Impact of child factors on parenting stress of mothers of children with autism Spectrum Disorder and intellectual disability: a UK school-based study

Abstract

Parents of children with autism spectrum disorder (ASD) are at a risk for high stress levels. Multiple child factors have been identified as predictors of parenting stress in parents of cognitively-able children with ASD, but factors associated with parenting stress in children with comorbid ASD and intellectual disability (ASD-ID) are not well understood. This study examined the role of child's age, social impairment, executive functions and adaptive skills on parenting stress in mothers of children with ASD-ID. Participants for this study included 113 children (aged 4-11 years) with a diagnosis of ASD-ID. Mothers completed the Parenting Stress Index–Short Form, the Behaviour Rating Inventory of Executive Function, the Vineland Adaptive Behaviour Scales, and the Social Responsiveness Scale. Parenting stress in mothers of children varied according to the child's educational stage. Parenting stress also associated with poor metacognitive functioning. No associations were found between parenting stress, age and adaptive skills of children. Results also showed that social impairment predicted parenting stress above and beyond child factors. This study contributes to literature by replicating that social impairment predicts parenting stress in ASD-ID and by showing that metacognitive executive functions also contribute to parenting stress. Implications for interventions are discussed.

Key words: autism spectrum disorder; parents; distress; parenting stress

Introduction

Stress is an unavoidable aspect of parenting and has been deemed to be a normal and adaptive experience associated with the related responsibilities of caring for a child (Peterson & Hawley, 1998). Even though parenting stress is common in most families, having a child with autism spectrum disorder (ASD) poses higher risk of stress for both parents, especially mothers (e.g. Gardiner & Iarocci, 2012). Indeed, it is well established that parents of children with ASD report higher risk of general stress than parents of typically developing children as well as parents of children with other developmental difficulties (Baker-Ericzen et al., 2005; Bromley et al., 2004; Eisenhower et al., 2005; Estes et al., 2009; Hayes & Watson, 201; McStay et al., 2014; Pisula and Kossakowska, 2010; Barroso,Mendez, Graziano, & Bagner, 2018). There are many characteristics of children with ASD that may cause stress for families. Examining the relationships between these child characteristics and parenting stress is of central interest in understanding the experience of parents of children with ASD that could lead to more targeted interventions to support families.

ASD is a heterogeneous disorder with a wide range of behavioural profiles in terms of symptoms and presentations that may differentially impact parenting stress. Age and severity of behavioural difficulties are some of the relevant child characteristics that may act as stressors. While numerous studies have reported a contribution of the severity of ASD and multiple child factors to parenting stress; the findings of which type of child factor mostly contributes to parenting stress are inconsistent. Some studies suggest that child problem behaviours account for variability in parenting stress beyond ASD severity(e.g. Estes et al., 2013; McStay et al., 2014). Other studies indicate that parenting stress patterns parallel child

problem behaviour problems but that autism diagnosis contributes to stress additionally, after behaviour problems are accounted for (e.g. Eisenhower; 2005). The present study aims to extend prior research by investigating relations between parenting stress and child factors in mothers of a specific subgroup within ASD, namely children with ASD and comorbid intellectual disability (ASD-ID).

The experience of parenting stress may vary based on the specific diagnosis of the child due to the associated behavioural phenotype. An estimated 31% of children with ASD are diagnosed with co-occuring intellectual Disability (ID) (Developmental Disabilities Monitoring Network Surveillance Year 2010 Principal Investigators; Centers for Disease Control and Prevention (CDC), 2014), making it the most common comorbid condition with ASD and a strong predictor of poor prognosis. Indeed research suggests that ASD severity, adaptive functioning, challenging behaviours, and comorbid psychopathology are more pronounced at the lowest end of the intellectual functioning spectrum (Matson, Dempsey, LoVullo, & Wilkins, 2008; Matson & Shoemaker, 2009). With regards to the effect of comorbid intellectual ability on maternal well-being, it has been reported that neither maternal emotional disorder nor positive mental health are related to ASD-ID (Totsika et al., 2011). Whether the same holds truth for maternal stress remains to be explored.

As previously mentioned, it has been argued that the child characteristics that most strongly predict parenting stress are associated to the child's core autism symptoms (i.e. communication and social impairment, repetitive and stereotyped behaviours and interests). The majority of studies, indeed, indicate a positive relationship between ASD symptomatology and parenting stress (Benson, 2006; Bromley et al., 2004; Davis and Carter, 2008; Hastings and Johnson, 2001; Konstantareas & Papageorgiou, 2006; Siu et al., 2019). However, not all studies have

reported such an association (Hastings et al., 2005; Manning et al., 2011; McStay et al., 2014; Siu et al., 2019). Inconsistencies in findings could be attributed to the differences in the measures used in the afore-mentioned studies to assess severity of autism. Severity of autism in parenting stress studies is usually assessed by the score on a clinician or a parent-completed autism-rating instrument. However, it has been recently suggested that different autism rating scales may assess different explicit behaviours of ASD (Chen at el., 2018), which could explain the discrepancies across studies.

