in seven dimensions of observed couple behavior coded during a dyadic problem-solving task among parents raising a school-aged child with ASD. Findings are consistent with the study hypotheses such that particular dimensions of couple behavior changed in meaningfully different ways across time. The specific pattern and direction of change for five of the seven dimensions of couple behavior (Engagement, Enjoyment, Cooperation, Sensitivity, and Conflict Resolution) was consistent with study hypotheses. Hypotheses that Irritation would increase, and Balance would decline, however, were not supported.

Results of the study indicate that multiple dimensions of couple behavior remained relatively stable across a span of three years, accounting for differences in couple relationship length at study outset, household income, and whether the couple separated or divorced during the study. Stable aspects of couple behavior across three years include Engagement, Irritation, and Balance. That is, couples tended to demonstrate a constant Moderate to Moderately High level of partner-directed behaviors including the degree to which partners look at each other, are facing each other, and demonstrate effort to begin and maintain conversation (i.e., Engagement), as well as a Moderately High degree of reciprocity in the interaction including turn-taking (i.e., Balance) when examining relatively shorter-term change (e.g., three years) among couples raising a school-aged children with ASD. At this level of Engagement, couples may still briefly yet frequently disengage, or few instances of longer separation may occur. Additionally, at a Moderately High level of Balance, couples share opinions and responses, although one partner may contribute slightly more to the conversation. Negative tone of the interaction (i.e., Irritation) as evidenced by tone of voice, facial expressions, and critical

or hurtful remarks also remained constant and at a Mild level across time. At this level of Irritation, couples raising children with ASD may express anger, negative affect, or tension briefly and infrequently or may display more frequent mild instances of irritation (e.g., eye rolling).

Additionally, analyses indicated declines in Enjoyment, Cooperation, Sensitivity, and Conflict Resolution across three years in our sample of couples raising a school-aged child with ASD. At the study outset, couples began, on average, at a Moderately Low level of Enjoyment or degree to which partners mutually display positive affect; at this level, interactions are characterized by some mild or infrequent positiveness that may be displayed by only one partner. Given the decline in Enjoyment, towards the end of the three years, couples were near a Low level of Enjoyment in which there may be very brief glimpses of enjoyment, but overall, the couple is not having fun nor displaying enthusiasm. Couples' level of Cooperation, or ease of completing task together involving teamwork, mutual participation, organization, began in the Moderate to Moderately High range on average. This level of Cooperation is characterized by overall good cooperation with some lapses such that the joint activity is interrupted at times. With the observed decline in Cooperation, after three years, couples raising a child with ASD were near a Moderate level of Cooperation in which there is intermittent joint task involvement, and one partner may be distracted at times. At the study outset, on average, couples displayed a Moderately Low or Moderate degree of Sensitivity – the frequency, latency, and appropriateness of partner responses such as affirming and/or reassuring the other partner's abilities or contributions. Given the observed decline across time, after three years, couples were on average near the Moderately Low level of Sensitivity in which

many comments are disregarded, responses may be neutral, or responses may be delayed. The degree to which the conflict settled in a mutually satisfying way (i.e., Conflict Resolution) began in the Moderate range such that solutions may not be satisfying to both partners although conflicts are frequently resolved. At the end of three years, however, couples were on average between the Moderately Low to Moderate range of Conflict Resolution with conflicts that are generally not resolved, and interactions characterized by tension and a "constant struggle". Similar to these findings, the two empirically derived composites, Positive Teamwork and Solution-Focused Reciprocity, demonstrated a pattern of linear decline across the three years.

Taken together, these findings highlight certain areas of the couple interaction that may be a strength or weakness for couples raising a child with ASD. In terms of strengths, more specifically, Engagement, Irritation, and Balance remained at a constant, relatively high level (low level for Irritation) throughout the course of the study. These findings are particularly important to consider within repect to the specific population – couples raising a child with ASD; that is, despite the high level of parenting stress (Hayes & Watson, 2013) and average lower levels of couple satisfaction documented in this population (Sim et al., 2016), there are dimensions of couple relationship functioning that may be resilient. Perhaps, raising a child with ASD offers many opportunities for couples to work together to solve unique childrearing challenges, in turn, bolstering and maintaining their capacity to share and contribute to problem-solving interactions. While the observed level of Engagement and Balance suggests a relatively high capacity to work together and share the interaction, additional data speak to potential impairments in

aspects of the quality, nature, and effectiveness of the problem-solving interaction among couples raising a school-aged child with ASD.

