Family Experiences in the Context of Broad Autism Phenotype

by

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Abstract

Little research has examined the adaptive processes and co-parenting behaviors in the context of broad autism phenotype (BAP). The overarching goal of my dissertation research was to enhance the understanding of how BAP is associated with parent-couple and co-parenting relationship quality. This research draws from a sample of families of a child with ASD (N = 189) and a comparison group of families (N = 185) parenting typically developing children (without neurodevelopmental disabilities). The first study examined the association of actor and partner effects of BAP characteristics (aloofness, pragmatic language, and rigidity) for mothers and fathers on positive and negative dyadic coping behaviors. Results suggested that BAP characteristics were present across parenting groups with parents in the ASD group reporting higher BAP characteristics than parents in the comparison group. Findings indicated that actor rigidity (one's own) was a significant predictor of lower levels of positive dyadic coping and higher levels of negative dyadic coping. Actor aloofness was also significantly associated with lower levels of positive dyadic coping. The second examined the role of BAP on the co-parenting relationship and children's co-occurring emotional and behavioral problems among parents of children with ASD. Findings suggested that BAP is associated with lower levels of co-parenting relationship quality through actor and partner pathways. For fathers, co-parenting relationship quality was a partial mediator of parental BAP on children's co-occurring emotional and behavioral problems. Study implications and future directions are discussed.

Keywords: broad autism phenotype, autism, co-parenting relationship quality, dyadic coping

Chapter 1: Introduction

The overarching aim of my dissertation research is to better understand the role of the broader autism phenotype (BAP) for family system processes. More specifically, my dissertation examines the impact of BAP on the marital or romantic partner couple relationship and on parenting experiences. The term BAP refers to the set of behavioral and cognitive traits associated with autism spectrum disorder (ASD) but at a subclinical level. ASD is a lifelong neurodevelopmental disorder that involves social communication impairments and restricted and repetitive interests and behaviors that impair functioning in multiple settings (American Psychological Association [APA], 2020). BAP was first written about by Leo Kanner (1943), who noted that some parents of children with ASD possessed similar characteristics and behaviors as their child including rigidity, social impairment, and obsessiveness but that these traits were not at the same degree of severity or caused the same level of impairment. Decades later, Folstein and Rutter (1977) further described BAP as having a genetic etiology shared with ASD in their sample of twins diagnosed with ASD. Folstein and Rutter reported that parents and other 1st-degree relatives of individuals with ASD were prone to exhibiting subtle ASD-like features indicative of BAP (see Bolton et al., 1994, Piven et al., 1997; Wolff, Narayan, & Moyes, 1988). The expression of BAP has since been identified as an intermediate phenotype or endotype, in ASD with some evidence that male 1st-degree biological family members of individuals with ASD exhibit a higher rate of BAP than female biological relatives (see Baron-Cohen et al., 2001).

While there still remains debate about the specific set of behavioral and cognitive traits that make up BAP, the most common operational definitions of BAP involve social-emotional relationship deficits such as having difficulty forming and maintaining friendship (Piven et al., 1997), pragmatic language impairments such as awkward or inadequate verbal expression, disinhibited social communication, or odd verbal interactions (Landa et al., 2007), and personality

characteristics of aloofness, rigidity, and repetitive behaviors or ruminating thoughts (Murphy et al., 2000; Piven et al., 1997). Across studies, BAP has been conceptualized and measured as a dichotomous (i.e., absent or present) variable but also as a continuous variable (or spectrum), with individuals having lower or higher levels of BAP characteristics. Thus, for my dissertation, the proposed studies will examine BAP as both a dichotomous and continuous variable.

Building on the growing body of research defining the BAP, there is now a critical need for research that examines how this set of traits influences family processes. To date, there is only sparse research on this topic and what is known about the effect of BAP on family processes is largely limited to mothers of children with ASD. My work will build on previous findings by utilizing a family system lens that accounts for the interconnectedness of family relationships to understand how parent BAP shapes family dynamics. The two papers that make up my dissertation will focus on the parent marital or couple relationship as well as co-parenting relationship experiences and will use a combination of objective (parent-informant response) and subjective (self-report survey) measures to examine how BAP is associated with the quality of these family relationships.

My dissertation draws on the first time point of the Family Outcomes in Autism study (R01MH199091; Hartley). This longitudinal study originally involved a sample of 189 families (N = 378 parents) who had at least one child with ASD. The study also included a comparison group of 185 families (N= 370 parents) who had typically developing children (i.e., no known or suspected developmental disability). Non-probability purposive sampling was used in which recruitment involved fliers posted in public settings (e.g., libraries, grocery stores, and coffee shops), ASD service agencies, schools, and childcare facilities. In addition, mailings were sent to school districts and through research registries. Study inclusion criteria included being a parent in

a committed, long-term couple relationship (≥ 3 years) in which partners lived together and both partners in the couple were willing to participate. The majority of couples were married (n = 366) and most (n = 302) were biological parents of the target child. For the ASD group, the child's diagnosis of ASD needed to be confirmed through medical or educational records and the Autism Diagnosis Observation Schedule (ADOS; Lord et al., 2000) had to have been used in the diagnostic evaluation. Parents in both the ASD and comparison group also completed the Social Responsiveness Scale-Second Edition (SRS-2; Constantino & Gruber, 2012) to verify the target child's current ASD symptoms were in the atypical range (SRS-2 Total t-score above 60). Families in the comparison group were screened to ensure that they did not have any children who had received Birth-to-Three or special education services or who had a known or suspected developmental disability. In addition, the SRS-2 was used to ensure that target children did not exhibit marked ASD symptoms (i.e., had to have an SRS-2 Total t-score below 60). The study has IRB approval from the University of Wisconsin-Madison. For both papers of my dissertation, BAP was assessed through the Broader Autism Phenotype Questionnaire (BAPQ; Hurley, Losh, Parlier, Reznick, & Piven, 2007), which is a 36-item self-report measure in which parents rate their own level of BAP traits.

Manuscript 1: Parent-couple relationships in the context of BAP

The first paper of my dissertation focused on:1) determining the prevalence of BAP in a community sample of 189 families who have a child with ASD as compared to a comparison group of 183 families who have typically developing children, and 2) evaluating the association between parent BAP and one's own and one's partner's ratings of the adaptive couple coping processes (positive dyadic coping and negative dyadic coping) in both the ASD and comparison group. Parent BAP was assessed as both a continuous and dichotomous variable. Dyadic coping is the adaptive processes parent-couples use when faced with stress within their partner

relationship through communication and behaviors. The Dyadic Coping Inventory (DCI; Bodenmann, 2008), a 37-item self-report measure, was used to assess dyadic coping in mothers and fathers both within the ASD group and comparison group. Dyadic coping communications and behaviors can be either positive (working jointly to solve stressors, delegating, or offering emotional support) or negative (making light of one's partner's stress, avoidance, or ambivalence). The ability to process and cope with stressors within the couple relationship in positive processes has been evidenced to play a key role in marital or partner relationship satisfaction (Falconier et al., 2015; Putney, Greenlee, & Hartley, 2021).

To date, virtually nothing is known about how one's own or one's partner's BAP influences their subjective experience of dyadic coping. Evidence published from my master's thesis uncovered differences in dyadic coping between the ASD and comparison groups and examined whether BAP (using BAPQ total score) accounted for these group differences. The proposed paper expands upon those findings by understanding which domains of BAP traits alter positive and negative dyadic coping using actor and partner models. This information has important implications for interventions aimed at promoting positive couple relationships. This paper used an actor-partner interdependence model (APIM) to examine the effect of BAP (actor and partner) on positive and negative dyadic coping in families of children with ASD and families of children without ASD. While BAP is posited to be more prevalent in the families of children with ASD, its effect on dyadic coping is predicted to be the same regardless of the ASD status of the child. In addition to examining the BAPQ Total score, we examined the three subdomain scores to better understand which aspects of BAPQ are most strongly associated with couple coping. The target journal for this paper is the *Journal of Family Psychology*.

Manuscript 2: Parenting experiences in the context of broad autism phenotype

The second paper of my dissertation focused on: 1) determining whether one's own (actor) and one's partners (partner) BAP level (assessed as a continuous variable) was associated with the quality of the co-parenting relationship; 2) examining whether having two parents with an elevated level of BAP (assessed as a dichotomous variable) within a family (as compared to none or one parent) influences the quality of the co-parenting relationship, and 3) determining if parent BAP was in part associated with child emotional and behavior problems through altered co-parenting quality. For all questions, BAP was be assessed using the BAPQ total score.

The quality of the co-parenting relationship, defined as the level of childrearing agreement, partner support, partner undermining, division of parenting labor, and the sharing of family activity management among parents (Feinberg, Brown, & Kan, 2012), has been shown to be a robust predictor of children's behavioral, psychological, and physical health outcomes within general (e.g. Troxel & Matthews, 2004) and ASD populations (e.g., Greenlee, Winter, & Diehl, 2018). Higher levels of co-parenting quality, such as parenting partners who feel supported in their parenting practices and are satisfied with the division of household labor, are more likely to engage in higher levels of adaptive parenting practices (Feinberg et al., 2012). However, little is known about how one's own or one's partner's BAP influences the co-parenting relationship. To date, ASD research has largely focused on child behavior severity as a predictor of parenting experiences such as parenting stress, marital discord, or family functioning (see Benson, 2006; Chan & Leung, 2020; Lyons, Leon, Phelps, & Dunleavy, 2010), rather than examining how aspects of parenting, such as the co-parenting relationship, influence child behaviors. Parent BAP could be a set of traits that alters how effectively parents are able to work together and support one another in parenting. If so, then a diminished co-parenting relationship quality could be one

mechanism through which parent BAP influences children with ASD. This paper aimed to expand on current literature in three ways. First, by using a dyadic lens to better understand the pathways (actor and partner) through which parent BAP may influence the co-parenting relationship. Second, by examining the potential exponential effect of having two parents (relative to one or none) with elevated BAP on the co-parenting relationship. Lastly, by examining whether a diminished co-parenting relationship mediates the relation between parental BAP and a higher level of child emotional and behavioral problems. Findings from this study have important implications for therapies and interventions aimed at enhancing parent-couple and parent-child relationships within the ASD community.

To address the study aims of this manuscript we used an APIM to examine the association between one's own and one's partner's level of BAP and co-parenting relationship quality experiences. The use of APIM allowed us to understand the role of one's own and their partner's level of BAP on the co-parenting relationship. We predicted that higher levels of BAP (one's own and one's partner's), assessed as a continuous variable, would be associated with lower levels of co-parenting relationship quality for both mothers and fathers of children with ASD. An analysis of covariance (ANCOVA) was used to test our hypothesis that families with two parents with elevated BAP (considered as dichotomous variable) would report a lower level of co-parenting relationship quality than those with one or no parents with elevated BAP. We hypothesized that, in part, parent BAP would be associated with a higher level of child emotional and behavioral problems through a more maladaptive co-parenting relationship (mediator). This mediation pathway was be tested following Zhang et al. 's (2009) 3-step centered within context approach using the 2-2-1 pathway, which controls for mediation at the within-couple (level-1) and between-family level (level-2). First, we examined the association between parental BAP and

child's emotional and behavioral symptoms (step 1). Next, we examined the association between parental BAP and the quality of the co-parenting relationship (step 2). We then determined the association between parental BAP and child's emotional and behavioral symptoms controlling for co-parenting relationship quality (step 3). We predicted that a lower quality co-parenting relationship would partially mediate the association between a higher level of parental BAP and a higher level of child co-occurring emotional and behavioral problems. The target journal for this paper will be *Autism*.

The Parent Couple Relationship in the Context of Broader Autism Phenotype

The term broader autism phenotype (BAP) refers to a set of observable behaviors and cognitive traits associated with autism spectrum disorder (ASD) but at a sub-clinical level (American Psychological Association [APA], 2017). Although there remains debate within the field, BAP has most commonly been defined as involving social-emotional relationship deficits such as having difficulty forming and maintaining quality relationships (Piven et al., 1997), pragmatic language impairments such as conversational pacing (turn-taking) (Hurley et al., 2007), ineffective communication, or unconventional verbal interactions (Landa et al., 2007), and personality characteristics of aloofness, rigidity, and repetitive or restrictive behaviors (Murphy et al., 2000; Piven et al., 1997). BAP has been posited to present as a spectrum, meaning that an individual may experience or exhibit one or multiple behaviors or characteristics associated with the phenotype. As the desire to identify and characterize BAP has continued to grow, studies have incorporated comparison group populations from the general population who did not have a child/sibling with ASD. These comparison group studies have provided evidence that BAP is continuously distributed in the general population (e.g., individuals range in how many/severe BAP traits they exhibit) but prevalence is elevated in biological family members of individuals with ASD (Constantino & Todd, 2003; Job & White, 2007; Landry & Chouinard, 2016). Indeed, it is estimated that 14-23% of first-degree relatives of an individual with ASD evidence one or more BAP behaviors or characteristics (Sasson et al., 2013), while BAP within the general population is estimated to be 5-9% (Sasson et al., 2014). For example, Wheelwright et al. (2010), using a sample of parents of a child with ASD and a comparison group of parents with typically developing children, found that 33% of fathers and 23% of mothers who parent a child with ASD evidenced BAP characteristics while 22% of fathers and 9% of mothers of typically developing

children evidenced BAP behaviors and characteristics. It is not clear from the literature how often both parents within a couple may be likely to have elevated BAP either in the context of having a child with ASD or in the context of having typically developing children.

The consequences of BAP for social and family relationships remain largely unknown. By definition, BAP traits are at a sub-clinical threshold and thus do not cause marked impairments in everyday life. However, there is evidence that some of these traits may contribute to social relationship challenges. Indeed, a growing body of evidence suggests that BAP traits often get in the way of establishing and maintaining a successful couple relationship (i.e., romantic partner or marital relationship). In samples of college students, level of BAP has also been found to be negatively associated with level of couple (or marital) relationship satisfaction (Pollmann et al., 2010), and a less secure romantic attachment style (Lamport & Turner, 2014). In a previous study stemming from our research group, parent-level of BAP had moderate-sized associations with the observed, self-reported, and physiological quality of observed couple problem-solving interactions in couples who had children with ASD (Hartley, Hickey, et al; 2019). The association between parent level of BAP and the quality of couple problem-solving interactions occurred through both actor (i.e., one's own BAP) and partner (i.e., one's partner's BAP) pathways. In other words, one's own level of BAP was associated with the quality of couple interactions as well as one's partner's level of BAP with higher levels of BAP being associated with lower levels of quality within couple's problem-solving interactions. Couples which included a partner with higher levels of BAP reported lower levels of enjoyment, engagement, cooperation, balance, and sensitivity and higher levels of irritation and were more significant for fathers (Hartley et al., 2019).