Parenting stress can also be influenced by child variables that are not core to an ASD diagnosis, such as the child's age. Some studies have shown that parents of older children with ASD have higher levels of stress than younger children (Konstantareas and Homatidis, 1998;Orr et al., 1993; Tehee et al., 2009), supporting the wear and tear hypothesis of caregiving which proposes that the increasing burden of providing long-term care leads to psychological distress (Townsend, Noelker, Deimling & Bass, 1989). On the other hand, other studies have shown that parents of children with ASD show a pattern of adaptation and either maintain or show less distress as children grow older (Barker et al., 2011; Gray, 2002; McStay et al., 2014; Peterson et al., 2012), possibly indicating that parents of children with ASD may be developing more effective coping strategies over time. Most of the afore-mentioned studies have compared younger with older children without clear justification of how the age cohorts were formed. As children age, the same impairment that seemed manageable in preschool may become more challenging to the parent when the child is in primary or secondary education. Indeed, the move to different educational stages has been found overwhelming for children with ASD and their parents. For example, Tobin et al. (2012) found that parents reported high levels of anxiety about their

child's capacity to meet the social and academic demands of school transitions and generally believed that support for their child in the new school context had been inadequate. Given the implications of service delivery over the lifespan of children with ASD and their families, it is essential to explore whether parenting stress differs across different educational stages.

Another factor that has been studied in relation to stress in parents of children with ASD is the child's level of adaptive functioning, as it is related to his or her capacity for independent functioning and ability to communicate and socialise. Low adaptive skills increase the time and energy demands of caring for these children, and thus might lead to a greater likelihood of parental stress (Sawyer et al., 2010). Again, results from studies relating parental stress to adaptive functioning are not conclusive. Some studies have reported that low adaptive functioning is associated with increased maternal stress (Fitzgerald et al., 2002; Tomanik et al., 2004), whilst others report no association between parental stress and adaptive skills (Estes et al., 2009; Lecavalier et al., 2006). A recent meta-analysis (Yorke et al., 2018) showed that adaptive functioning very rarely associated with parenting stress and parental mental heath problems. Interestingly, it was proposed that ASD severity could account for the relationship between parenting stress, adaptive skills and other child behaviour problems.

There are also other child behaviours that are associated with several diagnoses but may be more pronounced in children with ASD and may contribute to parenting stress. For example, behaviours related to executive functions are generally delayed or impaired in children with ASD (Demetriou et al., 2018). EF refers to a set of high-order and goal-directed cognitive skills coordinating problem solving and social behaviour (Best & Miller, 2010). While not a core symptom of ASD, EF has

been shown to be a predictor of key social and behavioural outcomes (Kouklari, Tsermentseli, & Monks, 2019; Pellicano, 2010), but there has been little explicit study of its association with parenting stress. One exception is the study by Hutchison, Feder, Abar & Winsler (2016) who found that cognitively-able children with ASD who exhibit more EF difficulties have parents who are more stressed. Studies have not yet explored the relation between parenting stress and EF in an ASD-ID sample; whether the same pattern of results would be found amongst individuals with ASD-ID remains to be explored.

In the current study we aim to extend prior research by investigating whether parenting stress in mothers of children with ASD-ID is uniquely associated with social impairment, which is a core ASD symptom, and multiple child characteristics that are not specific to ASD (i.e. age, executive functions, adaptive skills). We focused on mothers due to the larger role that they play in daily care for children with ASD and because mothers of children with ASD typically report higher levels of stress than fathers (e.g. Hastings et al., 2005). In addition, previous research interest in the child factors that influence stress in parents of ASD children has mainly focused in the subgroup without intellectual handicap, referred to as "high-functioning autism", or in mixed intellectual ability samples. The primary focus of this study is thus to fill in the gap that previous research has created, hence the focus on children with ASD-ID. There is also still a debate, whether the core symptoms of ASD, or alternatively other child characteristics drive this connection between ASD and maternal stress. Based on previous findings (Brei, Schwartz & Klein-Tasman, 2015; Eisenhower et al., 2005), we sought to examine whether parenting stress is predicted by child factors that are not specific to an ASD diagnosis and whether ASD symptomatology contributes to stress additionally.

It is predicted that social impairment will be significantly related to maternal stress; higher observed or reported social impairment is expected to predict higher maternal stress. Further, it is tentatively hypothesised that executive functions will account for the variance in parenting stress. It is also hypothesised that adaptive skills will not make statistically significant additional contributions to the prediction of stress. It is also predicted that social impairment will predict maternal stress above and beyond general child characteristics. As a secondary aim, we also sought to examine whether mothers of children with ASD-ID who attend Key Stage 1 & 2 classes (i.e. years 2 to 6 of primary school) would show more parenting stress than mothers of children with ASD-ID who are in the first year of primary school (i.e. reception), due to the additional increased demands resulting from the child's support needs.

Method

Participants

As part of a larger longitudinal study on executive function in ASD twenty primary schools ASD in London, UK were invited and participated in the study. The sample of participants for the present study comprised 113 mothers of children diagnosed with ASD-ID, aged between 4 and 11 years (48 females). Only one child with ASD per family was included so that each mother' observation would be independent. Participants spanned a wide range of socioeconomic status (SES) groups; however the majority was of white British origin and average SES for England.