In particular, Sensitivity, Enjoyment, Cooperation, and Conflict Resolution may be relative areas of weakness for these couples, as these dimensions declined and generally were in the Low to Moderately Low range by the end of the three years. Of note, Sensitivity and Enjoyment were also the only dimensions that also began below the Moderate range at the study outset. The low level and decline in Enjoyment is not particularly surprising, as the paradigm was focused upon couple disagreement and therefore not intended to elicit pleasure and fun. However, the relatively low and declining levels of Sensitivity, Cooperation, and Conflict Resolution are striking and have important implications for couple relationship quality in couples raising a child with ASD. For example, early theory and empirical research on marital relationships identified couple communication as a key ingredient for relationship satisfaction (Bradbury & Karney, 2010); although there are some exceptions, studies have generally found consistent connections between couple communication and relationship functioning (Johnson et al., 2005; Lavner et al., 2016). With particular relevance to the current study, dimensions characteristic of "positive" communication often include active listening and appropriate responding of each partner – aspects that are akin to Sensitivity as measured in the present study. Therefore, despite the aforementioned high level of Engagement and Balance, ability to respond promptly and sensitively to their partner declined and may be an integral hinderance to maintaining and fostering healthy relationships in the context of having a child with ASD.

Additionally, more frequent and severe conflict has been documented among couples raising a child with ASD relative to couples of children without neurodevelopmental conditions (Hartley, Papp, et al., 2017). Given the evidence that the way couples cooperate to handle conflict can be a driving force of their couple relationship quality (Kurdek, 1995), relationship stability (Karimi et al., 2019), and decisions to divorce (Birditt et al., 2010), the decline in Conflict Resolution and Cooperation may be particularly problematic for parents of children with ASD. For instance, maladaptive and ineffective strategies such as attacking or "exploding" (i.e., physical or verbal attacks), withdrawing (i.e., refusing to talk and shutting down), competing (i.e., asserting and forcing behavior), and compliance (i.e., giving in without presenting each partner's side) are found to be linked with poorer relationship satisfaction (Greeff & De Bruyne, 2000; Kurdek, 1995; Marchand, 2004). Additionally, adaptive and effective strategies such as compromise (i.e., attempting to work out a mutually acceptable solution), focusing on the problem, and collaborating (i.e., cooperating to find solutions) are related to higher levels of relationship satisfaction (Greeff & De Bruyne, 2000; Kurdek, 1995; Marchand, 2004). As such, the observed decline in couples' ability to come to a mutually satisfying resolution may be intertwined with the decline in Sensitivity (e.g., lack of timely and appropriate responses may beget less adaptive conflict resolution strategies, and thus, unresolved conflict), all of which have significant implications for overall couple relationship health and longevity.

Aim II Latent Classes of Couples

With respect to the second aim of the study to examine if latent growth classes of couples of children with ASD could be identified, results indicated that distinct

subgroup/latent classes were not evident using either all seven observational codes in tandem or using the two empirically derived composite scores. Thus, findings support a one-class solution. This is in contrast to the hypothesized two-class solution and previous research that has identified meaningfully different subgroups across time (Anderson et al., 2010; Birditt et al., 2012; Foran et al., 2013; Kamp Dush et al., 2008; Lavner et al., 2012; Lavner & Bradbury, 2010; Lorber et al., 2015; Williamson & Lavner, 2019). There are multiple possible reasons that no unique latent classes emerged in this sample. Potential explanations include the commonality of raising a child with ASD as well as aspects of the current methodology, including the unique metric of couple behaviors, the time span of the study (three years), and the particular phase within the life course of the couple relationship (partners had been in relationship for average of 15.05 years). That is, it may be that having a child with ASD serves as such a strong and powerful common experience among couples that, despite expected variability around the mean, no distinct subgroups with starkly different trajectory patterns emerge. Additionally, most studies that have employed a group-based approach to explore subgroups of couples have relied upon self-reported measures of general relationships satisfaction or couple conflict, but none to the author's knowledge have used observed metrics. It may be that partner perceptions of the couple relationship (i.e., self-report) are more sensitive to detecting subgroups than an unbiased account of specific aspects of couple adaptive behavior. Furthermore, the timespan of the study is three years and occurs on average approximately 15 years after couples began their relationship. Prior studies have generally either explored much longer time-spans (i.e. 16 to 20 years; Anderson et al., 2010; Birditt et al., 2012; Kamp Dush et al., 2008) or for those exploring shorter period