Together these studies suggest that, in part, elevated risk for BAP could contribute to the poorer couple relationship outcomes observed in parents of children with ASD relative to their peers who have typically developing children (see Brobst et al., 2009; Hartley, Papp, & Boldt, 2018). Indeed, parents of children with ASD have been found to report lower marital relationship satisfaction (Ekas et al., 2015; Sim et al., 2017), more frequent marital conflict (Hartley, Papp, & Bolt, 2018), and a higher risk of separation/divorce (Hartley et al., 2010; Kousgaard et al., 2018) relative to parents of children without ASD. Previous research has focused on examining the role of child-related factors (e.g., severity of ASD symptoms or co-occurring behavior problems) in predicting negative couple relationship outcomes in families of children with ASD (Saini et al., 2015). Efforts to also more clearly understand how BAP contributes to maladaptive couple relationships is thus a critical gap in current research. Indeed, this information can be used to develop couple relationship psychoeducational programs aimed at helping individuals with BAP become aware of and replace problematic couple relationship behaviors with more adaptive ones. In the current study, we focus on one set of couple relationship behaviors that may be negatively impacted by BAP -- dyadic coping processes.

Dyadic coping

Dyadic coping has been posited to play a significant role in the connection between parental stressors, such as job-related stressors, child-behavior-related stressors, and partner's trait behaviors (Bodenmann, 1995, 2000). Dyadic coping is defined as the couple-level processes employed by partners when presented with stress, by one or both partners (Bodenmann et al., 2006). Dyadic coping processes can be classified as either '*positive*' or '*negative*'. *Positive dyadic coping* is seen as the healthy adaptive ways that couples communicate or behave with one another and deal with this stress and includes supportive, delegated, and common coping. An

example of supportive dyadic coping is when one partner assists the other in identifying ways to fix a problem or provides emotional support to alleviate distressing emotions. An example of delegated dyadic coping is when one partner takes responsibility over the stressor to lower their partner's stress. Common coping is when both partners share in the stress experience and work together to process and handle the stressful situation. In contrast, *negative dyadic coping* can be identified as "unhealthy" or when one or both partners use negative behaviors and communication to cope with stress introduced into the dyad. *Negative dyadic coping* behaviors include ambivalence or anger when processing stress within the dyad and/or respond to each other's stress with animosity or ambivalence (Bodenmann, 2005). *Negative dyadic coping* also includes the absence of support for one's partner or avoidance of the partner as a means to avoid processing the stressor.

Research suggests that couples' dyadic coping strategies are a strong predictor of marital satisfaction (Brown et al., 2020). Robust research has shown that spouses/partners who report engaging in *positive dyadic coping* processes experience better couple relationship outcomes (Bodenmann, Meuwly, & Kayser, 2011; Falconier et al., 2015; Wunderer & Schneewind, 2008). For example, in a 5-year longitudinal study of Swiss couples from a general population sample, stable and satisfied couples (i.e., those that reported higher than average levels of marital relationship satisfaction) reported using a higher level of supportive dyadic coping (a type of *positive dyadic coping*) when faced with stressful situations as compared to stable and distressed or separated-divorced couples (Bodenmann & Cina, 2006).

Existing research indicates that parents of children with ASD report using lower levels of *positive dyadic coping* and higher levels of *negative dyadic coping* than parents of neurotypical children (Lai et al., 2015; Putney et al., 2020; Sim et al., 2017). It is possible that increased

prevalence of BAP in parents of children with ASD is at least partially driving this group difference. Indeed, there is evidence to suggest that a high level of BAP is associated with the use of more maladaptive coping strategies at an individual level (as opposed to the dyadic level which is the focus of the current study) such as self-blame and avoidance in parents of children with ASD (Ingersoll & Hambrick, 2011). Thus, it is possible that parental BAP traits could hinder the use of adaptive dyadic coping, and get in the way of couples being able to support one another and jointly navigate stress in successful ways. Among BAP traits, deficits in the domain of pragmatic language may be particularly strongly related to the use of high *negative* and low *positive dyadic coping*. Pragmatic Language involves the ability to use language effectively within social contexts to relay meaning (Hyter, 2007), which is critical for scaffolding discourse and the resolution of misunderstandings/miscommunications. Pragmatic language deficits within the context of BAP have been found to be associated with loneliness, difficulty in beginning and maintaining relationships, and social isolation (Jobe & White, 2007; Klusek, Thurman, & Abbeduto, 2021; Whitehouse et al., 2009). Thus, pragmatic language impairments associated with BAP may play a key role in shaping how couples communicate and work together to resolve stressors. These effects may be true regardless of the child's ASD status. However, given the increased prevalence of BAP in first degree relatives of children with ASD, these effects may be of particular relevance for the couple relationship of parents who have children with ASD.

Current Study

The goal of the current study was to determine if BAP (both one's own and their partner's) was associated with the use of *positive* and *negative dyadic coping*. In total, 184 couples who had a child with ASD and a comparison group of 183 couples who had typically developing children completed questionnaires about the target child, their own personality traits,

and their couple relationship. The study aims were to: 1) evaluate the prevalence of BAP in a community sample of parent-couples who have a child with ASD relative to a comparison group of parent couples of children without neurodevelopmental disabilities; 2) determine the relation between actor (one's own) and partner (one's partner) level of BAP (across the three subdomains (aloofness, rigidity, and pragmatic language deficits) and *positive* and *negative dyadic coping*; and 3) evaluate whether associations between BAP (actor and partner) and *positive* and *negative dyadic coping* differ between the ASD and comparison groups. We predicted that parent-couples in the ASD group would evidence a higher level of BAP traits than those in the comparison group. In addition, we predicted that parents with higher levels of BAP and those whose partner evidenced higher BAP levels would report more *negative* and less *positive dyadic coping* behaviors as compared to parents with lower BAP and who have a partner/spouse with lower BAP. Based on evidence indicating the importance of pragmatic language for social communication and problem-solving (see Jobe & White, 2007; Klusek, Thurman, & Abbeduto, 2021; Whitehouse et al., 2009), this domain of BAP traits was predicted to be most strongly associated with *negative dyadic coping* (higher) and *positive dyadic coping* (lower). Finally, we hypothesized that the associations between parent BAP (actor and partner) and positive and dyadic coping will be similar across the comparison and ASD groups.

Methods

The current study drew from the first time point of the Family Outcomes in Autism Spectrum Disorder, a longitudinal study (R01MH199091; Hartley). This longitudinal study originally involved a sample of 189 parent couples (mothers: M = 38.73 [SD =5.63 years, fathers: M = 40.76 SD = 6.70] years) who had at least one child with ASD at the first time point of the study. In addition, 185 parent couples (mothers: *M* = 38.70 [*SD* = 6.00]; fathers: *M* = 40.46 [*SD*

= 6.70] years) who had typically developing children (i.e., no known or suspected developmental disability) were recruited as a comparison group. The target child (i.e., focus of the study) in both groups was aged 5-12 years. The target child in the ASD group, if multiple children within the household had a confirmed ASD diagnosis, was the oldest as this marks the start of parenting within the context of child ASD. Comparison group children were matched to the ASD group by child age and biological sex. Non-probability, purposive sampling was used to recruit families, methods involved fliers posted in public settings (e.g., libraries, grocery stores, and coffee shops), ASD service agencies, and childcare facilities. In addition, mailings were sent to school districts and through research registries. Study inclusion criteria included being a parent in a committed, long-term couple relationship ($\geq$ 3 years) in which partners lived together and both partners in the couple being willing to participate. The majority of couples were married (98%, n = 366). For the ASD group, the child's diagnosis of ASD was confirmed through medical or educational records that included use of the Autism Diagnosis Observation Schedule (ADOS; Lord et al., 2000) in the diagnostic evaluation process. Parents in both the ASD and comparison group also completed the Social Responsiveness Scale-Second Edition (SRS-2; Constantino & Gruber, 2012) to verify the target child's current ASD symptoms. Five target children in the ASD group scored below a t-score of 60 on the SRS-2 and were not included in analyses. In the comparison group, families were screened to ensure that they did not have any children who had received Birth-to-Three or special education services or who had a known or suspected developmental disability. In addition, the SRS-2 was used to ensure that target children did not exhibit marked ASD symptoms (i.e., had to have an SRS-2 score below 60). In the ASD group, four target children had been adopted (> 5 years before study participation) and in 13 of the couples one of the parents was a stepparent. The

study had IRB approval from the University of Wisconsin-Madison and all participants provided informed consent.

Procedure

Couples participated in a 2.5-hour lab or home visit at Time 1 where they were interviewed about family socio-demographics. Parents then individually completed measures on regarding any BAP traits, the target child's symptoms and emotional and behavioral problems, and their *positive* and *negative dyadic coping* behaviors. Each parent was given $50 for completing this portion of the study.

Measures

Family socio-demographics. Socio-demographic information was jointly reported on by parents in the couple and included parent gender, parent age, marital status, household income, parent education, length of couple relationship, and date of birth of the target child. Parent gender was coded as mothers = 0 and fathers = 1. Parent age was coded in self-reported years. Parent education level was coded: less than high school diploma (0), high school diploma or General Equivalency Diploma (1), some college (2), college degree (3), some graduate school (4), and graduate/ professional degree (5). The month and year when couples first entered into the couple relationship was used to calculate couple relationship length (in years). The target child's date of birth was used to calculate the child age in years.

Parent Level of BAP. The Broader Autism Phenotype Questionnaire (BAPQ; Hurley, Losh, Parlier, Reznick, & Piven, 2007) was also used to evaluate parents' level of BAP. Parents individually completed the self-report version of the questionnaire. The BAPQ was derived from a direct assessment measure of personality and language characteristics associated with ASD (Piven, et al., 1990). Gendered respondent cut-offs values (see Sasson et al., 2013) for continuous

scores will be used. The three subdomain scores include: levels of aloofness, rigidity, and pragmatic language challenges. Each subdomain score is composed of 12-items. A total mean score is also calculated. Sample questions include, "I have been told that I talk too much about certain topics." and "I prefer to be alone rather than with others." The full measure includes 36 statements rated from 1 (very rarely) to 6 (very often). In the current sample, this measure demonstrated adequate internal consistency in the ASD (Cronbach $\alpha = 0.93$) and comparison (Cronbach $\alpha = 0.91$) group.

Dyadic Coping. The Dyadic Coping Inventory (DCI; Bodenmann, 2008) is a 37-item self-report measure that assesses coping behaviors and perceived communication of couples with daily stressors. The measure is designed to assess an individual's attempt to lessen the stress of their partner as well as how the couple copes with stressors as a dyadic unit (Bodenmann, 2008). Three dimensions (supportive, delegated, and joint) are summed to create a *Positive Dyadic Coping* score. Supportive dyadic coping is defined as the one partner provides problem and/or emotion-focused support to the other (10 items). Delegated dyadic coping is defined as one partner taking over the stressor responsibility to lower their partner's stress experience (4 items). Joint coming is defined as both partners experiencing stress and working together to process the stressors equally (5 items). Two dimensions (negative dyadic coping by self and negative dyadic coping by partner) are summed to create the *Negative Dyadic Coping* score. These two dimensions assess whether oneself or their partner utilizes ambivalent, angry, or shallow concern/actions with the intention of causing harm to the other (8 items per dimension). Sample questions include: "When I am stressed, my partner does not take my stress seriously", "When one of us is stressed, we consider it as our stress", and "I express to my partner that I am on his/her side". There are two DCI dimensions that are not part of the *Positive* or *Negative Dyadic*

Coping scores (satisfaction of support received by one's partner and effectiveness of their current dyadic coping processes). Responses on the DCI are made via 5-point scale with responses of 1(very rarely) to 5(very often). The DCI has been found to have good internal reliability and variability in general population samples (Bodenmann, 2008). In the current study, the DCI had good internal reliability in the ASD (Cronbach $\alpha = 0.92$) and comparison (Cronbach $\alpha = 0.93$) group.

Data Analysis Plan

To understand the distribution of the data for our main study variables, bivariate relations among variables and distributional assumptions (i.e., normality) were examined using correlations and boxplots. To address study question 1, descriptive statistics (percentage, means, and standard deviation) were used to describe the level of BAP traits in both the ASD and comparison groups. BAP was considered as a continuous and dichotomous variable. Chi-square and independent samples t-test were conducted to determine if there are differences in sociodemographics between ASD and comparison group. A multivariate analysis of covariance (MANCOVA), controlling for the previously identified sociodemographics that differed by group, was then used to compare level of BAP traits in the ASD vs. comparison group across the three BAPQ (Hurley et al., 2007) subdomains (aloofness, rigidity, and pragmatic language). This comparison was done separately for mothers and fathers. Within this model, the three BAPQ subdomain scores (continuous variable) were the dependent variables. Follow-up Bonferroni-corrected comparisons were used to determine which groups (ASD fathers, ASD mothers, comparison group fathers, and comparison group mothers) significantly differed in BAP subdomain scores. Given our sample size, study question 1 had a 59% chance of detecting group differences of small effect sizes and

greater than 90% chance of detecting group differences of medium effect sizes, using an alpha of .05.