All children held an official ASD diagnosis by a qualified clinician using DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition) or DSM-V (5th edition) criteria (American Psychiatric Association (APA), 1994, 2013), and qualified for a "broad ASD" on the Autism Diagnostic Interview/Autism Diagnostic Interview-Revised (Le Couteur et al., 1989; Lord, Rutter, & Le Couteur, 1994) and/or the Autism Diagnostic Observation Schedule (Lord, Rutter, DiLavore, & Risi, 2000). All children also possessed a formal diagnosis of intellectual disability. Intellectual disability (intelligence quotient (IQ) <70) was also confirmed by children's performance on the abbreviated version of the Wechsler Intelligence scales (WASI; Wechsler, 1999). Exclusion criteria included the presence of a diagnosed psychiatric illness or any known comorbid medical conditions, as these may cloud interpretations of what is driving perceived difficulties.

Measures

Parenting Stress. To assess parenting stress, mothers completed the Parenting Stress Index-Short Form (PSI-SF; Abidin 1995). The PSI-SF is a 36-item, self-report instrument that yields an overall parenting stress score. Parents rate each of the items on a 5-point scale ranging from strongly disagree (1) to strongly agree (5). The PSI-SF includes three subscales of parenting stress, each containing 12 items, namely parental distress (PD), parent–child dysfunctional interaction (PCDI), and difficult child (DC). For the purpose of the present study, the total raw score (PSI-total, Cronbach's $\alpha = .89$; range of possible scores: 36 to 180) was used as we were interested in the mothers' overall experience of parenting stress. Higher scores indicated increased parenting stress.

Executive function. In order to assess the EF abilities of children, mothers

completed the BRIEF (Gioia et al., 2000), which is composed of 86 items that are designed to tap behavioural aspects of EF in the home in children and adolescents. The BRIEF measures two broad areas/indices of EF: behavioural regulation (BRI), the ability to shift and modulate emotions and behaviour; and metacognition (MI), the ability to cognitively self-manage tasks and monitor performance. The BRI consists of three subscales (i.e., Inhibition, Shifting, and Emotional Control) and the MI consists of five subscales (i.e., Initiation, Working Memory, Planning/Organisation, Task Monitor, and Organisation of Materials). Raw scores are expressed as *T* scores (*M* = 50; *SD*= 10) derived from comparisons with normative age expectations. Higher scores are indicative of more EF difficulties and *T* scores of 65 or higher are categorised as clinically significant. The BRIEF has been found to have high test–retest reliability (r =.82) and high internal consistency (Cronbach's alphas = .98). Evidence regarding the convergent and divergent aspects of the BRIEF's validity derives from its association with other behavioural functioning measures (Isquith et al., 2008).

Social Impairment. Parents also completed the Social Responsiveness Scale (SRS; Constantino & Gruber, 2005), which is a 65-item rating scale that examines a child's ability to engage in emotionally appropriate reciprocal social interactions in natural social settings. The SRS was designed to provide a single quantitative, continuous score that serves as an index of the severity of the social deficits associated with ASD. Responses to items are on a 4-point Likert scale (0 = never true to 3 = almost always true) with higher SRS total *T* scores indicative of greater social impairment. The SRS can be also used as a screening. This measure has been shown to correlate well with the Autism Diagnostic Interview–Revised (ADI-R) in the assessment for ASDs (*r* = .64; Constantino et al., 2003). High internal consistency

was obtained in this study (Cronbach's alpha = 0.92). All child participants had a *T* score >65, corroborating the official ASD clinical diagnosis.

Adaptive Functioning. Parents also completed the Vineland Adaptive Behaviour Scales (VABS-P; Sparrow, Cicchetti, & Balla, & 2005). The VABS assess adaptive skills, as defined by the child's typical performance during daily activities, rather than perceived ability. That is, the VABS measures what a child does reliably, on a day-to-day basis across several domains, including communication, daily living, and socialisation skills. Standard scores were obtained for each domain. Higher scores are indicative of better adaptive functioning. The VABS has been found to have a good internal consistency (a = .80s to .90s) and test re-test reliability (r= .88) (Sparrow et al., 2005) and has been widely used to measure adaptive skills in ASD across childhood (e.g. Gilotty et al., 2002; Kenworthy, Case, Harms, Martin, & Wallace, 2010; Kouklari, Tsermentseli, & Monks, 2018; Tsermentseli, Tabares, & Kouklari, 2018).

Intelligence. The well-known abbreviated version of the Wechsler Intelligence scales (two subtests: vocabulary and matrix reasoning; Wechsler, 1999) was used to assess children's general intellectual functioning. All children scored <70, corroborating the official intellectual disability diagnosis.

Procedure

The study was approved by the university research ethics committee.

Teachers distributed consent forms for pupils to take home for their parents' completion. After an initial telephone interview, families who fit inclusion criteria were scheduled an appointment for a one-time session. Researchers briefly explained the study to the parent and child. All children provided verbal assent to

participate. While children were completing the intelligence assessment, parents filled out the parent-report measures.

Data analyses

Statistical analyses were performed using the Statistical package for the Social Science Version 24. Prior to conducting primary analyses, data were screened and no outliers were detected. Pearson's correlations were run to examine the correlations between the PSI-total score scale and child variables (i.e. age, social impairment, EF indices, adaptive skills sub-domains). Regressions were run separately to determine the relative contributions of the child variables to the total PSI score. Based on results of correlations, factors were selected for inclusion in subsequent hierarchical multiple regression analyses.

Results

Descriptive statistics for the study variables are presented in Table 1.