of time, these have generally focused on newly-weds who tend to experience more change in couple outcomes than do couples who have been together for longer-periods (Williamson & Lavner, 2019). It may be that subgroups only emerge when considering a more birds-eye-view of the couple relationship lifespan or in the few years immediately subsequent to a time of potential adjustment (e.g., marriage), rather than among couples who have been together a substantial length of time and are not faced with an acute relationship change.

Aim III Links with Stressors and Vulnerabilities

Group differences in terms of stressors and vulnerabilities could not be explored due to the results of Aim II. Therefore, examination of vulnerabilities and stressors as predictors of level and change in observed couple behavior served to shed light on VSA factors that may shape aspects of couple interactions over time for couples raising a child with ASD. In contrast to our hypotheses, initial levels of stressors did not have effects on level or change in couple interactions. These null findings are surprising in light of previous research that has demonstrated effects of child characteristics on parenting stress (Rodriguez et al., 2019), as well as marital satisfaction (Langley et al., 2017; Sikora et al., 2013) in families of children with ASD. These seemingly contradictory findings might be, in part, due to the methodology of the present study, as the relationship metric was captured via observation rather than self-report. In prior studies, shared method variance may in part contribute to the identified associations between stressors (i.e., parent report of their parenting stress) and couple constructs (i.e., parent report of their marital satisfaction). The current study also focused on couples of school-aged (5-12 yrs.) children with ASD, which may have impacted findings. It is possible that child stressors

have more direct connections to couple relationship quality early on. However, over time, in line with the VSA model, these external stressors have shaped couple processes in ways that endure beyond changes in child factors (e.g., couples develop problematic problem-solving habits that endure even if child stressors change). It should also be noted that the lack of connection between child-specific factors and couple relationship interaction in the present study can be seen as a positive. It further challenges the notion that "marital strife, separation, and divorce are almost expected outcomes because an autistic child places an 'impossible stress' on a marriage" (Yahraes, 1978, pp 747). Our findings can be interpreted to mean that factors external to the child may play a larger role in determining couple relationship functioning than do child symptoms and behaviors, contrary to previous belief.

Findings highlight the critical role of parent BAP, especially father's BAP, in predicting couple interactions. In particular, couples with a father who demonstrates more features of the BAP were predicted to decline in their Solution Focused Reciprocity at a faster rate across time and begin at a lower level of Positive Teamwork. As aloofness is a core feature of the BAP, this aspect may create challenges connecting and engaging with one's partner (i.e., an aspect of Positive Teamwork). Rigidity that is often associated with the BAP may also impede the "give and take" necessary to work together and effectively solve problems (i.e., an aspect of Solution Focused Reciprocity). Challenges with pragmatic language (e.g., difficulty getting "words out smoothly", determining when someone isn't interested in conversation, staying on topic) may beget problems conveying thoughts and feelings as well as picking up on more subtle partner cues, which may hinder effective problem-solving (i.e., an aspect of Solution-Focused Reciprocity).

These robust father effects are in consort with prior research that has identified strong father-effects on couple relationship functioning (e.g., Hartley et al., 2019; Kouros & Cummings, 2011). Interestingly, Father BAP affected the degree of change (i.e., Slope) in Solution Focused Reciprocity but only the initial level (i.e., Intercept) of Positive Teamwork. It may be that, initially, couples possess the capacity and resources to compensate for Father BAP in terms of their back-and-forth of the interaction, but over time, depleting couple resources begets a cycle of one-sided and less effective problem-solving related to the BAP. In contrast, perhaps, Father BAP has a more immediate impact on the positiveness and willingness to work together that is more readily apparent at the study outset.