To address study question 2, we first conducted Pearson correlations to examine the association between actor (i.e., one's own) and partner (one's partner) level of BAP (across the three BAPQ domains) and level of *positive dyadic coping* and *negative dyadic coping*. Next, we conducted actor-partner-interdependence models (APIM) using HLM software to examine these associations in nested models that control for the yoked nature of data from parents within couples and to adjust for relevant sociodemographics (i.e., variables associated with dependent measures and/or that differed between the ASD and comparison group). There were two dependent variables in these models: *positive dyadic coping* total score and *negative dyadic coping* total score. The level 1 independent variables were actor BAP and partner BAP subdomain scores (considered as continuous variables using BAPQ). Parent gender was included at level 1. Additional models were run to examine parent gender x actor and parent gender x partner BAP effects. The level 2 variables were parent education, parent age, relationship length, and group (ASD or comparison parent group). For study question 2, based on PINT power calculations using estimated HLM coefficients, we had a greater than 75% of detecting a small effect size and a greater than 95% chance of detecting large effect sizes using an alpha of .05.

Results

Descriptive Statistics

Seven hundred thirty-five parents completed all of our main measures (level of BAP and dyadic coping). Fifteen participants did not complete the main study measures and thus were eliminated from analyses. These 15 participants did not significantly differ from the remaining sample in child age, parent education, parent relationship length, severity of child ASD

symptoms, or child race/ethnicity based on chi-square and independent sample t-test values ($p > .05$). There were no cases with more than 5% of responses missing on an individual measure with the remaining participants. Little's MCAR was run to ensure that the small percentage of items that were missing, were missing at random. The null assumption was upheld and mean imputation was used to fill in missing items on measures. Measures of BAP, co-parenting, and child functioning had relatively normal distributions without skew (kurtosis range -.65 to 1.15 and skew range -.15 to .60).

Differences in family socio-demographics, level of BAP (aloofness, pragmatic language, and rigidity), level of *positive dyadic coping*, and level of *negative dyadic coping* reported by ASD and comparison group were compared using independent sample t-tests and chi-square tests (see *Table 1*). There was a significant difference between ASD and comparison group mothers in level of education ($\chi^2 = 19.83$, $p = 0.03$), *positive dyadic coping* ($t = -4.86$, $p < 0.001$) and *negative dyadic coping* ($t = 3.85$, $p < 0.001$). Group differences in child characteristics were significant and in the expected direction. Specifically, the target child in the ASD group had a higher severity of ASD symptoms on the SRS-2 ($t = 28.42$, $p < 0.001$) and co-occurring emotional and behavioral problems on the CBCL ($t = 15.31$, $p < 0.001$) than the target child in the comparison group. Since these child variables are tied to the grouping variable of interest (ASD vs comparison group) and thus expected as part of group condition they were not controlled for when examining group differences.

Correlations between family socio-demographics and variables of interest (*positive* and *negative dyadic coping*, level of BAP as a mean total score and levels of subscales aloofness, pragmatic language, and rigidity) are shown in Table 2, with the ASD group noted above the diagonal and the comparison group below the diagonal and is shaded. For both groups, *positive*

dyadic coping was negatively associated with *negative dyadic coping* (ASD: $r = -.65$, $p < .001$; CG: $r = -.55$; $p < .001$). Parent age was negatively significantly associated with rigidity in the comparison group ($r = -.11$, $p < .05$) and couple relationship length was significantly negatively associated with rigidity ($r = -.15$, $p < .001$) and BAP total mean ($r = -.15$, $p < .001$). In the ASD group, parent education was significantly negatively associated with rigidity ($r = -.22$, $p < .001$) and the BAP total mean ($r = -.19$, $p < 0.001$). In the comparison group, parent education was significantly negatively associated with pragmatic language ($r = -.14$, $p <0.001$), rigidity ($r = -.11$, **p** $< .05$) and BAP total mean ($r= -.13$, $p < .05$). For both groups (ASD and comparison), BAP total mean was significantly negatively associated with *positive dyadic coping* ($r = -.25$, $p < .001$; $r = -.27$, $p < 0.001$) and positively associated *negative dyadic coping* ($r = .24$, $p < .001$; $r = .26$, $p < .001$). In the ASD group, *positive dyadic coping* was significantly negatively associated with aloofness ($r = -.18$, $p = < .001$), pragmatic language ($r = -.13$, $p < .001$), and rigidity ($r = -.16$, $p < .001$) and *negative dyadic coping* was significantly positively associated with aloofness ($r = .15$, $p < .001$), rigidity ($r = .16$, $p < .001$), and pragmatic language ($r = .13$, $p < .05$). In the comparison group, *positive dyadic coping* was significantly negatively associated with aloofness ($r = -.18$, $p <.001$), pragmatic language ($r = -.14$, $p < .001$), and rigidity ($r = -.18$. $p < .001$) and *negative dyadic coping* was significantly positively associated with aloofness ($r = .11$, $p < .05$) and rigidity ($r = .20$, $p < .001$).

BAP in ASD versus Comparison Group

A one-way MANCOVA was used to address study question 1 and included BAP subscales (aloofness, pragmatic language, and rigidity) and total score as dependent variables. Fixed groups were ASD mothers, ASD fathers, comparison group mothers, and comparison group fathers. Social-demographic covariates included parent age, parent education, and couple

relationship length, as these were the variables that differed by group and/or were associated with BAP. Means and standard deviations for the BAP subscales and total score are displayed in Table 4 along with total scores for each of the four groups using estimates which accounted for robust errors. The overall MANCOVA was significant, $F\ (12, 1889.358) = 8.076$, $p < 0.001$, $Wilks'\ \lambda = .876$, $n_p^2 = .043$. Significant group differences were found in the following univariate tests: aloofness (F (724) =18.142, $p < 0.001$), pragmatic language (F (724) = 8.166, p <0.001), rigidity (F (724) = 3.329, $p = 0.019$), and the BAP total score (F (724) 13.322, $p < 0.001$). Bonferroni corrected follow-up comparisons indicated that mothers in the ASD group reported significantly lower aloofness than fathers in the ASD group and comparison group fathers. Mothers in the comparison group reported significantly lower aloofness than fathers in the ASD and comparison groups. Fathers in the comparison group reported significantly higher pragmatic language challenges compared to mothers in the ASD group and mothers in the comparison group. Mothers in the ASD group reported significantly lower rigidity compared to the ASD fathers. Lastly, fathers in the ASD group reported significantly higher overall level of BAP (total score) as compared to mothers in the ASD group, mothers in the comparison group, and fathers in the comparison group. Mothers in the comparison group reported significantly lower overall level of BAP (total score) than both ASD and comparison group fathers. Table 5 presents BAP as a dichotomous variable using gendered and informant cut-off scores; parents who exceeded the cutoffs were deemed as having BAP (see Sasson, 2013). Parents within the ASD group presented with more cases of BAP across subscales and total scores than their comparison group peers. Based on the BAPQ total score, within our sample, 20% (N=37) of mothers in the ASD group met the cut-off for BAP, while 16% (N= 30) of comparison group mothers met the cut-off for BAP. For fathers, 21% (N = 38) of ASD group fathers met cut-off for BAP, while only 8% (N=14) of

fathers in the comparison group met this cut-off. In terms of BAPQ subdomains, 24% of mothers in the ASD group met the cut-off for aloofness as compared to 20% of the comparison group mothers. Fifteen percent of ASD group mothers met the cut-off for rigidity as compared to 13% of comparison group mothers. Fourteen percent of ASD mothers met the cut-off for pragmatic language compared to 12% of comparison group mothers. Overall, 15% of fathers in the ASD group met the cut-off for aloofness as compared to 10% of comparison group fathers. Seventeen percent of ASD group fathers met cut-off for rigidity as compared to 7% of comparison group fathers. Lastly, 23% of ASD group fathers met the cut-off for pragmatic language whereas only 5% of comparison group fathers me this cut-off.

Actor and Partner BAP and Dyadic Coping

To address study question 2, we first examined Pearson correlations between the subscale values of BAP (aloofness, pragmatic language, and rigidity) and actor and partner *positive dyadic coping* and *negative dyadic coping* for each parent group (ASD mothers, ASD fathers, comparison group mothers, and comparison group fathers) in Table 3. For both ASD (r = -.736, p < .001) and comparison group mothers (r = -.608, p <.001), *negative dyadic coping* was significantly negatively associated with *positive dyadic coping*. *Negative dyadic coping* significantly positively associated with actor aloofness and actor pragmatic language for both ASD (r = .172, p = .019) and comparison group mothers (r = .172, p =.020). For the mothers in the comparison group, partner aloofness was also significantly positively associated with *negative dyadic coping* (r =.163, p = .028), but it was not for ASD mothers. Lastly, *negative dyadic coping* was positively associated with actor rigidity for comparison group mothers (r = .226, p =0.02) and ASD mothers (r = .182, p = .013). *Positive dyadic coping* was significantly negatively associated with actor pragmatic language and actor rigidity for both ASD (r = -.170, p = .020; r =.175, p =

.017) and comparison group mothers (r = -.174, p =.018; r = -.178, p =.016). Actor aloofness was significantly negatively associated with *positive dyadic coping* for ASD mothers (r = -.225 , p =.002) and significantly negatively associated for comparison group mothers (r = -.162 , p = .029). Lastly, partner aloofness was negatively associated with *positive dyadic coping* for comparison group mothers (r = - .195, p = .008). For fathers, *negative dyadic coping* was extremely negatively associated with *positive dyadic coping* in both ASD (r = -.556, p < .001) and comparison groups (r = -.503, p < .001). Actor rigidity was significantly positively associated with *negative dyadic coping* for both ASD (r = .149, p = .043) and comparison group fathers (r = .163, p = .028) but for ASD fathers *negative dyadic coping* was also significantly positively associated with actor aloofness (r = .147, p = .047). *Positive dyadic coping* was significantly negatively associated with actor aloofness and actor rigidity for both the ASD (r = - .151, p = .040) and comparison father groups (r = -.152, p = .018).

Next, dyadic MLMs using HLM were conducted that included all of the actor and partner BAP subdomain scores to predict *positive* and *negative dyadic coping*. Parent gender was included at Level 1 of models to allow us to determine and control for any differences in *positive* and *negatively dyadic coping* between mothers and fathers. Level 2 variables included group and parent age, parent education, and couple relationship length.

Positive dyadic coping. Table 6 displays the model predicting *positive dyadic coping*. There was a significant group effect when all other variables were held at their mean; specifically, comparison parents reported using a higher level of *positive dyadic coping* than parents in the ASD group. When all other variables were at their mean level, actor aloofness and actor rigidity were significantly negatively associated with *positive dyadic coping*. At a trend-level, partner aloofness was also negatively associated with *positive dyadic coping*. Actor and partner pragmatic

language and partner rigidity were not significantly associated with *positive dyadic coping* when the other BAP domains were at their mean.

Follow-up models were run to examine potential interactions of group x actor BAP domain scores and group x partner BAP domain scores on *positive dyadic coping*. There was not a significant effect of group x actor aloofness (*coefficient*= 0.306585, *S.E.* = 0.506554), group x partner aloofness (*coefficient* = -0.370201, *S.E.* = 0.484663), group x actor pragmatic language (*coefficient* = -0.001510, *S.E.* =0.646595), group x partner pragmatic language (*coefficient* = --0.556282, *S.E.* = 0.659206), group x actor rigidity (*coefficien*t = 0.567307, S.E. = 0.627950) or group x partner rigidity (*coefficient* = -0.442284, S.E. = 0.639464). This means that the effect of actor and partner BAP subdomains was similar across the ASD and comparison groups. Given no significant group interactions, these interactions were not included in the final MLM model.

Follow up models were also run to examine potential interactions of parent gender x actor BAP subdomain scores and parent gender x partner BAP subdomain scores on *positive dyadic coping*. There was not a significant effect of parent gender x actor aloofness (*coefficient* = -0.507371, *S.E.* = 0.479349), parent gender x actor pragmatic language (*coefficient* = -0.789641, *S.E.* = 0.660791), parent gender x partner pragmatic language (*coefficient* = -0.814185, *S.E.* = 0.0.659767), and parent gender x actor rigidity (*coefficient* = -0.156424, *S.E.* = -0.296) on *positive dyadic coping*. There was a significant interaction of parent gender x partner aloofness (*coefficient* = -0.899675, *S.E.* = 0.464461) and parent gender x partner rigidity (*coefficient* = -1.316716, *S.E.* = 0.554185). Thus, these latter two parent gender interaction terms were included in the final MLM model. These interactions mean that partner aloofness and partner rigidity was significantly negatively related to *positive dyadic coping* in mothers but not was not associated with differences in *positive dyadic coping* in fathers. However, gender x partner aloofness

(coefficient = -0.362130, *S.E.* = 0.0.575117) and gender x partner rigidity *(coefficient* = -1.066933, *S.E.* = 0.637038) became insignificant when added to the final model and were thus removed.

Another model was run to examine the potential actor x partner interactions on BAP subdomain scores for *positive dyadic coping*. Interactions of actor x partner aloofness on *positive dyadic coping* were insignificant (*coefficient* = 0.447731, *S.E.* = 0.764463). Interactions of actor x partner pragmatic language (*coefficient* = 2.451771, *S.E.* = *1.584417*) and actor x partner rigidity (*coefficient* = -1.389903, *S.E.* = 0.928512) were also insignificant on *positive dyadic coping* and not included in the final model.

Negative dyadic coping. Table 7 displays the final model examining the actor and partner BAP subdomain scores on *negative dyadic coping.* There was a significant group effect at level 2; specifically, comparison group parents reported a lower level of *negative dyadic coping* than ASD group parents, with all other variables held at their mean. Parent age, parent gender, parent education, and couple relationship length was not significantly associated with *negative dyadic coping* in the full model. There was a significant positive association between actor rigidity and *negative dyadic coping*. There was also a trend-level association between actor aloofness and partner aloofness and *negative dyadic coping*. There was not a significant association between actor or partner pragmatic language or partner rigidity and *negative dyadic coping*.

Follow-up models were run to examine potential interactions of group x actor BAP subdomain scores and group x partner BAP subdomain scores on *negative dyadic coping*. There was not a significant effect of group x actor aloofness (*coefficient* = 0.086911, *S.E.* = 0.236469), group x partner aloofness (*coefficien*t = 0.127365, *S.E.* = 0.247651), group x actor pragmatic

language (*coefficien*t = 0.187739, *S.E.* = 0.284930), group x partner pragmatic language (*coefficien*t = 0.174008, *S.E.* = 0.312288), group x actor rigidity (*coefficien*t = -0.255667, *S.E.* = 0.300788), or group x partner rigidity (*coefficien*t = 0.231142, *S.E*. = 0.288686) on *negative dyadic coping*. This means that there was not a significant difference in the association between actor and partner BAP and *negative dyadic coping* between the ASD and comparison group. Thus, these group interactions were not included in the final MLM model.