[Insert Table 1 here]

In order to assess differences in parenting stress across different educational stages, children were grouped into three cohorts signifying school stages in the British education system (i.e. Reception, Key Stage 1 & Key Stage 2). Table 2 presents descriptive statistics for parenting stress stratified by educational stages. A one-way between subjects ANOVA showed a significant effect of educational stages on parenting stress [$F(2, 110) = 3.406$, $p < .05$]. Post hoc comparisons using the Tukey HSD test indicated a statistically significant difference in parenting stress between Reception and Key Stage 2 levels ($p<.05$), indicating that parents of children who were in Years 3-6 of primary education were more stressed that parents of children

who were in Reception (i.e. Early years).

[Insert Table 2 here]

Pearson's correlations coefficients were conducted to investigate relationships between child characteristics and parenting stress (see Table 3). Since the age range of the sample was wide, we also did analyses with age as a covariate but the results did not change.

Age and FSIQ did not correlate with parenting stress in the current sample. Significant small to moderate positive correlations were found between social impairment (SRS), metacognition (BRIEF MI) and parenting stress. Results also indicated that socialisation and communication adaptive skills did not correlate with parenting stress. These results suggest that the level of overall parenting stress is not related to the degree of intelligence quotient, chronological age or adaptive skills but rather is associated with the level of social impairment and elevated difficulties in metacognition.

[Insert Table 3 here]

A hierarchical multiple regression analysis was performed to investigate the unique contribution of child's age, metacognition and social impairment to the parenting stress (see Table 4). Child age was entered in the model first as a control variable to account for potential confounding effects (step 1), followed by metacognition (step 2), and social impairment (step 3). Age did not explain a significant variance in parenting stress, $F (1, 109)= .197$, $p>.05$. Metacognition at step 2 explained a significant amount of variance (16.5%) in parenting stress $F (2, 109)= 4.239$, $p < .05$. For social impairment entered in block 3, the total variance rose to 29.8% representing a significant increase of 13.3%, $F (3, 109) = 6.723$ $p < .01$, of

additional variance explained, indicating that high levels of social impairment are uniquely related to higher levels of parenting stress.

Further inspection of individual metacognition items showed that initiation (r= .248, P < .01) and working memory (r= .207 p < .05) correlated with parenting stress. A second set of regressions was run to examine the contribution of these specific EF sub-domains to parenting stress after controlling for age. The results showed that the first block introducing age as a control variable did not contribute a significant amount of variance, F (1,112)=. 038, p >.05. BRIEF initiation and working memory in block 2 significantly contributed to the model and explained 33% of the variance, F (3,112)=5.435, p <. 01. Higher levels of difficulties in initiation and working memory predicted parenting stress.

[Insert Table 4 here]

Discussion

This study extends the growing literature documenting relations between child characteristics and parenting stress among mothers raising a child with ASD. The principal aim was to investigate specific characteristics of the child as contributors of parenting stress in mothers with a school-aged child with ASD and comorbid ID. In this subgroup, parenting stress and its relationship with child risk factors have hardly been studied. This is the first study to report that difficulties in metacognition can contribute to parenting stress in mothers of children with ASD-ID. Given the unique challenges in raising a child with ASD, it is not surprising that social impairment was the most significant predictor of parenting stress.

Consistent with prior research (Beck et al., 2004; Estes et al., 2009; Lecavalier et al., 2006) and our hypothesis, adaptive skills were not associated with parenting stress confirming that mothers appear to be resilient to the additional responsibilities that decreased adaptive skills bring. In addition, in agreement to previous findings (McStay et al., 2014; Peterson et al., 2012), this study also did not find an association between child's chronological age and parenting stress. Interestingly, even though child's age did not associate with parenting, in our study, parenting stress varied according to a child's educational stage with mothers of children who were in Key Stage 2 (i.e. third to sixth primary school years) reporting being more stressed than mothers of children who were in Early years. These findings are in agreement with results from earlier studies (Kohler, 1999; Starr et al., 2001) where parents of children with ASD were reported to be more satisfied during the first years of school, whilst parents of older children (middle school) reported concerns about their children not progressing to their potential in the classroom.

Parents, usually mothers, play an important and active role in their child's school life, providing organisational, academic and emotional support. It is possible that mothers of younger children reported being less stressed because communication between home and school is more frequent in Reception year. In addition, educational transition problems can be especially evident for children with ASD. To ease transitions, parents may opt to provide support for every change within a daily schedule. As school demands increase, children with ASD may become overly dependent to stay on task and on schedule (Scheuermann & Webber, 2002) making it especially stressful for parents. More research is needed on what parents' perceptions are of education programmes that are available for their children with ASD, and how their well-being is related to the priorities and needs related to these educational programmes.

As hypothesised, EF difficulties were associated with greater parenting stress. The current findings reveal that difficulties associated with the metacognitive abilities of initiation and working memory were reported as highly stressful to mothers. These findings are particularly relevant since recent research implicates metacognition as a central impairment in ASD (Torske et al., 2018). These findings are also consistent with parallel research that shows parents raising children with ADHD (who also experience EF deficits) are also particularly stressed by their children's EF difficulties in the metacognitive domain (Graziano et al., 2011; Hutchison et al., 2016; Joyner et al., 2009; McLuckie et al., 2018). For mothers of children with initiation and working memory difficulties engaging in the daily routine of constantly helping their children to begin a task as well as helping them with difficulties with holding information in mind in order to complete a task, such as homework, may lead to heightened stress. Consistent with Lazarus's (1966) model of

parenting stress, we can argue that the behavioural difficulties related to initiation and working memory may impose demands on parents and/or the parenting role that likely exceed their perceived parenting resources and their ability to cope.