In some cases, parent BAP interacted with stressors; a majority of these interactive effects were across partners (i.e., Father BAP with mother-reported stressors). For example, when mothers were stressed, couple interaction quality declined regardless of the personality traits the father brought to the relationship. However, when mothers weren't stressed, low Father BAP appeared to protective and help maintain a relatively constant level of Solution Focused Reciprocity across time, while high Father BAP appeared to be even more detrimental, causing faster declines in Solution Focused Reciprocity across time. Interaction between stressors with Mother BAP, however, demonstrated a strikingly different pattern. In the context of higher levels of father-reported child factors (i.e., stressors), Mother BAP functioned as a protective factor demonstrating a positive effect on the slope of Positive Teamwork (i.e., higher BAP is predictive of less rapid declines in Positive Teamwork). One possibility is that there may be less contagion of tension or stress from fathers to mothers for couples with high

Mother BAP due to less attunement or picking up on social cues (i.e., lower social cognition and facial emotion recognition; Kadak et al., 2014; Sasson, Nowlin, & Pinkham, 2013). It may also be that when there is a high level of challenging behaviors and ASD symptoms, a high degree of rigidity inherent in the BAP may be beneficial for implementing and maintain a structured environment that sets the stage for a less chaotic household, and in turn, more adaptive couple processes.

The differential effects of Mother versus Father BAP may be due to differences in the presentation of BAP among females versus males. More specifically, examination of sex differences in the BAP have indicated a higher rate of aloofness among fathers compared to mothers (Klusek et al., 2014; Seidman et al., 2012), while mothers tend to rate higher on rigidity (Seidman et al., 2012). Additionally, another factor that may explain these differential effects are differences in the division of labor in the family system. Evidence demonstrates that role specialization often takes place such that mothers tend to engage in more child care and father in more paid employment in families raising a child with ASD, with the degree of role specialization being more pronounced for those raising a child with a higher level of disability (Hartley et al., 2014). It may be that such role specialization serves to capitalize on potential benefits of the BAP (e.g., mothers in caregiver roles maintaining order due to rigidity) and exacerbates the challenges (e.g., fathers working outside the home for a majority of the day and then being aloof while at home).

Taken together, the results of Aim III provide partial support for the VSA Model among couples raising a school-aged child with ASD. In line with the VSA Model, parent vulnerability, and more specifically BAP, was found to predict how couples work

together to solve problems (i.e., adaptive processes) over time. Interestingly, and in contrast to the VSA Model, no stressors examined in this study (i.e., parenting stress and child factors) emerged as predictors of couple adaptive processes. Interactive effects, as posited by the VSA model, were evident between stressors and vulnerabilities; these effects were partner specific. Interestingly, interactions did not illustrate an amplifying effect of stressors and vulnerabilities (e.g., parenting stress strengthening the negative effect of BAP), and instead, negative effects of vulnerabilities were evident in conditions of low stress or were inverted (i.e., opposite direction of effect) under conditions of high stress. As such, it may be that processes unique to couples raising a child with ASD are at play and suggest that a modified version of the VSA Model may be appropriate.

Clinical Implications

Couples raising a child with ASD may be at risk for relationship dissatisfaction, deterioration, and dissolution, and therefore, these findings should be considered with an eye towards clinical interventions and support. Addressing areas of weakness and supporting areas of strength in couple adaptive processes may not only serve to bolster relationship quality and satisfaction (Karney & Bradbury, 1995b), but may also potentially yield positive effects on the larger family unit (Brown, 1999; Minuchin, 1985), including child functioning (Cummings et al., 2003; Knopp et al., 2017; McCoy et al., 2013). Given the multitude of stressors facing parents of a child with ASD (Hayes & Watson, 2013), having a strong and supportive romantic relationship may especially important for broader family functioning.