Follow-up models were also run to examine potential interactions of parent gender x actor BAP subdomain scores and parent gender x partner BAP subdomain scores on *negative dyadic coping*. There was a significant effect for parent gender x partner aloofness (*coefficient* = 0.768015, *S.E*. = 0.304266), meaning that mothers who had a partner with a high level of aloofness, reported that they themselves used a higher level of negative dyadic coping. There was not a significant effect for parent gender x actor aloofness (*coefficient* = 0.233760, *S.E*. = 0.245438), parent gender x actor pragmatic language (*coefficient* = 0.449966, *S.E*. = 0.308505), parent gender x partner pragmatic language (*coefficient* = -0.216202, *S.E*. = 0.339368), parent gender x actor rigidity (*coefficient* = 0.065115, *S.E.* = 0.292353), or parent gender x partner rigidity (*coefficient* = -0.062375, *S.E.* = 0.292998) on *negative dyadic coping.* Thus, none of these parent gender interaction terms were included in the final MLM model.

Lastly, models were run to examine the potential actor x partner interactions on BAP subdomain scores for *negative dyadic coping*. Interactions of actor x partner aloofness on *negative dyadic coping* were insignificant (*coefficient* = -0.081982, *S.E.* = 0.365724). Interactions of actor x partner pragmatic language (*coefficient* = 0.629568, *S.E*. = *0.736380*) and actor x partner rigidity (*coefficient* = -0.347378, *S.E*. = 0.466871) were also insignificant on *negative dyadic coping* and not included in the final model.

Discussion

On average, parents of children with ASD are at at-risk for poor couple/marital relationship outcomes (Brobst et al., 2009; Goetz et al., 2019; Hartley et al., 2017). However, making up this average experience is marked variably in couple relationship experiences. Indeed, some parents of children with ASD are in long standing and thriving couple relationships (see Bekhet et al., 2012). Differences in parent personality traits, including BAP, may explain some of this variability. The overall goals of the current study were to understand the prevalence of BAP in a community sample of parent couples of children with ASD and to determine the effect of these traits in the domains of aloofness, pragmatic language challenges, and rigidity on parent couple processes.

In the current study, BAP traits were evident in both ASD and comparison group parents, which is consistent with previous research showing that these traits are not limited to biological relatives of individuals with ASD but seen along a continuum across the general population (Jobe & White, 2007; Sasson et al., 2013). However, also consistent with prior work (Piven et al., 1997; Rubenstein & Chawla, 2018), parents of children with ASD had more of these traits (in all three domains – aloofness, pragmatic language, and rigidity) than parents of neurotypical children. Overall, 20% of mothers and 21% of fathers in the ASD group had BAP when using the BAPQ cut-offs in comparison to 16% of mothers and 8% of fathers in the comparison group. Previous research has identified associations between parental BAP characteristics and child ASD phenotype (see Rubenstein & Chawla, 2018) however, to our knowledge BAP characteristics within the context of family processes has not been examined. In line with previous findings which suggest that BAP traits might differ by biological sex (Bolton et al., 1994; Dawson et al., 2007; Muphy et al., 2000; Schwichtenberg et al., 2010), fathers in our sample evidenced higher levels of BAP (total mean) and pragmatic language challenges than mothers. BAP traits may

interfere with adaptive couple coping behaviors by hindering communication in through reducing empathetic responding and partner perspective talking, limiting flexible thinking, and making it difficult to decode information, all skills necessary for positive dyadic coping (see Bodenmann et al., 2016).

Our findings suggest that BAP traits may interfere with effective *dyadic coping*, and this is true for both parents of children with and without ASD. Moreover, these effects occur through both actor and partner pathways. Actor and partner BAP across all three subdomains (rigidity, aloofness, and pragmatic language) were significantly correlated with positive and negative dyadic coping. However, when examining all subdomains in a single MLM, some of these traits had stronger effects than others. In contrast to our hypothesis, when simultaneously considering all BAP subdomains, rigidity and aloofness (versus pragmatic language) had the most robust ties to maladaptive dyadic coping. Having a high level of rigidity, oneself (i.e., actor effect) predicted a lower level of *positive dyadic coping* in fathers but not in mothers. Actor aloofness (oneself) was also a significant predictor of lower levels of *positive dyadic coping*. Partner aloofness was associated with a lower level of *positive dyadic coping* in mothers but not in fathers. In line with our hypothesis, the association between actor and partner BAP and dyadic coping was similar across the ASD and comparison groups. Thus, while parents of children with BAP may be more like to have BAP traits, the effect of these traits on couple coping processes is similar outside of the context of having a child with ASD.

Our findings highlight the role of aloofness and rigidity in couple processes. As noted by Olsen et al.'s (1979) circumplex model of marital and family systems, family cohesion is reliant on flexibility. Actor or partner rigidity may limit cohesion within the couple relationship through the practice of rigid beliefs and behaviors that enmeshes them beyond autonomy or disengages

one or both members from one another to protect autonomy. In other words, a couple which includes a parent with a high level of rigidity could become so co-dependent on routine processes and behaviors that they lose their ability to act with autonomy or, in contrast, the fear of losing control of behaviors and practices leads a parent into isolation from their partner. Parents who evidence a higher level of rigid traits may be more emotionally distant and less likely to take over their partner's stressor or jointly cope with stressors out of a fear of losing their autonomy. Parental aloofness could also hinder partners from being able to adapt to stressors.

It is not clear why pragmatic language problems did not have as robust of an association with *positive* and *negative dyadic coping* as the other BAP subdomains. This could indicate that parent-couples that include a partner with a pragmatic language deficit have come to accept one another's communication quirks provided they can adapt and be flexible to change associated with marital stressors. This could be a result of study participants being members of committed relationships in which they have developed and grown accustomed to one another's verbal communications. Pragmatic language impairments (PLI) at a clinical level, within the context of ASD and outside the context of ASD is well associated with behavioral challenges or problem behavior such as hyperactivity and limitations in the use of prosocial behavior (Ketelaars et al., 2010). It is possible that the subclinical assessment of pragmatic language deficits is not pronounced enough to elicit significant changes in a parent's adaptive coping behaviors. The current study suggests that specific BAP characteristics may be associated with parent-couples' adaptive coping behaviors across parent populations (ASD and comparison).

Our finding that BAP traits involving aloofness and rigidity may have strong impacts on couple-level coping processes is in line with some prior research. Losh and Piven (2006) also reported that BAP aloofness traits had especially strong associations with social cognition

problems among couples parenting a child with ASD. It is possible that parents with high aloofness may be prone to working on stressors individually and struggle interpreting and accommodating their partner's stressors. If one's partner has a high level of aloofness, it is possible that one's self would employ higher *negative dyadic coping* behaviors because they themselves do not feel supported within the subsystem.

Findings from this study point to specific characteristic challenges in which targeted couples' interventions and therapies could focus on identifying and strengthening communication practices around. Within our sample, rigidity was the strongest predictor of dyadic coping. Parents who reported a higher level of rigidity, were significantly more likely to report lower levels of *positive dyadic coping* behaviors and higher levels of *negative dyadic coping behaviors*. Parents who evidence higher levels of rigidity and aloofness could be prone to poorer marital and family outcomes through deficits in adaptive behaviors and problem solving. Targeted interventions and therapies could enhance marital couples and family subsystems communication skills in order to promote greater reliance on positive adaptive coping behaviors.

Strengths and limitations. This study had many strengths. The use of both ASD and comparison group parent-couples allowed us to examine the effect of parental BAP on *positive* and *negative dyadic coping* between mothers and fathers and across the child ASD and neurotypical populations. The use of MLMs supported the simultaneous evaluation of actor and partner effects of BAP characteristics within and between families. Additionally, MLMs also allowed us to investigate the relationship between subscale dimensions when viewed independently and collectively to better understand the driving deficits behind more positive and negative dyadic coping processes. Targeted children enrolled in the student had a clinical diagnosis of ASD by an independent clinician and comparison children were matched by age,

gender, and other social demographics. This study also has some limitations. Our study sample was limited in terms of racial and ethnic diversity, with the majority of our participants identifying as Caucasian, non-Hispanic. Inclusion criteria for participation in our study didn't allow for couples who were in the process of separating or divorcing, they were required to be in stable relationships in excess of 3 years. This prevented us from including participants who were in newer relationships with additional children from blended families. This study also utilized self-report to measure BAP characteristics and dyadic coping behaviors and was cross-sectional. Future research should consider longitudinal research to better understand effects of BAP characteristics across time using objective and subjective measures of BAP and dyadic coping processes such as observational task-oriented research and informant report.

Summary

To summarize, findings from the current research suggest that BAP traits may create challenges to how parents work together to manage stressors. In the current community sample, 20% of mothers and 21% of fathers in the ASD group had BAP based on total score. Thus, while BAP traits are not limited to biological relatives of individuals with ASD, they occur at a higher rate in these relatives. There were important associations between BAP traits (in both oneself and in one's partner) and dyadic coping behaviors. In particular, BAP traits involving rigidity (e.g. difficulty with change, challenges with cognitive and behavioral flexibility) and aloofness (e.g., disinterested in social communication) appeared to take a toll on dyadic coping processes. The effect of actor and partner BAP on dyadic coping was similar across the ASD and comparison groups. However, given their higher likelihood of having BAP traits, parents of children with ASD may be more likely to experience these effects. Our findings highlight that BAP traits may get in the way of effective couple processes and thus are an important target for interventions.

Strategies for recognizing and managing any negative effect of rigidity and aloofness on couple processes may be important. For example, this could include targeted interventions aimed at promoting communication strategies that emphasize empathy and enthusiasm towards parent-couple interactions.

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Tables

Table 1. *Socio-demographic characteristics of the autism spectrum disorder (ASD) and comparison parent groups*

	ASD (n= 378)	Comparison (n=370)	t value or x^2, p value
Mother			
Age in years [M(SD)]	38.73(5.63)	38.70 (6.00)	*t(368)=.037, p = .97*
Race/ethnicity [N (%)]			
White, non-Hispanic	168 (89.8%)	159 (85.5%)	*χ2*(2, N=369)9.66, p =.09
Other	18 (9.5%)	24 (12.9%)	
Education [N (%)]			
No HS degree	3(1.6%)	5 (2.7%)	*χ2*(5, N=369)19.83, p= .03
HS degree or equivalency	11(5.8%)	10 (5.3%)	
Some college	30(16.0%)	18 (9.7%)	
Associates or bachelor's degree	97(51.9%)	87 (46.8%)	
Graduate degree	38(20.3%)	62 (33.3%)	
BAP total score	2.71 (0.61)	2.65 (0.52)	*t(370)=89.99, p= <0.001*
BAP aloofness	2.78 (0.83)	2.66 (0.78)	*t (368) = 64.79, p= < .001*
BAP pragmatic language	2.38 (0.63)	2.34 (0.54)	*t (368) = 76.57, p= < .001*
BAP rigidity	2.97 (0.77)	2.96 (0.68)	*t (368) = 78.56, p= < .001*
Positive DCI	63.89(11.49)	69.29 (11.08)	*t(369)= -4.86, p= <.001*
Negative DCI	17.83(5.70)	15.57(5.50)	*t(369)= 3.85, p = <..001*
Father			
Age in years [M (SD)]	40.76(6.22)	40.46 (6.70)	*t(367)=120.45, p=.67*
Race/ethnicity [N (%)]			
White, non-Hispanic	164 (87.7%)	155 (82.9%)	*χ2*(2, N=369)20.05, p=<.001
Other	22 (11.8%)	28 (15.0%)	
Education [N (%)]			
No HS degree	10 (5.4%)	4 (2.2%)	*χ2*(5, N=369)12.89,p= .23
HS degree or equivalency	22 (24.6%)	14 (7.5%)	
Some college	29 (15.5%)	24 (12.8%)	
Associates or bachelor's degree	90 (48.1%)	88 (47.1%)	
Graduate degree	33 (17.7%)	50 (26.7%)	
BAP total score	3.04 (0.61)	2.84 (0.50)	*t* (367) = 99.07, *p*= < .001
BAP aloofness	3.25 (0.84)	3.08 (0.82)	*t* (367) = 72.95, *p*= < .001
BAP pragmatic language	2.69 (0.70)	2.44 (0.51)	*t* (367) = 79.01, *p*= < .001
BAP rigidity	3.19 (0.73)	2.99 (0.58)	*t* (367) = 89.55, *p*= < .001
Positive DCI	63.59(11.40)	69.34 (11.40)	*t(369)=-2.58, p= .01*
Negative DCI	17.83(5.70)	15.57 (5.50)	*t(369)=-4.23, p=<.001*
Couples' Relationship			
Relationship length [M (SD)]	14.5 years (5.87	15.5 years (5.30)	*t(373)=-1.79, p=.08*
Household income [M (SD)]	9.16 (3.08)	10.54 (2.98)	*t(362)=-4.31, p=<.001*
Target child			
Male [N (%)]	160 (85.6%)	154 (82.8%)	*χ2*(2, N=372) .38, p= .54
Female [N (%)]	27 (14.4%)	31 (16.7%)	
Child Age [M (SD)]	7.90 (2.34)	7.96 (2.36)	t(372)=.-.25, p= .81
ID [N (%)]	65 (34.8%)	0	*χ2*(2, N=372)77.92, p=<.001
SRS-2 [M (SD)]	77.82 (10.65)	49.67 (8.26)	*t(370)= 28.42, p =<.001*
CBCL [M (SD)]	65.45 (9.89)	49.41 (10.26)	*t(370)=15.31, p=<.001*

Note. *HS* high school, *BAP* broader autism phenotype, *ID* intellectual disability, *SRS* Social Responsiveness Scale total t-score score, *CBCL* child behavioral checklist total T-score. Dyadic Coping assessed through the dyadic coping inventory (DCI; Bodemann,2008). Target child data as well as relationship length and household income were taken from Mothers' reports.