Regression analyses revealed that while EF problems accounted for considerable variance in maternal stress, social impairment contributed to maternal stress after controlling for EF problems and age. This finding is in agreement with previous studies (Eisennhower et al., 2005; Lecavalier et al., 2006; Miranda et al., 2019) and contradict the findings of no association with ASD symptoms (Estes et al., 2009; Giovagnoli et al., 2015; Hastings et al., 2005; Miranda et al., 2019). One explanation for the discrepancies across studies is due to the differences across measures used to assess ASD severity. Brei et al (2015) found that parenting stress was associated with parent-reported SRS but not with clinician-reported measures of autism severity (i.e.ADOS). Chen et al. (2018) argue that perceptions of children's behaviours of caregivers could differ from those of clinicians due to differences in their embedded ASD-related knowledge and the rating contexts. This might mean that parents' perception of ASD-associated symptoms is related to their perception of their own parenting stress: if they report more severe impairment, they also report higher stress. Another explanation for the discrepancy across studies may be because different explicit behaviours of ASD are operationalised across different measures. It is therefore essential when discussing findings derived from autism rating measures to interpret the specific constructs assessed by those scales, rather than using them as an estimate of overall autism severity.

The current study produced a number of important findings that have numerous implications for clinicians and educators working with children and parents affected by ASD-ID and parenting stress. These findings highlight the importance of

providing parents with support and training by offering services that target child problems and autism-associated symptoms. One of the major sources of increasing stress is social impairment, which should be an important target of early intervention. While it is not surprising that social impairment contributes to parenting stress, our findings demonstrate that children's executive functioning and particularly metacognitive difficulties can also be stressful to parents and should be considered during evaluations and treatment monitoring. It will also be critical for future research to examine whether adjustments to current evidence-based treatments to better target these executive function deficits are also successful in reducing parenting stress. Most importantly, assessing parenting stress should be established as standard procedure in clinical and school settings. Clinicians and educators can work collaborative with parents to identify resources for all family members, and options for interventions in order to act preventatively against stress and encourage positive outcomes for both children and their parents.

Several limitations need to be considered when interpreting these findings. The present findings should be interpreted cautiously as the data were based entirely on mothers' observations. It is possible that mothers who experience more distress also perceive the child behaviours as more severe (Najman et al., 2000). Moreover, features of child behaviour that mothers find distressing may not align with behaviours that are problematic for others, including the children themselves. Future studies should gather input from multiple informants to identify a range of problems and symptoms displayed by children in both the home and school environments. In addition, the lack of a control group did not allow us to make comparisons with a typically developing group or with another group with developmental disabilities. Additional diagnostic groups should be included in future work to compare stress in

parents of children with ASD-ID to those with other diagnoses. Unfortunately we did not collect socioeconomic information, which could impact the response patterns in the current sample. Also, the correlational nature of the study only indicates a relationship, not causation. Therefore, the direction of the relationship between child factors and parenting stress is unknown based on the results of this study, although analysis lends evidence to child factors influencing parenting stress. Future studies should collect data from a more diverse sample longitudinally to provide a better picture of the transactional relationships among the variables of interest.

Despite these limitations, the findings of this study are consistent with previous studies, and may be generalisable and highly relevant to children with ASD-ID and their parents. Overall, we may conclude that maternal reports of specific child behaviours and parenting stress are related in a sample of children with ASD and comorbid ID. We found that the metacognitive domain of EF has a significant predictor of parenting stress and that social impairment was the most significant contributor of parenting stress. These results may have implications for understanding the risk factors that contribute to parenting stress in families with children with ASD. Further studies are needed to clarify whether parenting stress decreases if children with ASD would improve their social and executive function through intervention programmes.

References

Abidin, R. R. (1995). *Parenting Stress Index* (3rd ed.). Odessa, FL: Psychological Assessment Resources.

American Psychiatric Association (APA) (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association (APA) (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Baker-Ericzén, M. J., Brookman-Frazee, L., & Stahmer, A. (2005). Stress levels and adaptability in parents of toddlers with and without autism spectrum disorders. *Research and practice for persons with severe disabilities, 30,* 194-204.

Barker, E. T., Hartley, S. L., Seltzer, M. M., Floyd, F. J., Greenberg, J. S., & Orsmond, G. I. (2011). Trajectories of emotional well-being in mothers of adolescents and adults with autism. *Developmental psychology*, *47*, 551.

Barroso, N. E., Mendez, L., Graziano, P. A., & Bagner, D. M. (2018). Parenting stress through the lens of different clinical groups: a systematic review & meta-analysis. *Journal of abnormal child psychology*, *46*, 449-461.

Beck, A., Hastings, R. P., Daley, D., & Stevenson, J. (2004). Pro-social behaviour and behaviour problems independently predict maternal stress. *Journal of Intellectual and Developmental Disability, 29,* 339-349.