Considering the observed declines in Sensitivity, Cooperation, and Conflict Resolution, these dimensions may be important treatment targets in couples therapy for

parents raising a child with ASD. That is, clinicians may want to focus on skills such as listening and responding to each partner promptly and appropriately, as well as strategies to work together to generate mutually satisfying resolutions of problems and conflict. These clinical implications are in consort with findings from a recent study that identified effective communication, especially during conflict, as a top priority for promoting healthy relationships in this population (Sim et al., 2019).

Fortunately, many empirically supported behavioral marital/couple therapies and programs include strategies to improve communication (i.e., communication training) and work together to resolve conflict (i.e., problem-solving training) (Benson & Christensen, 2016; Jacobson & Margolin, 1979). Across populations, such program, including brief psychoeducational programs (i.e., four to five sessions), have been shown to improve communication skills and reduce conflict long-term (Cummings et al., 2008; Markman et al., 1993) with evidence for secondary improvements in the mental health of each partner (Askari et al., 2012). It is noteworthy that the mechanism by which communication-based interventions impact relationship satisfaction is unclear, which some evidence that it may not be mediated by improved communication skills (Williamson et al., 2016). Surprisingly few studies have evaluated the effects of couples therapy among couples with a child with ASD. Preliminary evidence shows promising effects of Emotion Focused Couple Therapy (Lee et al., 2017; Ramisch et al., 2013) and solution-focused brief couples therapy (Handley et al., 2020; Turns et al., 2019) for decreasing marital distress and increasing marital satisfaction in this population, yet no studies to the author's knowledge have developed or adapted/tailored couples therapy for caregivers of

a child with ASD targeting areas of specific concern. Results of the current study could be used to inform treatment adaptation or development for these couples.

Additionally, considering the relatively consistent effect of Father BAP on decline in couple relationship functioning, couples that include a father with a high level of BAP traits may benefit from individual therapy designed to target flexibility, social communication, and/or interpersonal interactions. It may also be important for clinicians to note that observing a high level of Mother BAP is less consequential for the couple relationship, and may perhaps even be protective. Thus, individual partner vulnerabilities, more so than parenting stressors, may be critical factors for clinicians to consider in delivering treatment to couples raising a child with ASD.

Consideration of couple strengths is also paramount when approaching treatment. Despite the aforementioned areas of potential weakness, the stable degree of Engagement and Balance may suggest that when asked to engage with their partner (e.g., in couple's therapy), couples are willing to do and generally share the interaction. Therapists may want to leverage these strengths by intentionally incorporating frequent in-vivo problem-solving into session when therapists can guide and support the interaction. Furthermore, given that the couples in this study were found to generally share the interaction with one another (i.e., Balance), therapists may be less likely to encounter a demand-withdraw communication pattern among these couples. Finally, the low stable levels of overtly hostile behavior (i.e., Irritation) is also clinically noteworthy and promising. Given that the interactions were observed in a research setting, however, it may be that day-to-day level of irritation are not as congruent with the observation data as other dimensions of less overt couple behavior (e.g., Sensitivity) due to social desirability bias.

Strengths, Limitations, and Future Directions

The current study has many strengths that merit discussion. Such strengths include the use of an observational paradigm to capture multiple dimensions of couple adaptive behavior, the large sample size, the longitudinal nature of the study, report from both mothers and fathers, and use of advanced statistics techniques. These strengths help to fill important gaps in the current knowledge base on romantic couple relationships among caregivers raising a child with ASD. While this study has many strengths, there are limitations that warrant consideration. The sample composition is relatively homogenous in terms of race/ethnicity. This limits the generalizability of the findings. Additionally only two same-sex couples were included in the sample; future studies would benefit from examinination of these processes among larger samples of same-sex couples. Additionally, although the age range of the sample allows for specificity of these processes within the context of school-aged child development, a sample of caregivers of young children, school-aged children, adolescents, young adults, and older adults across time would allow for examination of age, period, and cohort effects. Additionally, the current study follows couples across three years; continued measurement and observation across a longer period of time would be beneficial in order to understand the lifecourse of marital relationships in this population. Although a strength of the current study is the use of observational methods, additional information such as in depth clinical interviews and self-reported measures would enrich the findings. Furthermore, additional constructs that may be important for couple relationships, such as parent attributions (Bradbury & Fincham, 1990a), social support (Paynter et al., 2013; Stuart & McGrew, 2009), dyadic coping (Bodenmann, 2005), and parent self-esteem (Erol & Orth, 2013, 2014; Sacco &