Table 2. *Correlations of key study variables*

	1.	2.	3.	4.	5.	6.	7.	8	9.	10.	11.
1. Child Age	-	0.024	0.018	.327**	0.022	0.064	-0.004	-0.038	-0.058	-0.026	-0.053
2.Parent Age	.268**	-	0.020	0.085	0.072	0.034	-0.019	0.027	-0.004	-0.077	0.048
3.Parent Education	-.105*	.144**	-	.128*	-0.004	-0.053	0.062	-0.095	-0.099	-.216**	-.185**
4.Relationship Length	.397**	.332**	0.071	-	0.096	-0.041	0.045	-0.018	-0.056	-0.060	-0.022
5.SRS	0.047	-.127*	-.218**	-0.034	-	-0.096	.195**	0.093	0.057	.121*	.148**
6. Positive DC	0.053	-0.038	0.067	-0.014	-.229**	-	-.650**	-.179**	-.134**	-.164**	-.253**
7.Negative DC	0.000	-0.018	-0.087	0.058	.195**	-.547**	-	.147**	.131*	.162**	.239**
8.Aloofness	-0.037	-0.009	-0.086	-0.088	.204**	-.182**	.109*	-	.599**	.445**	.560**
9.Pragmatic Language	0.019	-0.001	-.138**	-0.006	.110*	-.138**	0.094	.458**	-	.371**	.466**
10.Rigidity	-0.076	-.107*	-.109*	-.150**	.117*	-.178**	.196**	.366**	.374**	-	.795**
11.BAP Mean	-0.099	-0.035	-.130*	-.153**	.246**	-.274**	.261**	.412**	.475**	.757**	-

Note. DC = dyadic coping level, SRS = autism symptom severity of the child, BAP = Broad Autism Phenotype, *= $p < 0.05$, **= $p < 0.01$. Values below the diagonal and shaded = comparison group, values above the diagonal and not shaded = ASD group.

Table. 3 *Actor and partner correlations of BAP subscales, positive, and negative dyadic coping*

		1	2	3	4	5	6	7	8
ASD Group	1. Negative DC	1	-.736**	.172*	0.120	.170*	0.031	.182*	0.101
	2. Positive DC	-.556**	1	-.225**	-0.059	-.170*	-0.021	-.175*	-0.089
	3. Actor Aloofness	.147*	-.151*	1	-0.127	.563**	-0.122	.417**	0.005
	4. Partner Aloofness	0.058	-0.078	-0.127	1	0.052	.611**	0.001	.437**
	5. Actor Pragmatic Language	0.104	-0.103	.611**	-0.122	1	0.051	.317**	0.033
	6. Partner Pragmatic Language	0.070	-0.028	0.052	.566**	0.051	1	-0.014	.399**
	7. Actor Rigidity	.149*	-.158*	.437**	0.005	.399**	0.033	1	0.019
	8. Partner Rigidity	0.108	-0.058	0.001	.416**	-0.014	.319**	0.019	1
Comparison Group	1. Negative DC	1	-.608**	.172*	.163*	.172*	-0.027	.226**	0.024
	2. Positive DC	-.503**	1	-.162*	-.195**	-.174*	-0.085	-.178*	-.155*
	3. Actor Aloofness	0.067	-.152*	1	0.036	.439**	-0.014	.441**	-0.111
	4. Partner Aloofness	-0.045	0.090	0.036	1	0.105	.422**	-0.007	.285**
	5. Actor Pragmatic Language	0.033	-0.058	.422**	-0.014	1	0.098	.439**	0.068
	6. Partner Pragmatic Language	0.036	0.116	0.105	.439**	0.098	1	-0.016	.305**
	7. Actor Rigidity	.163*	-.174*	.285**	-0.111	.305**	0.068	1	0.047
	8. Partner Rigidity	0.048	0.108	-0.007	.441**	-0.016	.439**	0.047	1

Note. BAP = broader autism phenotype. ASD Group = parents of children with ASD, DC = dyadic coping, *= $p < 0.05$, **= $p < 0.01$. Moms' correlations are above the diagonal and unshaded, dads' correlations are below the diagonal and shaded.

Table 4. *Means, standard deviations, and multivariate analysis of covariance analysis for broader autism phenotype subscales and categories for parents (gender and group)*

	ASD		Comparison					
	Mothers N=183 (A)	Fathers N=180 (B)	Mothers N=180 ©	Fathers N=181 (D)	F value	P value	n_p^2	Significant Group Diff
Aloofness (M, [SD])	2.68 (.84)	3.20 (.92)	2.75 (.76)	3.13 (.72)	18.142	<0.01**	.071	A < B, D C <B, D
Pragmatic Language (M, [SD])	2.34 (.59)	2.51 (.65)	2.39 (.59)	2.63 (.59)	8.166	<0.01**	.033	D > A, C
Rigidity (M, [SD])	2.97 (.76)	3.19 (.72)	2.96 (.68)	2.99 (.58)	3.329	.014*	.014	B > A, C
Total Mean BAP (M, [SD])	2.70 (.61)	3.04 (.62)	2.66 (.53)	2.84 (.50)	13.322	<0.01**	.053	B > A, C, D D > C

Note. BAP = broad autism phenotype, ASD = parents of a child with ASD, CG = comparison group parents. * = $p < 0.05$, ** = $p < 0.01$. Covariates included parent age, parent education, and relationship length.

Table 5. *BAP as a dichotomous variable*

	BAP cutoff	BAP present N=ASD (CG)	% present ASD (CG)
Moms ASD(CG)			
Aloof	3.45	44 (37)	24(20)
Rigid	3.70	27 (23)	15(13)
Pragmatic language	2.94	26 (21)	14 (12)
Mean Total Score	3.17	37 (30)	20(16)
Dads ASD (CG)			
Aloof	4.13	28 (18)	15 (10)
Rigid	3.91	31 (12)	17 (7)
Pragmatic Language	3.23	43(9)	23(5)
Mean Total Score	3.55	38(14)	21(8)

Note. BAP = broad autism phenotype, CG = control group, ASD = autism spectrum disorder

Table 6. *Broad autism phenotype on positive dyadic coping*

Positive Dyadic Coping

Level 1	Coefficient	S.E.	*t*-ratio	P value
Aloofness Actor	-1.369525	0.595541	-2.300	0.022*
Aloofness Partner	-1.106020	0.579030	-1.910	0.057
Pragmatic Language Actor	-0.566587	0.751274	-0.754	0.451
Pragmatic Language Partner	1.035191	0.750535	1.379	0.169
Rigidity Actor	-1.846763	0.666846	-2.769	0.006*
Rigidity Partner	-0.594398	0.685415	-0.867	0.386
Parent Gender	0.415753	0.332634	1.250	0.212
Level 2				
Intercept1	65.817356	0.469563	140.167	< 0.001
Group	-1.941715	0.493659	-3.933	< 0.001**
Mom's age	-0.102312	0.167542	-0.611	0.542
Dad's age	0.066880	0.155015	0.431	0.666
Mom's education	-0.346955	0.306754	-1.131	0.259
Dad's education	0.332474	0.286491	1.161	0.247
Relationship length	-0.111576	0.104535	-1.067	0.287
Variance Components (SD)		*d.f.*	X^2	P value
Intercept	47. 89894 (6.92091)	353	846.25970	< 0.001
Level 1 effect	67.55575 (8.21923)			

Note. . * = p < 0.05, ** = p < 0.01. Covariates included parent age, parent education, and relationship length.

Table 7. *Broad autism phenotype on negative dyadic coping***.**

Negative Dyadic Coping

Level 1	Coefficient	S.E.	*t*-ratio	P value
Aloofness Actor	0.533662	0.294393	1.813	0.071
Aloofness Partner	0.578680	0.302056	1.916	0.056
Pragmatic Language Actor	0.274482	0.338831	0.810	0.418
Pragmatic Language Partner	-0.378160	0.383350	-0.986	0.325
Rigidity Actor	1.181031	0.328416	3.596	< 0.001**
Rigidity Partner	0.470714	0.328917	1.431	0.153
Parent Gender	0.240686	0.174489	1.379	0.169
Parent Gender x Partner Aloofness	0.768015	0.304266	2.311	0.012*
Level 2				
Intercept1	16.517260	0.42296	68.170	< 0.001**
Group	1.059005	0.240243	4.408	<0.001**
Mom's age	0.027058	0.083998	0.322	0.748
Dad's age	-0.013408	0.068283	-0.196	0.844
Mom's education	0.099130	0.157298	0.630	0.529
Dad's education	-0.095545	0.135025	-0.708	0.480
Relationship length	0.010776	0.051507	0.209	0.834

Variance Components (SD)		*d.f.*	X^2	P value
Intercept	12.23781 (3.49836)	354	806.69225	< 0.001**
Level 1 effect	18.85037 (4.34170)			

Note. * = p < 0.05, ** = p < 0.01. Covariates included parent age, parent education, and relationship length.

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Abstract: Manuscript 1

The quality of parent-couple relationships is a robust predictor of adult physical and psychological well-being (Carr & Springer, 2010). Specific traits (e.g., neuroticism) and conditions (e.g., depression) have long been associated with difficulties establishing and maintaining romantic relationships. Broader autism phenotype traits (BAP) are also linked to negative couple outcomes such higher levels of conflict (Hartley et al., 2019) and lower levels of relationship satisfaction (Pruitt et al., 2018). BAP has been evidenced across populations including those with and without ties to a child with autism spectrum disorder (ASD) as a milder expression of ASD traits. The current study examined the association between actor and partner level of BAP traits on parent-couples use of *positive* and *negative* dyadic coping in couples parenting a child with ASD and those with children with no developmental disability using the Broader Autism Phenotype Questionnaire (BAPQ; Hurley et al., 2007) and the Dyadic Coping Inventory (DCI; Bodenmann, 2005). MLMs were conducted using Hierarchical Linear Modeling (HLM 7) software to test Actor-Partner Interdependence Models. Results indicated an actor effect of rigidity on both the use of *positive* and *negative dyadic coping*. Additionally, we found a gender effect on partner's aloofness on negative dyadic coping, suggesting that mothers evidenced higher levels of negative dyadic coping when their partner (fathers) evidenced a higher level of aloofness than mothers whose partners had lower levels of aloofness. Overall, findings suggest that mothers and fathers are impacted by BAP traits within the couple relationship. Implications for targeted interventions are discussed.

Keywords: Broader autism phenotype (BAP), dyadic coping, rigidity, aloofness, couple relationship, autism

Chapter 2: Manuscript 1

Abstract: Manuscript 2

This study aimed to examine the association of broader autism phenotype (BAP) as a dichotomous variable (absent or present) and a continuous on children's co-occurring emotional and behavioral problems within couples parenting a child with autism spectrum disorder (ASD). A total of 184 parent-couples who had a child with ASD between 2-16 years of age completed assessments of own's own broader autism phenotype characteristics, co-parenting relationship quality, and children's co-occurring emotional and behavioral problems. Actor-partner interdependence modeling (APIM) and analysis of covariance (ANCOVA) indicated that the presence of BAP within the parenting dyad was associated with lower levels of co-parenting relationship quality regardless of which parent evidenced BAP characteristics or if both parents evidenced BAP, as compared to parent-couple dyads with no BAP. MLMs further indicated that the level of parental BAP was negatively associated co-parenting relationship quality at a trend level. Lastly, we found that co-parenting relationship quality was a partial mediator of BAP traits on children's co-occurring emotional and behavioral problems thus suggesting that altered co-parenting relationship quality is an important mechanism for which parental BAP can impact child outcomes, specifically for fathers. These findings should serve to inform psychoeducational interventions aimed at strengthening co-parenting relationship behaviors (e.g., communication, expectations, and support) and modeling desired behaviors and behavioral regulation for children with ASD.

Keywords: broad autism phenotype (BAP), co-parenting quality, autism (ASD), emotional and behavioral problems

Chapter 3: Manuscript 2

Parenting Experiences in the Context of Broader Autism Phenotype

Autism spectrum disorder (ASD), a neurodevelopmental condition that includes social communication deficits and repetitive and restricted behaviors (American Psychiatric Association, 2013), is currently estimated to occur in 1 in 44 children in the United States (Maenner et al., 2021). In addition to ASD symptoms which involve impairments in social communication and restricted and repetitive behaviors, children with ASD often present with co-occurring emotional and behavioral problems such as inattention, hyperactivity, and anxiety (see Li et al., 2020; Matson & Shoemaker, 2009; Menezes & Mazurek, 2021). To date, ASD research has largely focused on how child ASD symptoms and co-occurring emotional and behavioral problems influence parenting experiences and there is robust literature on these effects. However, a growing body of empirical evidence indicates that parent attributes and parenting experiences also shape the functioning of the child with ASD (see Clauser et al., 2021; Osborne et al., 2008; Rodriguez et al., 2019). Thus, there is an important need within the ASD field for research that identifies the specific parent traits and behaviors that shape child outcomes in positive and negative ways, and thus could be the target of interventions alongside of traditional applied behavioral analysis interventions aimed at modifying the child's behaviors. One set of parent traits that may shape parenting experiences, and is of particular relevance to parents of children with ASD, is the broader autism phenotype (BAP).

Parents of children with ASD are more likely than their peers who have typically developing children to exhibit subclinical levels of ASD symptoms and behaviors (Ingersoll & Hambrick, 2011; Losh, Childress, Lam, & Piven, 2008). This set of subclinical behaviors and characteristics are known as BAP, and include social-emotional deficits such as pragmatic

language deficits (i.e., awkward verbal exchanges or disinhibited social communication) and aloofness (i.e., difficulty making eye contact with others, inappropriate or inadequate responses in social contexts) as well as rigid and repetitive behaviors (i.e., finger or foot tapping, rumination of thoughts, or limited interests) (Losh et al., 2008). These traits are present in both parents of children with ASD and in general population samples of individuals without relatives with ASD (Constantino & Todd, 2003; Job & White, 2007; Landry & Chouinard, 2016). However, BAP has been found to be elevated in first-degree relatives of children with ASD. Indeed, 20 - 50% of first-degree relatives of children with ASD have one or more feature of BAP (Dawson et al., 2007) compared to 5-9% in individuals without known genetic links to ASD (Sasson et al., 2014). Across studies, males have been found to be more likely than females to evidence the behaviors and characteristics associated with BAP (Klusek et al., 2014).