Benson, P. R. (2006). The impact of child symptom severity on depressed mood among parents of children with autism spectrum disorder: The mediating role of stress prolif- eration. *Journal of Autism and Developmental Disorders, 36*, 685–695.

Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. *Child development*, *81*, 1641-1660.

Brei, N. G., Schwarz, G. N., & Klein-Tasman, B. P. (2015). Predictors of parenting stress in children referred for an autism spectrum disorder diagnostic evaluation. *Journal of Developmental and Physical Disabilities*, *27*, 617-635.

Bromley, J., Hare, D. J., Davison, K., & Emerson, E. (2004). Mothers supporting children with autistic spectrum disorders: Social support, mental health status and satisfaction with services. *Autism*, *8*, 409-423.

Chen, K. L., Lin, C. H., Yu, T. Y., Huang, C. Y., & Chen, Y. D. (2018). Differences between the childhood autism rating scale and the social responsiveness scale in assessing symptoms of children with autistic spectrum disorder. *Journal of autism and developmental disorders*, *48*, 3191-3198.

Constantino, J. N., & Gruber, C. P. (2005). Social responsiveness scale (SRS). Los Angeles: Western Psychological Services.

Constantino, J. N., Davis, S. A., Todd, R. D., Schindler, M. K., Gross, M. M., Brophy, S. L., ... & Reich, W. (2003). Validation of a brief quantitative measure of autistic traits: comparison of the social responsiveness scale with the autism diagnostic interview-revised. *Journal of autism and developmental disorders*, *33*, 427-433.

Davis, N. O., & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *Journal of autism and developmental disorders*, *38*, 1278-1291.

Demetriou, E. A., Lampit, A., Quintana, D. S., Naismith, S. L., Song, Y. J. C., Pye, J. E., ... & Guastella, A. J. (2018). Autism spectrum disorders: a meta-analysis of executive function. *Molecular psychiatry*, *23*, 1198–1204.

Developmental Disabilities Monitoring Network Surveillance Year 2010 Principal Investigators (2014). Prevalence of autism spectrum disorder among children aged 8 years—Autism and developmental disabilities monitoring network, 11 sites, United States, 2010. Morbidity and Mortality Weekly Report: Surveillance Summaries, 63, 1–21.

Eisenhower, A. S., Baker, B. L., & Blacher, J. (2005). Preschool children with intellectual disability: syndrome specificity, behaviour problems, and maternal well-being. *Journal of Intellectual Disability Research, 49,* 657-671.

Estes, A., Munson, J., Dawson, G., Koehler, E., Zhou, X. H., & Abbott, R. (2009). Parenting stress and psychological functioning among mothers of preschool children with autism and developmental delay. *Autism, 13,* 375-387.

Estes, A., Olson, E., Sullivan, K., Greenson, J., Winter, J., Dawson, G., & Munson, J. (2013). Parenting-related stress and psychological distress in mothers of toddlers with autism spectrum disorders. *Brain and Development, 35,* 133-138.

Fitzgerald, M., Birkbeck, G., & Matthews, P. (2002). Maternal burden in families with children with autistic spectrum disorder. *The Irish Journal of Psychology, 23,* 2-17.

Gardiner, E., & Iarocci, G. (2012). Unhappy (and happy) in their own way: A developmental psychopathology perspective on quality of life for families living with developmental disability with and without autism. *Research in developmental disabilities, 33,* 2177-2192.

Gilotty, L., Kenworthy, L., Sirian, L., Black, D. O., & Wagner, A. E. (2002). Adaptive skills and executive function in autism spectrum disorders. *Child Neuropsychology, 8,* 241–248.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior rating inventory of executive function: BRIEF*. Odessa, FL: Psychological Assessment Resources.

Giovagnoli, G., Postorino, V., Fatta, L. M., Sanges, V., De Peppo, L., Vassena, L., et al. (2015). Behavioral and emotional profile and parental stress in preschool children with autism spectrum disorder. *Research in Developmental Disabilities, 45*, 411–421.

Gray, D. E. (2002). Ten years on: A longitudinal study of families of children with autism. *Journal of Intellectual and Developmental Disability, 27*, 215-222.

Graziano, P. A., McNamara, J. P., Geffken, G. R., & Reid, A. (2011). Severity of children's ADHD symptoms and parenting stress: A multiple mediation model of self-regulation. *Journal of abnormal child psychology, 39*, 1073-1083.

Hastings, R. P., & Johnson, E. (2001). Stress in UK families conducting intensive home-based behavioral intervention for their young child with autism. *Journal of autism and developmental disorders, 31*, 327-336.

Hayes, S. A., & Watson, S. L. (2013). The impact of parenting stress: A meta-analysis of studies comparing the experience of parenting stress in parents of children with and without autism spectrum disorder. *Journal of Autism and Developmental Disorders, 43*, 629–642.

Hutchison, L., Feder, M., Abar, B., & Winsler, A. (2016). Relations between parenting stress, parenting style, and child executive functioning for children with ADHD or autism. *Journal of Child and Family Studies, 25*, 3644-3656.

Joyner, K. B., Silver, C. H., & Stavinoha, P. L. (2009). Relationship between parenting stress and ratings of executive functioning in children with ADHD. *Journal of Psychoeducational Assessment, 27*, 452-464.