Phares, 2001) were not examined in the current study and should receive longitudinal empirical investigation in future studies. Additionally, as the current study does not include a comparison sample, it is unknown whether the identified changes in couple adaptive processes are unique to this population or reflective or couple relationships in general. Finally, given the important father effects identified in the study and the lack of father representation and inclusion in autism research (Rankin et al., 2019), future studies of families of a child with ASD should make a special effort to include fathers.

Summary and Conclusions

In sum, the current study reveals that aspects of problem solving interactions among couples raising a child with ASD evolve over time. Declines were evident in the degree and quality of responsiveness of each partner (Sensitivity), ability to work together (Cooperation) to come to a satisfying resolution (Conflict Resolution), and fun and positivity of the interaction (Enjoyment). Other dimensions of the couple interaction, especially those focused upon the sharing of the interaction (Balance), attention towards each other (Engagement), and hostility (Irritation) remained stable. No identifiable subgroups emerged, suggesting that most couples change over time in a similar manner. Findings revealed that although surprisingly no stressors (parenting stress and child factors) were found to predict trajectories of adaptive processes, parent BAP explained variability in the degree of decline over time. Partner specific effects were found for the BAP such that those with higher Father BAP demonstrated steeper declines in adaptive processes across time, especially in the context of low stress as reported by mothers, while Mother BAP may be protective in the context of a high level of father stress. This study help to better understand how romantic couple relationship unfold across a three-

year timespan among couples that may be at risk for relationship strain, dissatisfaction, and divorce; findings highlight areas of strength that can be leveraged and weaknesses that can be supported in treatment to promote healthy and long-lasting couple relationships, and in turn, and happier and thriving families.

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APPENDICIES

Appendix A
Abbreviated Descriptions of Observational Coding of Couple Interactions

Engagement: partner-directed behaviors such as initiating conversations, displaying visual regard, and demonstrating involvement

1	4	7
-Doesn't initiate conversation -Poor eye contact- glances occasionally -Body language is closed off, facing away from partner -Tone of voice is monotonous	-Sometimes initiates conversation -Alternating periods of eye contact and no eye contact -Body language is fluid; shows some interest -Tone of voice conveys some interest -Both partners participate in the conversation	-No lull in conversation -Eye contact nearly all of the time, especially when partner is speaking -Body language is open and body is facing partner -Comments build on one another

Enjoyment: expression of pleasure and mutual exchange of positive affect such as smiling, laughter, and positive vocalizations

1	4	7
-No enjoyment at all, with signs of non-enjoyment -Both partners contribute to the negative tone -No smiling or laughter -No positive intonation in voice -Overall negative tone	-Alternating between enjoyment and non-enjoyment -Absence of positive or negative feelings/tone -Some smiling and laughter -Overall neutral tone	-Both partners enjoy the discussion -Almost all interactions are positive, pleasant -Often smiling and laughing -Overall warm tone

Positive Affect of Individual: scored separately for husbands and wives and includes smiling, laughter, and warm tone

1	4	7
-No warmth -No smiling or laughter -No optimistic or positive comments	-Some smiling or laughter -Tone is neutral -Makes some positive or optimistic comments	-Overall warm tone -Smiling or laughing often -Generally optimistic comments

Irritation of Individuals and Overall: scored separately for husbands and wives and includes overt anger, hostility, or more subtle expressions of displeasure including negative comments or nonverbal behaviors such as frowning

1	4	7

-No negative comments -No overt anger, hostility, or obvious displeasure -No frowning	-Small signs of anger, irritability, or annoyance -No overt anger or hostility but makes some negative comments -Facial expression is stern	-Expresses negativity often -Outright anger or hostility -Raising of voice in anger, annoyance, or displeasure -Frowning, eye-rolling, scoffing is present