The family systems framework posits that the experiences and functioning of individuals and subsystems within the family (i.e., parent-couple subsystem, parent-child subsystem, sibling subsystem) are intertwined (McHale & Lindahl, 2011). Thus, parent traits and behaviors such as BAP are thought to influence the experiences of other family members (spouse/partner and children) and influence how well parents work together and with other family members. Thus, in this framework, parent BAP could have direct effects on the functioning of the child with ASD and/or could influence child functioning by altering the quality of the co-parenting relationship. Co-parenting relationship quality refers to the subjective experience of perceived partner support of one's own parenting practices, in addition to the level of undermining behaviors enacted by the co-parent, and of parenting practices endorsement received by one's co-parent and given to one's co-parenting partner (Feinberg, Brown, & Kan, 2012). Co-parents who evidence high levels of co-parenting quality report feeling in-sync and supported in their co-parenting relationship. Co-

parenting relationship quality has been found to be associated with a variety of aspects of the parenting experience in general population samples. For example, co-parenting relationship quality has been found to be related to the level of parenting stress experienced by both mothers and fathers in general populations (Bonis, 2016; May et al., 2015). Indeed, parents who report higher levels of co-parenting support from their partner report lower levels of stress which subsequently, was found to facilitate the use of more optimal parenting practices such as warmth and engagement (Bonds, Gondoli, Sturge-Apple, & Salem, 2002). In turn, these more optimal parenting practices foster better child functioning. Indeed, co-parenting relationship quality has important links with child functioning. Robust research has reported that the quality of the co-parenting relationship is associated with children's behavioral and emotional outcomes in studies on the general population (see Cummings, Davies, & Simpson, 1994; Gartland & Day, 1992; Katz & Gottman, 1993; McHale, 2007; van Eldik et al., 2020), and this includes evidence from longitudinal studies (see Heinrichs et al., 2010; Kaniušonytė & Žukauskienė,2016). Moreover, within studies on the general population, co-parenting relationship quality that includes hostility and undermining behaviors (i.e., competitive parenting behaviors with co-parent) has been associated with teacher-reports of higher levels of child aggressive behaviors (McHale & Rasmussen, 1998). Maladaptive conflict-resolution behaviors enacted by co-parenting partners, such as emotionally distant, hostile, and withdrawn couple problem solving behaviors, have also been found to predict a higher level of internalizing and externalizing behavior problems (i.e., antisocial behaviors and anxiety) in children without ASD years later (Katz & Gotman, 1993).

To-date, only sparse research has examined the association between co-parenting relationship quality and the severity of ASD symptoms and/or co-occurring emotional and behavioral problems of children with ASD. In a recent systematic review of the literature related

to co-parenting within the context of child ASD, Downes and Cappe (2021) identified the unique experiences of co-parenting a child with ASD including a greater amount of child responsibility to divide among parents and a tendency to experience a higher level of parenting stress than parents of children without ASD. The authors highlighted the need for research to examine how the co-parenting relationship affects the child with ASD as this question has received relatively little research attention to-date. The limited research on this topic has shown associations between higher co-parenting relationship quality and better child functioning including higher levels of prosocial behavior and lower levels of internalizing and externalizing behavioral problems (Sim et al., 2017; Sim et al., 2018). For example, Sim et al., (2017) found that lower levels of co-parenting relationship quality (i.e., feeling unsupported or socially isolated) was related to a more strained parent-child relationship. Thus, as is true for outside of the context of child ASD, parents of children with ASD who have a strong co-parenting relationship may be better able to maintain adaptive parenting than those who do not feel close and supported by their parenting partner.

There is reason to believe that BAP traits may hinder parents from forming a close and adaptive co-parenting relationship. BAP includes personality characteristics such as aloofness, rigid and repetitive behaviors, and deficits with pragmatic language or social communication (Ingersoll & Wainer, 2014; Losh et al., 2008). These traits have been found to be associated with impaired interpersonal relationships. For example, in a general population study of 514 adults, a higher level of BAP in the domain of social impairments was associated with lower social skills during observed stranger interactions (Sasson, 2012). In this study, individuals with higher levels of BAP evidenced impairments in terms of picking up on others' emotions, understanding others' facial expressions, and being able to take perspectives within interpersonal relationships. These social difficulties may interfere with the ability to discuss and resolve child-related problems with

a parenting partner and to provide and receive support in a co-parenting relationship. Indeed, higher levels of parental BAP have been found to be associated with numerous parenting challenges within general population samples such as lower levels of parenting satisfaction, lower self-reported parental support, and increased challenges associated with parenting responsibilities (DeLucia et al., 2021; Dissanayake et al., 2020). Moreover, parents with higher BAP report lower levels of enjoyment and fulfilment within their parent-child relationships (Dissanayake et al., 2019). Fathers who evidence high levels of BAP characteristics have also been found report lower levels of parenting efficacy than those with lower levels of these characteristics (Lau et al., 2016). Further, in a community sample of 138 individuals parenting a child between the ages of 6 and 18 years, a higher level of BAP was associated with lower levels of positive parenting practices, parenting involvement, and child monitoring, and a higher use of inconsistent discipline (DeLucia et al., 2021). Similarly, in a recent study of parents of children with ASD (N=148), mothers with higher levels of BAP were more likely to exhibit lower levels of warmth within her family relationships (i.e., mother-child, mother-couple) and fathers with higher levels of BAP also evidenced higher levels of criticism and lower levels of warmth within his own family relationships and other family member relationships (i.e., mother-child relationship) (Hickey, Nix, & Hartley, 2019). Thus, there is reason to believe that BAP may alter the co-parenting relationship in ways that are detrimental to fostering positive functioning in children with ASD. These impacts may be exacerbated if both parents are high on BAP, however, to-date research has yet to examine multiple incidences of BAP within a family.

Current Study

The aims of the current study were to: 1) determine whether one's own (actor) and one's partners (partner) parent BAP level (assessed as a continuous variable) was associated with the

co-parenting relationship quality; 2) evaluate whether the number of parents with an elevated level of BAP (assessed as a dichotomous variable) within a family (none, one, or two) influences co-parenting relationship quality, and 3) examine whether parent BAP is in part associated with child emotional and behavioral problems through (i.e., partial mediator) a more negative co-parenting relationship quality. For all questions, BAP was be assessed using the BAPQ total score. Drawing on actor-partner models, we hypothesized that a higher level of parent BAP (in both oneself and one's partner) would be associated with lower co-parenting relationship quality. We also predicted that families with two parents with elevated BAP would report a lower level of co-parenting relationship quality than those with one or no parents. Finally, we predicted that co-parenting relationship quality would partially mediate the association between a higher level of parent BAP and co-occurring emotional and behavioral problems.

Methods

The current study draws from the first time point of data from the Family Outcomes in Autism Spectrum Disorder, a longitudinal study (R01MH199091; Hartley). This longitudinal study originally involved a sample of 189 parent couples (mothers: M = 38.73 [SD =5.63 years] fathers: M = 40.76 [SD = 6.70] years) who had at least one child with ASD at the first time point of the study. At time 1, the target child (i.e., focus of the study) was aged 5-12 years. If multiple children within the household had a confirmed ASD diagnosis, the eldest child was selected as the target child. Selection of the eldest child marks the start of parenting within the context of when ASD began. Purposive sampling was used to recruit families, which involved fliers posted in public settings (e.g., libraries, grocery stores, and coffee shops), ASD service agencies, and childcare facilities. Additionally, mailings were sent to school districts and through research registries. Inclusion criteria included being a parent in a committed, long-term couple relationship

(> 3 years). Partners needed to live together and both partners in the couple needed to be willing to participate. The majority of couples were married (n = 183 couples). For the ASD group, ASD diagnoses needed to be confirmed through medical or educational records and the Autism Diagnosis Observation Schedule (ADOS; Lord et al., 2000) had to have been administered in the diagnostic evaluation. Parents completed the Social Responsiveness Scale-Second Edition (SRS-2; Constantino & Gruber, 2012) to confirm the target child's current ASD symptoms. Five target children scored below a t-score of 60 on the SRS-2 and were not included in analyses. Among the participants, four target children had been adopted (> 5 years before study participation) and in 13 of the couples one parent was a stepparent. The study had IRB approval from the University of Wisconsin-Madison. All participants provided consent prior to study activities.

Procedure

Parent-couples participated in a 2.5-hour lab or home visit where they individually completed measures on socio-demographics, child's autism symptom severity and co-occurring behavioral problems, parent BAP level, and co-parenting relationship quality. Each parent was given $50 as an incentive for this part of the study.

Measures

Family Socio-demographics. Family socio-demographic information was reported by parents and included in analyses as control variables when significantly correlated with self- or partner-reported level of co-parenting relationship quality. The target child's age was reported in years and their biological sex was reported as female = 1 and male = 0. The presence of co-occurring child intellectual disability was based on having a medical/educational diagnosis of intellectual disability or having an IQ and adaptive behavior in the intellectual disability range as reported in medical or educational records provided by parents. The presence of child intellectual

disability was reported as intellectual disability = 1 or no intellectual disability = 0. Couples' relationship length was reported in years and based on when the couple reported having entered into a committed relationship with their current partner. Household income was coded 1-14, beginning at ≤ $9,999 (coded =1) and then increasing by $10,000 to $20,000 intervals to ≥ $160,000 (coded = 14). Individually, parents reported on their race and ethnicity, education, and employment status. Parent education level was coded: less than high school diploma (0), high school diploma or General Equivalency Diploma (1), some college (2), college degree (3), some graduate school (4), and graduate/ professional degree (5).

Child's Co-occurring Emotional and Behavior Problems. Children's co-occurring emotional and behavioral problems were assessed using the Child Behavioral Checklist (CBCL; Achenbach, & Edelbrock, 1991). The CBCL is a 140-item survey designed to measure both internalizing and externalizing behaviors. The version of the CBCL administered is dependent on the child's age (under 5 years or over 5 years of age). Likert-based questions identify specific behaviors by frequency on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, and 2 = very true or often true) The CBCL scores seven different behavioral symptoms (Emotionally Reactive, Anxious/Depressed, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems, and Aggressive Behavior), and five different DSM-oriented scales (Affective Problems, Anxiety Problems, Pervasive Developmental Problems, Attention-Deficit/Hyperactivity Problems, and Oppositional Defiant Problems) for a total composite score. The CBCL total t-score demonstrated high internal consistency in the current sample (CBCL for 5-year olds Cronbach $\alpha = 0.95$, CBCL for 6-12-year olds Cronbach $\alpha = 0.94$).

Parent Level of BAP. The Broader Autism Phenotype Questionnaire (BAPQ; Hurley, Losh Parlier, Reznick, & Piven, 2007) was used to evaluate parents' level of BAP. Parents

individually completed the self-report version of the questionnaire. The BAPQ was derived from a direct assessment measure of personality and language characteristics associated with ASD (Piven, et al., 1990). The measure includes 36 statements rated from 1 (very rarely) to 6 (very often). Sample items include: “I am “in-tune” with the other person during conversation”, “I find it hard to get my words out smoothly”, and “I keep doing things the way I know, even if another way might be better”. In the current sample, this measure had adequate internal consistency (Cronbach $\alpha = 0.93$). Gendered respondent cut-offs values (see Sasson et al., 2013) were used.

Co-parenting relationship quality. Level of co-parenting relationship quality was measured using 20 items from the Co-parenting Relationship Scale (CPRS; Feinberg, Brown, & Kan, 2012). This adapted measure utilizes a 4-point Likert-based scale ranging from 0 = strongly disagree to 3 = strongly agree, to assess co-parenting closeness, co-parenting support, co-parent undermining, and co-parenting endorsement. Sample items include: “My spouse/partner and I work closely together as parents.”, “My spouse/partner backs me up as a parent.”, “I feel too ashamed about my mishaps with the children to talk them over with my spouse/partner.”, and “My spouse/partner has a good feel for the kids and what they might need.” Items were summed for a total score with higher values indicating higher levels of co-parenting relationship quality. In the current sample, these items had good internal consistency (Cronbach $\alpha = 0.84$).

Data Analysis Plan

The distribution of main study variables was examined using boxplots. We also examined their bivariate relations using Pearson correlations. To address study aim 1, Pearson's correlations were first conducted to examine the associations among the BAPQ Total score, Co-parenting Relationship Quality measure (modified CPRS), CBCL and SRS-2 and our sociodemographic variables. Next, we conducted dyadic multilevel models (Bolger & Laurenceau, 2013) using

Hierarchical Linear Modeling software (HLM version 8.2; Raudenbush et al., 2011) to examine the association between parent BAP (BAPQ) and co-parenting relationship quality (modified CPRS) in models that account for the interconnected nature of data from parents in couples and also controlled for relevant socio demographics (i.e., those associated with our dependent variable). In these models, the Level 1 variables are mother and father BAPQ Total Score and parent gender (mother = 1 and father = -1), and the Level 2 variables are relevant family sociodemographic variables. The dependent variable was co-parenting relationship quality (modified CPRS). We also re-ran the above multilevel model but now also tested the interaction of parent gender by actor BAP (parent gender x actor BAP) and by partner BAP (parent gender x partner BAP) on co-parenting relationship, by adding parent gender and these new interaction terms to Level 1. A second follow-up model was also tested in which the interaction of actor BAP x partner BAP was entered at Level 1, along with actor and partner BAP, to determine if partner BAP moderated the association between actor BAP and co-parenting relationship quality.

To address study aim 2, BAP was treated as a dichotomous variable (above vs. below the BAPQ cutoff), and we ran an analysis of covariance (ANCOVA) to examine potential differences in co-parenting relationship quality based on the number of parents with elevated BAP in the couple. The ANCOVA included four groups: no parents with elevated BAP, self with elevated BAP, partner with elevated BAP, and both parents with elevated BAP.