Kenworthy, L., Case, L., Harms, M. B., Martin, A., & Wallace, G. L. (2010). Adaptive behavior ratings correlate with symptomatology and IQ among individuals with high-functioning autism spectrum disorders. *Journal of autism and developmental disorders, 40*, 416-423.

Kohler, F., (1999). Examining the services received by young children with autism and their families: A survey of parent responses. *Focus on Autism and Other Developmental Disabilities, 14*, 150-159.

Konstantareas, M. M., & Homatidis, S. (1989). Assessing child symptom severity and stress in parents of autistic children. *Journal of Child Psychology and Psychiatry*, *30*, 459-470.

Konstantareas, M. M., & Papageorgiou, V. (2006). Effects of temperament, symptom severity and level of functioning on maternal stress in Greek children and youth with ASD. *Autism*, *10*(6), 593-607.

Kouklari, E. C., Tsermentseli, S., & Monks, C. P. (2018). Everyday executive function and adaptive skills in children and adolescents with autism spectrum disorder: Cross-sectional developmental trajectories. *Autism & Developmental Language Impairments, 3*, 1-16.

Kouklari, E. C., Tsermentseli, S., & Monks, C. P. (2019). Developmental trends of hot and cool executive function in school-aged children with and without autism spectrum disorder: Links with theory of mind. *Development and psychopathology*, *31*, 541-556.

Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York: McGraw-Hill.

Le Couteur, A., Rutter, M., Lord, C., Rios, P., Robertson, S., Holdgrafer, M., et al. (1989). Autism diagnostic interview: A standardized investigator-based instrument. *Journal of Autism and Developmental Disorders, 19,* 363–387.

Lecavalier, L., Leone, S., & Wiltz, J. (2006). The impact of behaviour problems on caregiver stress in young people with autism spectrum disorders. *Journal of Intellectual Disability Research, 50*, 172-183.

Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism diagnostic interview-revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of autism and developmental disorders, 24*, 659-685.

Lord, C., Rutter, M., DiLavore, P. C., & Risi, S. (2000). Autism diagnostic observation schedule (ADOS). Los Angeles, California: Western Psychological Services.

Matson, J. L., & Shoemaker, M. (2009). Intellectual disability and its relationship to autism spectrum disorders. *Research in developmental disabilities, 30*, 1107-1114.

Matson, J. L., Dempsey, T., LoVullo, S. V., & Wilkins, J. (2008). The effects of intellectual functioning on the range of core symptoms of autism spectrum disorders. *Research in Developmental Disabilities*, *29*, 341-350.

McLuckie, A., Landers, A. L., Rowbotham, M., Landine, J., Schwartz, M., & Ng, D. (2018). Are Parent-and Teacher-Reported Executive Function Difficulties Associated With Parenting Stress for Children Diagnosed With ADHD?. *Journal of attention disorders*, 1087054718756196.

McStay, R. L., Trembath, D., & Dissanayake, C. (2014). Stress and family quality of life in parents of children with autism spectrum disorder: parent gender and the double ABCX model. *Journal of autism and developmental disorders*, *44* 3101-3118.

Miranda, A., Mira, A., Berenguer, C., Rosello, B., & Baixauli, I. (2019). Parenting stress in mothers of children with autism without intellectual disability. Mediation of behavioral problems and coping strategies. *Frontiers in psychology*, *10*, 464.

Najman, J. M., Williams, G. M., Nikles, J., Spence, S. U. E., Bor, W., O'Callangham, M. I. C. H. A. E. L., ... & Andersen, M. J. (2000). Mothers' mental illness and child behavior problems: cause-effect association or observation bias?. *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*, 592-602.

Orr, R. R., Cameron, S. J., Dobson, L. A., & Day, D. M. (1993). Age-related changes in stress experienced by families with a child who has developmental delays. *Mental Retardation*, *31*, 171.

Pellicano, E. (2010). Individual differences in executive function and central coherence predict developmental changes in theory of mind in autism. *Developmental psychology*, *46*, 530.

Peterson, J., & Hawley, D. R. (1998). Effects of stressors on parenting attitudes and family functioning in a primary prevention program. *Family Relations, 47,* 221-227.

Pisula, E., & Kossakowska, Z. (2010). Sense of coherence and coping with stress among mothers and fathers of children with autism. *Journal of autism and developmental disorders, 40,* 1485-1494.

possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 24,* 659–685.

Sawyer, M. G., Bittman, M., La Greca, A. M., Crettenden, A. D., Harchak, T. F., & Martin, J. (2010). Time demands of caring for children with autism: What are the implications for maternal mental health?. *Journal of Autism and Developmental Disorders, 40,* 620-628.

Scheuermann, B., & Webber, J. (2002). *Autism: Teaching does make a difference*. Wadsworth Publishing Company.

Siu, Q. K., Yi, H., Chan, R. C., Chio, F. H., Chan, D. F., & Mak, W. W. (2019). The Role of Child Problem Behaviors in Autism Spectrum Symptoms and Parenting Stress: A Primary School-Based Study. *Journal of autism and developmental disorders, 49,* 857-870.

Sparrow, S. S., Cicchetti, V. D., & Balla, A. D. (2005). *Vineland adaptive behavior scales* (2nd ed.). Circle Pines, MN: American Guidance Service.

Starr, E.M., Foy, J.B., Cramer, K.M. (2001). Parental perceptions of the education of children with pervasive developmental disorders. *Education and Training in Mental Retardation and Developmental Disabilities, 36,* 55-68.