Cooperation: joint focus and sense of "we-ness" in completing the task

1	4	7
-Couple does not seem as though they are talking about the same issue -Each partner has own agenda -Don't seem to care if problem is solved -Use of "togetherness" words are limited (i.e., we, us)	-Partners are on the same page but not completely in sync -Somewhat motivated to solve problems -Sometimes changes conversation away from goal	-Couples seem very focused on task -Motivated to accomplish task -Use of "togetherness" words are prevalent -Both partners are engaged and cooperative

Balance: relative contribution of each spouse to the interaction

1	4	7
-One partner completely dominates conversation -Other partner rarely speaks and is interrupted -Conversation seems more like a monologue	-One partner tends to lead conversation -Other partner participates, but to a lesser extent -Contributions are occasionally, but not often, interrupted	-Both partners speak and contribute -Conversation has a "back-and-forth" style -Neither partner speaks noticeably more than the other

Sensitivity: extent to which spouses affirmed each other's contributions to caring for their child and home or presented their opinions in a constructive, respectful manner

1	4	7
-Condescending, negative tone -Does not appreciate spouses contributions -Disregards spouses point of view	-Neutral tone, neither negative or positive -Somewhat sensitive to partner -Sometimes respectful -No outright negativity -Overall neutral in sensitivity	-Affectionate and supportive ton -Respectful of partner's thoughts and feelings -Positive about spouse's actions and contributions

Conflict Resolution and Satisfaction: efficiency and smoothness with which couples were able to resolve discrepancies without increasing or continuing conflict, emotional distancing, or withdrawal

1	4	7
-Did not solve problem or did not make progress at solving it -Conversation caused anger and negativity -Couple seems unhappy and unpleasant at the end of the conversation	-Some aspects of the problem were resolved or made some progress toward solving it -Couple seems neither anger nor happy -Neither happy nor unhappy at the end of the conversation	-Solved or made significant progress toward solving problem -Conversation did not cause anger, annoyance, or other negative emotions -Couple seems happy and pleasant at the end of the conversation

Appendix B

Couple Interaction Rating Form

Engagement: partner-directed behaviors such as initiating conversations, displaying visual regard, and demonstrating involvement

Low- 1 2 3 4 5 6 7 -High

Enjoyment: expression of pleasure and mutual exchange of positive affect such as smiling, laughter, and positive vocalizations

Low- 1 2 3 4 5 6 7 -High

Positive Affect of Individual: scored separately for husbands and wives and includes smiling, laughter, and warm tone

Wife/Participant A:
Low- 1 2 3 4 5 6 7 -High

Husband/B:
Low- 1 2 3 4 5 6 7 -High

Irritation: overt anger or hostility or more subtle expressions of displeasure, including negative comments or nonverbal behaviors such as frowning, ranging from no instances of irritation, antagonism, anger, or hostility to pervasive or extreme irritation.

Low- 1 2 3 4 5 6 7 -High

Individual negative affect: scored separately for husbands and wives; expression of hostility, anger or displeasure ranging from no negative affect expressed toward spouse to marked sadness or anger, very negative tone

Wife/Participant A:
Low- 1 2 3 4 5 6 7 -High

Husband/Participant B:
Low- 1 2 3 4 5 6 7 -High

Cooperation: joint focus and sense of "we-ness" in completing the task

Low- 1 2 3 4 5 6 7 -High

Balance: relative contribution of each spouse to the interaction

Low- 1 2 3 4 5 6 7 -High

Sensitivity: extent to which spouses affirmed each other's contributions to caring for their child and home or presented their opinions in a constructive, respectful manner

Low- 1 2 3 4 5 6 7 -High

Conflict Resolution and Satisfaction: efficiency and smoothness with which couples were able to resolve discrepancies without increasing or continuing conflict, emotional distancing, or withdrawal

Low- 1 2 3 4 5 6 7 -High

Global rating of Interaction Quality: overall quality of relationship, including liking, caring, commitment, and positive emotional regard ranging from indifferent or antagonistic, partner replacement would be ignored or greeted with some enthusiasm to couple enjoys and trusts each other, expresses and responds to feelings directly, interacts with ease and enjoyment.

Low- 1 2 3 4 5 6 7 -High