To address study aim 3, which tests the mediating effect of level of co-parenting relationship quality in the association between parental BAP and children's severity of co-occurring emotional and behavioral symptoms, we again used dyadic multilevel models conducted with HLM version 8.2. Analysis followed Zhang et al. 's. (2009) 3-step centered within context approach using the 2-2-1 pathway. The 2-2-1 pathway controls for mediation at the

within-couple (level-1) and between-family level (level-2). Our focus was on between-family mediation. The mediation effect was tested by examining the association between parental BAP and child behavioral symptoms (step 1), followed by the association between parental BAP and co-parenting relationship quality (step 2), and lastly, the association between parental BAP and the child's co-occurring emotional and behavioral problems while controlling for co-parenting relationship quality (step 3). At each step, predictor variables were entered at level-1 (group mean centered) and level-2 (average of mother and father scores). Relevant socio-demographics, those that were significantly associated with our dependent variable were included and grand mean centered. Change in the coefficient for the association between parental BAP and the child's severity of co-occurring emotional and behavioral symptoms (CBCL) was compared at step 1 (without mediator) to step 3 (with mediator). Reduction in the coefficient was tested using a *t* statistic as indicated by Freeman and Schatzkin (1992) and suggested by Zhang et al. (2009). This analysis focused on the mediation effect at the between-family level because co-parenting relationship quality is largely considered a couple-level process, in which partners engage in supportive, undermining, and collaborative behaviors. This lens allowed us to determine if parental BAP is associated with the child's co-occurring emotional and behavioral problems because of their co-parenting relationship quality, behaviors and attitudes, as hypothesized by the family systems framework which illustrates the interconnectedness of family experiences.

Results

Descriptive Statistics

A total of 15 participants were removed from the analyses due to incomplete measures (child behavioral problems (CBCL), level of BAP (BAPQ), co-parenting relationship quality (modified CRPS). Based on chi square tests and independent sample t-test values ($p > .05$), these

participants did not significantly differ from the remaining participants in severity of child's ASD symptoms or co-occurring emotional and behavior problems, child's race or ethnicity, parent couple relationship length, parent education level, or child's age. Of the remaining 368 participants, there were no cases with more than 5% of items missing on any given measure. Little's Missing Completely at Random (MCAR) was run to confirm that the small percentage of items that were missing, were missing at random. The MCAR null hypothesis was upheld. Thus, mean imputation was utilized to fill in missing items on measures where participants completed at least 95% of the items.

Table 1 provides descriptive statistics on ratings of parent BAP, co-parenting relationship quality and children's severity of co-occurring emotional and behavior problems by mothers and fathers within couples and family socio-demographics. Skewness and kurtosis values indicated a normal distribution for continuous variables (skew range: .19 to.29; kurtosis range: -1.50 to -1.78). Paired sample t-tests indicated that fathers (M= 3.04, SD = 0.61) had significantly higher levels of BAP than mothers (M = 2.71, SD = 0.62) (t (184) = -5.454, p <.001). There was also a significant difference between mothers (M = 38.65, SD = 5.65) and fathers (M = 40.66, SD = 6.22) (t (180) = -3.060, p = < .001) in age. There was not a significantly difference in rating of the child's co-occurring emotional and behavioral problems by mothers (M = 65.42, SD = 9.90) versus fathers (M = 64.45, SD = 9.10) (t(180) = 1.496, p = .136. There was a trend-level difference in co-parenting relationship quality between mothers (M = 35.25, SD = 6.79) and fathers (M = 34.17, SD = 6.53); on average, fathers reported a lower level of co-parent relationship quality than mothers (t (184) = -1.903, p = .059).

Pearson correlations between family socio-demographics and main variables of interest are shown in Table 2, with mothers shown above the diagonal and fathers shaded and below the

diagonal. Co-parenting relationship quality was significantly negatively correlated with parent level of BAP for both mothers (r = -.25, p <.0007) and fathers (r = -.37, p < .00001); this means that a higher level of BAP was associated with lower co-parenting relationship quality. Parent education was significantly negatively associated with mothers' BAP (r = -.16. p < .035) and fathers' BAP (r = -.15, p <.039). Couple relationship length (r = .18, p <.017) was significantly positively correlated with mothers' reported child CBCL score but not fathers' reported CBCL score. CBCL was significantly positively correlated to mother's age (r = .16, p < .028) and father's age (r = .19, p < .011). CBCL was extremely positively associated with mothers' BAP (r = .21, p < .005) and fathers' BAP (r = .21, p < .005). Given the significant associations with study variables of interest, parent age, parent education, and relationship length were controlled for in

MLMs.Actor and Partner BAP and Co-parenting relationship quality

A dyadic MLM was conducted in HLM to examine the association between actor and partner BAP (Level 1) and co-parenting relationship quality, controlling for between couple differences in parent age, parent education, and relationship length at Level 2 (Table 3). In the MLM, both actor level of BAP (*coefficient*= -3.19, *SE* = .52) and partner level of BAP (*coefficient* = -1.47, *SE* = .51) were significantly associated with co-parenting relationship quality when level 2 variables were held at their mean. Parent gender was not a significant predictor of co-parenting relationship quality; thus, mothers and fathers reported a similar level of co-parenting relationship quality.

A follow up model (Table 4) was run to explore the interaction of parent gender x actor BAP and parent gender x partner BAP on co-parenting relationship quality. These interaction terms were entered at Level 1 along with the original Level 1 variables described above. There was not a significant effect of parent gender x actor BAP (*coefficient* = 0.670, *SE* = 0.578) or

parent gender x partner BAP (*coefficient* = 0.426, *SE* = 0.564) on co-parenting relationship quality. These findings mean that the effect of actor and partner BAP on co-parenting relationship quality were similar for mothers and fathers. These parent gender interaction terms were thus removed from the final MLM model.

A second follow-up model (Table 4) was run to explore the interaction of actor BAP x partner BAP on co-parenting relationship quality by adding this interaction term to the original MLM model. There was a trend-level (p = .082) effect of actor BAP x partner BAP on co-parenting relationship quality (*coefficient* = 0.670, *SE*. = 0.578). Thus, trend indicated that there was a stronger negative effect of actor BAP and co-parenting relationship quality when partner BAP was also higher (rather than lower).

Number of Parents with Elevated BAP and Co-parenting Relationship Quality

To address study aim 2, we conducted a one-way ANCOVA, controlling for parent age, parent education, and relationship length. In this analysis, parent BAP was treated as a dichotomous variable using previously established BAPQ cutoffs (above versus below the BAPQ cutoff for elevated BAP traits). Table 5 presents the frequency and percentage of parents by group (no BAP, actor BAP, partner BAP, and actor and partner BAP) and fixed group estimates which also accounted for robust errors. The overall ANCOVA was significant F (3,1290.573) =10.483 $p < .001$, Wilks' $\lambda = 3.781$, $n^2_{p=}$ 0.081. Univariate tests indicated significant group differences between parents in a couple in which neither parent evidenced elevated BAP versus when the parent themselves (actor) had elevated BAP, their partner had elevated BAP, or both they and their partner had elevated BAP. These findings align with findings from that MLM models and indicate that if either the actor (i.e. parent themselves) and or their partner have elevated BAP, the

parent experiences a lower quality co-parenting relationship quality relative to parents who do not have elevated BAP nor are in a couple relationship with someone with elevated BAP.

Co-parenting Relationship as Mediator between Parent BAP and Child Behavior

The Zhang et al., (2009) 2-2-1 Centered within Context (CWC) MLM approach was used in HLM to conduct the three mediations steps involved in study aim 3. Table 6 highlights the MLM equations and their results. Partially in line with our hypothesis, there was a partial mediation effect of quality of the co-parenting relationship on the association between parent BAP and children's co-occurring emotional and behavioral problems at the between-family level (Level 2) for both fathers but not for mothers. For fathers the coefficient for the effect of parent BAP on child's severity of co-occurring emotional and behavioral problems dropped from a significant level in step 1 (without co-parenting relationship quality) (*coefficient* =2.49, *SE* 0.95) to non-significant in step 3 (*coefficien*t = 1.78, *SE* = 0.95) when co-parenting relationship quality was included (see Table 6). The reduction in coefficients was statistically significant (t (183) = 7.15, $p < .0001$). For mothers, the coefficient for the effect of parent BAP on child's severity of co-occurring emotional and behavioral problems at step 1 (without co-parenting relationship quality) (*coefficient* = 2.20, *SE* =0.82) was not significant however it was significant at step 3 (with co-parenting relationship quality). However, t tests indicate that the change from step 1 to step 3 was insignificant (t (183) = -0.010, p = .9987); thus, co-parenting relationship quality did not partially mediate the effect of parent BAP on child's co-occurring emotional and behavioral problems for mothers. At the within-family level (level 1) at step 1, parental BAP was not significantly associated with child's co-occurring emotional and behavioral problems for mothers (*coefficient* = 1.17, *SE* = .85) or fathers (*coefficient* = .78, *SE* = .76) therefore, co-parenting relationship quality was not considered as a potential mediator at the within-family level.

Discussion

The overarching goal of the current study was to understand how parent BAP influences co-parenting relationship quality within families and subsequently if this is a mechanism through which parent BAP shapes the behavioral functioning of children with ASD. Prior research has shown that parents of children with ASD are more likely to report negative couple-level processes (Putney et al., 2021; Sim et al., 2017) than parents of neurotypical children. However, these previous findings are based on group differences (average differences between couples who have a child with ASD and couples who have a neurotypical child); among parents of children with ASD there are important differences in couple processes and experiences and it is important to understand how parent factors such as BAP contribute to these differences. First-degree relatives, such as parents, of children with ASD are at an increased risk for exhibiting BAP traits (Dawson et al., 2007). It is possible that these traits contribute to difficulties with interpersonal relationships through social anxiety, social communication deficits, or rigid beliefs and cognitions.

The toll of having one parent in the couple with elevated BAP on co-parenting relationship quality appears to be similar regardless of whether it is the actor or their partner who has elevated BAP. In the current study, among parents of children with ASD, those who had a higher (vs. lower) level of BAP reported a lower level of co-parenting relationship quality consistent with our hypothesis. Also consistent with our hypothesis, parents who had a partner with a higher (vs. lower) level of BAP reported a lower level of co-parenting relationship quality. Thus, the presence of BAP may be a key parent-level trait that explains why some parents of children with ASD are at-risk for poor parenting experiences relative to others. In contrast to our hypothesis, parents who were part of couples in which both partners had elevated BAP did not evidence more negative co-parenting relationships than parents in couples where only one parent

had elevated BAP. Moreover, a similar level of co-parenting relationship quality was reported regardless of which partner (oneself or one's partner) had elevated BAP. In line with this finding, there was not a significant interaction of actor BAP x partner BAP on co-parenting relationship quality. Together these findings suggest that if one parent in a couple has elevated BAP, both parents in the couple will be at risk for reporting a lower quality co-parenting relationship. However, the toll of having one parent in the couple with elevated BAP on co-parenting relationship quality was similar regardless of whether it is the actor or their partner who has elevated BAP. Moreover, there does not appear to be an additional negative effect on quality of the co-parenting relationship if both parents in the couple have elevated BAP.

These findings are in line with previous literature in which parent BAP was linked to more maladaptive family emotional climate (Hickey et al, 2020). Our findings expand on this work by showing that parent BAP may affect family emotional climate and influence child functioning through altering the co-parenting relationship. If one or more parents in the co-parenting relationship has elevated BAP, these traits could interfere with the ability of parents to communicate with one another and work together in a coherent way in parenting decisions and behaviors.

In support of this idea, the current study suggests that altered co-parenting relationship quality may be an important mediator of the relation between parent BAP and child with ASD's co-occurring emotional and behavioral problems in fathers. There is substantial support from non-ASD samples that the co-parenting relationships has important associations with parenting stress (Ponnet et al., 2013; Zemp et al., 2017), parenting behaviors (Hickey et al., 2020; Nelson et al., 2009) and child outcomes. Thus, by creating challenges to a high-quality co-parenting relationship, parent BAP may shape parenting experiences and behaviors in ways that negatively

shape the emotional and behavioral regulation of children. Mother BAP was positively associated with child emotional and behavioral problems; however, the co-parenting relationship was not a mediator of this association. The reason for this mother-father difference is not clear. Families of children with ASD often engage in role specialization in which one parent (most often mothers) takes on the majority of parenting activities and the other parent (most often fathers) focuses on paid employment (e.g., Callander & Lindsay, 2017). Mother BAP may have a direct effect on child emotional and behavioral functioning given that their increased time spent in childcare. In contrast, there is evidence from non-ASD samples that father effects on children often occur through altered mother-father relationship (Goeke-Morey, 2007). In other words, given that they spent less time in direct childcare, father BAP may influence its effect on children through the co-parenting relationship.

The findings from the current study support the family systems approach to understanding family processes. This study highlights the role of parent co-parenting processes on the functioning of children with ASD. Family-wide interventions should offer psychoeducation on parenting factors (e.g., such as rigidness or difficulties communicating that can be part of BAP) that may interfere with a strong co-parenting relationship and ways to develop new co-parenting strategies, along with providing more traditional interventions aimed at teaching emotional and behavioral regulation skills to children with ASD.

Strengths and limitations. This study had both strengths and limitations. One strength of this study was the use of couple dyads which allowed us to examine the effect of parent BAP on the co-parenting relationship quality in both mothers and fathers. The use of MLMs allowed us to simultaneously study and test the role of actor and partner BAP within and between families. The effect of parent BAP was examined using both moderation models that examined BAP as a

continuous variable and group difference models that examined BAP as a dichotomous variable. Target children in the study had a clinical diagnosis of ASD by an independent healthcare provider using the ADOS and had elevated ASD symptoms on the SRS-2. In terms of limitations, the sample had limited racial/ethnic diversity, with the majority of participants identifying as Caucasian, non-Hispanic. Parents in this sample were considered to be in stable couple relationships, meaning that they had been coupled for a minimum of 3 years; thus, couples in new relationships and/or those who experienced marital dissolution were not accounted for in our analyses. This study used subjective self-report measures to identify parent BAP and co-parenting relationship quality, future research should consider the use of objective observational methods or informant reports. The current study was also cross-sectional and thus future longitudinal analyses are needed examine the effect of parent BAP on co-parenting relationship quality and subsequently child functioning over time. In terms of future research, it will also be important to understand if parent BAP operates in a similar way outside of the context of families of children with ASD. Our sample focused on parents of children with ASD, as these parents are at elevated risk for BAP (Ingersoll & Hambrick, 2011; Sasson et al, 2013). However, BAP is also found in populations in which there is no known genetic link to ASD, and thus future research should explore the effect of parent BAP in families of neurotypical children as it is not known if effects would be similar or would differ across these populations.