Tehee, E., Honan, R., & Hevey, D. (2009). Factors contributing to stress in parents of individuals with autistic spectrum disorders. *Journal of Applied Research in Intellectual Disabilities, 22,* 34-42.

Tobin, H., Staunton, S., Mandy, W., Skuse, D., Helligreil, J., Baykaner, O., ... & Murin, M. (2012). A qualitative examination of parental experiences of the transition to mainstream secondary school for children with an autism spectrum disorder. *Educational and Child Psychology, 29,* 75.

Tomanik, S., Harris, G. E., & Hawkins, J. (2004). The relationship between behaviours exhibited by children with autism and maternal stress. *Journal of Intellectual and Developmental Disability, 29*, 16-26.

Torske, T., Nærland, T., Øie, M. G., Stenberg, N., & Andreassen, O. A. (2018). Metacognitive aspects of executive function are highly associated with social functioning on parent-rated measures in children with autism spectrum disorder. *Frontiers in behavioral neuroscience*, *11*, 258.

Totsika, V., Hastings, R. P., Emerson, E., Lancaster, G. A., & Berridge, D. M. (2011). A population-based investigation of behavioural and emotional problems and maternal mental health: Associations with autism spectrum disorder and intellectual disability. *Journal of Child Psychology and Psychiatry*, *52*, 91-99.

Townsend, A., Noelker, L., Deimling, G., & Bass, D. (1989). Longitudinal impact of interhousehold caregiving on adult children's mental health. *Psychology and aging*, *4*, 393.

Tsermentseli, S., Tabares, J. F., & Kouklari, E. C. (2018). The role of every-day executive function in social impairment and adaptive skills in Autism Spectrum Disorder with intellectual disability. *Research in Autism Spectrum Disorders*, *53*, 1-6.

Wechsler, D. (1999). *Wechsler abbreviated scale for intelligence.* San Antonio, TX: The Psychological Corporation.

Yorke, I., White, P., Weston, A., Rafla, M., Charman, T., & Simonoff, E. (2018). The association between emotional and behavioral problems in children with autism spectrum disorder and psychological distress in their parents: a systematic review and meta-analysis. *Journal of autism and developmental disorders*, *48*(10), 3393-3415.

Table 1. Participant characteristics (N =113) including mean age, IQ as well as executive function index scores, adaptive functioning, social impairment and parenting stress index scores.

Measure	**M**	**SD**	**Range (Min-Max)**
Age	7.46	2.19	4-11
Full scale IQ	52.82	7.07	46-68
SRS	122.69	20.54	67-158
BRIEF BRI	80.20	14.66	58-115
BRIEF MI	76.05	13.07	47-107
VABS socialisation	53.62	13.99	30-89
VABS communication	52.28	11.64	31-86
VABS daily living	50.84	12.73	30-89
PSI total score	105.50	19.23	70-148

Note. SRS = Social Responsiveness Scale; BRIEF = Behavioural Rating Inventory of Executive Function; BRI = Behavioural Regulation Index; MI = Metacognition Index; VABS= Vineland Adaptive Behaviour Scales; PSI= Parenting Stress Index.

Table 2. Parenting stress scores across different educational stages.

Parenting stress	N	M	SD
Reception	24	103.81	20.49
Key stage 1	32	105.32	18.56
Key stage 2	57	107.50	18.36

Table 3. Pearson's correlations for potential covariates, social impairment, executive function, adaptive skills and parenting stress.

Measures	1	2	3	4	5	6	7	8	9
1.Age	-	-.032	-.229*	.213*	.327**	-.013	-.226*	-.048	.018
2.FSIQ	-	-	.497	.053	.041	-.041	-.016	-.026	-.047
3.SRS	-	-	-	.139	.005	-.295**	-.121	.299**	.257**
4.BRIEF MI	-	-	-	-	.877*	-.395**	-.206*	-.463**	.264**
5.BRIEF BRI	-	-	-	-	-	-.121	-.051	-.172	.020
6.VABS socialisation	-	-	-	-	-	-	.630**	.865**	-.101
7.VABS communication	-	-	-	-	-	-	-	.673**	-.028
8. VABS daily living	-	-	-	-	-	-	-	-	-.064
9. PSI total score	-	-	-	-	-	-	-	-	-

Note. FSIQ= Full scale IQ; SRS = Social Responsiveness Scale; BRIEF = Behavioural Rating Inventory of Executive Function; BRI = Behavioural Regulation Index; MI = Metacognition Index; VABS= Vineland Adaptive Behaviour Scales; PSI= Parenting Stress Index.

*$p < .05$. **$p \leq .01$.

Table 4. Hierarchical multiple regression analyses of child predictors of parenting stress.

Predictors	β	ΔR^2
Step 1		.01
Age	.14	
Step 2		.15
BRIEF MI	.20*	
Step 3		.13
SRS	.25**	
Metacognition subscale analysis		
Step 1		.01
Age	.14	
Step 2		.32
BRIEF Working Memory	.25*	
BRIEF Initiation	.36**	

Note. FSIQ= Full scale IQ; SRS = Social Responsiveness Scale; BRIEF = Behavioural Rating Inventory of Executive Function; MI = Metacognition Index.

*$p < .05$. **$p \leq .01$.