Summary

In closing, evidence from the current research indicates that parent BAP is an important factor that may shape co-parenting relationship quality in parents of children with ASD. Being in a couple in which one or both parents have higher (vs. lower) BAP is associated with a lower quality co-parenting relationship. Interestingly, it did not matter if it was oneself or one's partner

who had elevated BAP; if either parent in the couple had elevated BAP, both parents reported lower co-parenting relationship quality relative to couples in which neither partner had elevated BAP. We also found that co-parenting relationship quality appeared to partially mediate the between-family link between parent BAP and children's co-occurring emotional and behavioral problems for fathers but not mothers. Further research is necessary to understand the importance of the co-parenting relationship to better understand this gendered finding. Thus, one way that parent BAP may shape child functioning is through altering how parents work together in parenting. Psychoeducational interventions aimed at strengthening the co-parenting relationship (e.g. teaching couples how to listen and support one another in parenting) may be an important way to create a family environment that teaching children with ASD emotional and behavioral regulation skills. Such interventions are particularly relevant to parents who report having a high level of BAP traits and/or whose partner evidences these traits.

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Tables

Table 1. *Mother and father-reported means (M) and standard deviations (SD) for main study variables.*

Measure	Couple M (SD)	Mother M (SD)	Father M (SD)	*t* value or x^2 , p value
Individual				
BAP		2.71 (0.62)	3.04(0.61)	*t(184) = -5.454, p=<0.001**
Co-Parenting Relationship		35.25 (6.79)	34.17 (6.53)	*t(184)=-1.903, p= 0.059*
CBCL		65.42 (9.90)	64.45 (9.10)	*t(184)= 1.496, p= 0.136*
Parent Age		38.65 (5.65)	40.66(6.22)	*t(180) = -3.060, p =< 0.001**
Education [N (%)]				
No HS degree		2 (1.6%)	4 (2.2%)	*χ2*(5, N=368)13.232 , p= 0.211
HS degree or equivalency		11 (5.8%)	10 (11.5%)	
Some college		30 (16%)	29 (15.8)	
Associates or bachelor's degree		96 (51.9%)	89 (48.4)	
Graduate degree		38 (20.3%)	33 (17.9)	
Race/ethnicity [N (%)]				
White, non-Hispanic		168 (90.8%)	163 (88.6%)	*χ2*(2, N=368)6.179, p =0.289
Other		17 (9.0%)	21 (11.4%)	
Couple				
Child Age	7.91 (2.25)			
Relationship Length {M(SD]	14.5 years (5.87)			
SRS-2	77.82 (10.65)			
ID [N (%)]	65 (34.8%)			
Household Income	9.16 (3.08)			

Note: *t* value = value for paired samples *t* test; *df* = degrees of freedom; BAP = level of broad autism phenotype (Hurley et al., 2007); CBCL = parental report co-occurring child behavioral problems (Achenbach & Rescorla, 2000); SRS-2 = Social Responsiveness Scale, Second Edition (Constantino & Gruber, 2012).

Table 2. *Correlations of key study variables.*

	1	2	3	4	5	6	7	8
1.Parent Age	--	.119	.066	**.163***	.082	.074	-.036	.022
2. Relationship Length	.061	--	.062	**.177***	.125	**.328****	.057	-.008
3. Parent Education	.029	**.208****	--	.014	.037	-.022	-.129	**-.155***
4. CBCL Total T Score	**.188***	.054	-.084	--	**.720****	-.015	-.086	**.208****
5. SRS Total T Score	.093	0.65	-.064	**.648****	--	.034	-.081	**.194****
6. Child Age	.003	**.328****	.072	-.033	.019	--	.149*	-0.37
7. Co-parenting	.002	-.012	.001	**-.256****	-.088	.012	--	**-.245****
8. BAP Mean	-.006	-.054	**-.153***	**.205****	**.153****	-.056	**-.371****	--

Notes. *Correlation significant at the0.05 level (2-tailed), **correlation significant at the 0.01 level (2-tailed). CBCL = Child Behavior Checklist Total T Score, SRS = Symptom Rating Severity, BAP = Broad Autism Phenotype. Mothers values shaded above the diagonal, Fathers unshaded below the diagonal.

Table 3. *Broad Autism Phenotype MLM with Co-parenting Relationship Quality*

Co-parenting Relationship Quality

Level 1	Coefficient	S.E.	*t*-ratio	P value
BAP Actor	-3.19	0.52	-6.151	<0.001**
BAP Partner	-1.47	0.51	-2.917	0.004*
Parent Gender	0.30	0.30	0.999	0.319
Gender x Actor BAP	0.69	0.58	1.159	0.248
Gender x Partner BAP	0.43	0.56	0.754	0.452
Level 2				
Intercept1	34.79	0.37	93.440	<0.001
Mom's age	-0.15	0.10	-0.151	0.881
Dad's age	-0.00	0.09	-0.039	0.969
Mom's education	-0.34	0.24	-1.44	0.153
Dad's education	-0.12	0.25	-0.498	0.619
Relationship length	0.02	0.07	0.262	0.794
Variance Components (SD)				
Intercept	11.25 (3.35) x^2 =309.70, p = <0.001			
Level 1 effect	28.08 (5.30)			

Note. BAP = level of broad autism phenotype.

Table 4. *Actor-partner interdependence modeling of BAP and Co-parenting relationship quality with interactions.*

Co-parenting Relationship Quality

Level 1	Coefficient	S.E.	*t*-ratio	P value
BAP Actor	-3.37	0.55	-6.185	<0.001**
BAP Partner	-1.40	0.53	-2.668	0.008*
Parent Gender	-0.29	1.80	-0.163	0.870
Gender x Actor BAP	0.41	0.62	0.671	0.503
Gender x Partner BAP	0.23	0.61	0.380	0.705
Actor BAP x Partner BAP	1.42	0.81	1.747	0.082
Level 2				
Intercept1	34.797	0.37	93.57	<0.001**
Mom's age	-0.01	0.10	-0.085	0.932
Dad's age	-0.01	0.09	-0.082	0.935
Mom's education	-0.32	0.23	-1.375	0.171
Dad's education	-0.14	0.24	-0.590	0.556
Relationship length	0.01	0.07	0.178	0.859
Variance Components (SD)				
Intercept	11.24 (3.35) x^2 307.96, p <0.001**			
Level 1 effect	28.07 (5.30)			

Note. BAP = level of broad autism phenotype.

Table 5. *Frequencies, percentage, Co-parenting means and standard errors, and one-way analysis of covariance of BAP group*

	N	%	Mean (SE) Co-parenting	Sig. Differences
A.BAP One's self	58	15.2	31.62(0.87)	A < D
B. BAP One's partner	58	15.2	33.25 (0.86)	B < D
C. BAP Both partners	18	5.4	30.27 (1.54)	C < D
D. No BAP	236	64.1	36.13 (0.42)	D>A, B, C

Notes. Sasson et al. (2013) gendered self-report cutoffs. BAP = broader autism phenotype.

Table 6. *Mediation Model of Co-parenting Relationship Quality on the Relationship between BAP and Children's Emotional and Behavioral Problems (HLM 2-2-1 CWC(M) Model)*

	Model 1 (step 1)	Model 2 (step 2)	Model 2 (step 3)
Dependent	**Child Behavioral Problems** ***Coefficient (SE)***	**Co-parenting Relationship Quality** ***Coefficient (SE)***	**Child Behavioral Problems** ***Coefficient (SE)***
Predictor variables			
Intercept	64.54 (0.61)	34.86 (0.37)	64.52 (0.60)**
Parent BAP (level 2)			
Mom BAP	2.20 (0.82)*	-1.76 (0.60)*	2..21 (0.83)*
Dad BAP	2.49 (0.95)*	-2.85 (0.60)**	**1.78 (0.95)**
Co-parenting Relationship Quality			
Mom PAI			0.09 (0.09)
Dad PAI			-0.22 (0.10)*
Parent BAP (level 1)			
Mom BAP	1.17 (0.85)	-1.61 (0.71)*	0.67 (0.87)
Dad BAP	0.78 (0.76)	-1.83 (0.64)*	0.83 (0.88)
Co-parenting Relationship Quality			
Mom PAI			-0.10 (0.10)
Dad PAI			-0.15 (0.11)
Between-family variance	46.00(6.71)**	11.31 (3.36)**	**44.07 (6.64)****
Within-family variance	38.27 (6.19)	27.97 (5.29)	38.15 (6.18)

Note. BAP=broad autism phenotype, PAI = Co-parenting relationship quality. Level 2 covariates: mom's age, dad's age, mom's education, dad's education and relationship length.* $p < 0.05$, ** $p < 0.001$

Chapter 4. Conclusions

It is currently estimated that 1 in 44 children in the United States meet the criteria for ASD (Centers for Disease Control, 2021), making ASD a critical public health concern. Parents of children with ASD are more likely than their peers who do not have biological children with ASD to evidence subclinical levels of behavioral and cognitive impairments associated with ASD, referred to as broad autism phenotype (BAP) (Bolton et al., 1994; Rubenstein & Chawla, 2018). Using a family systems lens (Belsky, 1981; McHale & Lindahl, 2011), the goal of my dissertation was to add understanding about the impact of parent BAP on family subsystems including the parent romantic couple relationship and parent co-parenting relationship. Across my two papers, I explored the prevalence BAP in a community sample of parents of children with ASD and the influence of these traits at both an individual-parent level and parent couple-level (e.g., actor-partner effects and presence of high BAP in both partners in a couple) on adaptive family processes. Furthermore, my dissertation explored the mediating role of role co-parenting relationship quality in the association between parent BAP and severity of co-occurring emotional and behavioral problems in children with ASD.

Our findings illustrate the important role BAP characteristics play in parent-couple adaptive processes through altering the use of *positive* and *negative dyadic coping* behaviors. In line with previous research (Rubenstein & Chawla, 2018; Sasson et al., 2013), we found that fathers reported higher levels of BAP characteristics involving rigidity, aloofness, and pragmatic language than mothers. Fathers in the ASD group reported the highest levels of rigidity and aloofness compared to mothers in the ASDS and fathers and mothers in the comparison group. Parents with a higher level of BAP were more likely to report lower levels of positive dyadic coping and higher levels of negative dyadic coping. One's own (i.e., actor) level of rigidity was

the most significant predictor of the use of *positive* or *negative dyadic coping*, with higher levels of rigidity being associated with lower levels of *positive* and higher levels of *negative dyadic coping*. One's own (i.e., actor) level of aloofness was also significantly related to a lower level of positive dyadic coping and higher level of negative dyadic coping. At a trend level, one's partner's aloofness was also associated with lower positive and higher negative dyadic coping, especially for mothers. This suggests that mothers' couple experiences are especially sensitive to having a partner who is aloof. It is important to note that the effect of BAP traits on couple dyadic coping is not limited to families of children with ASD, but also occurred in families of neurotypical children.

In line with our hypotheses, parents in our study reported lower levels (vs. higher) of co-parenting relationship quality when either they themselves or their partner identified as having higher levels of BAP. However, in contrast to our hypothesis, parent-couples which included two parents with elevated BAP did not report a lower level of co-parenting relationship quality than those with only one parent with elevated BAP. This suggests that having at least one co-parenting partner with elevated BAP, regardless of it is oneself or one's partner, significantly impacts the co-parenting relationship quality of both partners. Parent-couples in which one or more members have elevated BAP may struggle to effectively communicate and support one another in parenting. Moreover, our findings suggest that for fathers, one way that parent BAP influences the functioning of children with ASD is by reducing co-parenting relationship quality. On the flip side, this finding suggests that one way to reduce any negative effect of parenting BAP traits on children with ASD is by targeting the co-parenting relationships; interventions aimed at teaching couples how to overcome communication difficulties and support one another in parenting could help ensure that a high co-parenting relationship is achieved even if parents exhibit BAP traits.

Co-parenting relationship quality might play a more significant role for fathers, this could stem from traditional parental roles in which mothers assume the primary care role and rely less on co-parent support whereas fathers in traditional roles might defer or be more reliant on co-parent support and assurance.

Implications and next steps

Parent BAP traits appear to have family-wide influences and shape both the parent couple and parent co-parenting. Targeted interventions and therapies should be aimed at teaching parents of children with ASD who have high BAP strategies for communication, positive adaptive coping, and co-parenting behavior strategies. In particular, these interventions should focus on how rigidity and aloofness may make it hard for couples to support one another in managing stress. Such parent-focused interventions could be delivered in addition to more traditional ABA interventions focused on the child with ASD. Interventions focused on reducing any challenges associated with parent BAP traits and promoting an adaptive co-parenting relationship may have downstream effects on children with ASD; specifically, by helping to promote better child emotional and behavioral regulation.

Future research should consider the effects of parent BAP over time on co-parenting relationship quality and adaptive dyadic coping, both within the context of families of children with ASD and in families with no known genetic link to ASD. Identifying the ways in which parent-couples, co-parenting partners, and families may thrive with high BAP traits is also critical. In other words, while BAP traits may pose challenges to adaptive parent couple and parent cop-parenting relationships, these effects were generally of small-size to moderate-size and some parents with high BAP had strong parent couple and co-parenting relationships. Investigation of specific BAP characteristics could help identify the ways in which families cope

and parent with resilience. Research targeting specific subdomain characteristics could offer specific areas where targeted interventions and therapies can identify potential challenges such as conflict avoidance, attempts at control, or evading interactions with others. Understanding specific characteristics, such as cognitive or behavioral rigidity, could help families better understand specific relationship patterns, expectations, or reactions of a family members and thus lead to interventions which promote greater family cohesiveness and communication.

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