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Variability in adaptive behaviour in young children with autism spectrum disorder

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Abstract

Background—Understanding adaptive behaviour variability in children with autism spectrum disorder (ASD) may have important implications for early intervention. The purpose of this study was to explore whether autism symptom severity and caregiver depression affected adaptive behaviour in young children with ASD.

Method—Data were collected from 60 primary caregivers of children aged 2–6 years with ASD. A factorial multivariate analysis of covariance was conducted to investigate if different levels of autism symptom severity and caregiver depression affected communication, socialisation, and daily living skills, after controlling for child age.

Results—Findings suggest that only autism symptom severity accounted for significant variance in adaptive behaviour, with socialisation being most impacted. Although more than half of the caregivers reported heightened depressive symptoms, caregiver depression was not related to adaptive behaviour.

Conclusions—Findings highlight the level of functional impairment that young children with ASD experience in relation to autism symptom severity.

Keywords

autism spectrum disorder; adaptive behaviour; autism symptom severity; maternal depression

Introduction

Autism spectrum disorder (ASD) is a continuum of neurodevelopmental conditions characterised by deficits in reciprocal social communication and social interaction and restricted, repetitive patterns of behaviour, interests, or activities (American Psychiatric Association, 2013). The prevalence of ASD has grown considerably and is now estimated to be 1 in 68 children aged from birth to 8 years in the United States (Centers for Disease Control and Prevention, 2014). Although there are no biological markers or known cure for ASD, the general importance of early intervention for ASD is widely recognised. An important goal of early intervention is to promote the child's adaptive functioning because it

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prepares the child for increased responsibility and personal independence (Myers & Johnson, 2007).

Adaptive behaviour, as defined by Sparrow, Cicchetti, and Balla (2005), is the extent to which an individual is capable of being self-sufficient in real-life situations. Sparrow et al. discuss four elements that are inherent in their definition: (a) adaptive behaviour is an age-related construct, and as children grow older, adaptive behaviour increases and becomes more complex; (b) adaptive behaviour is determined by the expectations, cultural values, and standards of people who live, play, teach, and interact regularly with the child; (c) adaptive behaviour is modifiable and can deteriorate or improve depending on interventions, changes in environment, or other events; and (d) adaptive functioning emphasises the child's observable performance of daily activities and places less emphasis on ability.

Early social, communication, and play behaviours represent critical skills and serve as the foundation for later language abilities, adaptive functioning, and academic performance (Bergen & Mauer, 2000; McGovern & Sigman, 2005). For preschool children, educational objectives are closely linked to adaptive behaviour. Information about adaptive behaviour in young children with ASD may be especially important because diagnostic assessments are frequent during the preschool years (Mandell, Novak, & Zubritsky, 2005), and assessing a child's adaptive behaviour has been shown to improve diagnostic accuracy over and above that provided by reliable instruments for ASD (Tomanik, Pearson, Loveland, Lane, & Shaw, 2007).

The importance of adaptive behaviour assessment in children with ASD is illustrated by its strong contribution to diagnosis as well as treatment planning (Gillham, Carter, Volkmar, & Sparrow, 2000). Several studies (e.g., Bölte & Poustka, 2002; Gillham et al., 2000; Liss et al., 2001) have documented a characteristic pattern of adaptive behaviour in children with ASD with deficits in socialisation skills, strengths in daily living skills, and intermediate communication skills. Additionally, there is an observed discrepancy between the levels of cognitive functioning and the ability to apply these skills to a real-world context, at least among children with high-functioning autism (Klin et al., 2007). Evidence also suggests that lower adaptive functioning becomes more prominent at older ages (Fenton et al., 2003; Klin et al., 2007).

An aspect of ASD that makes it heterogeneous is that there is a wide range in terms of types and severity of symptoms (Rapin & Tuchman, 2008). The few studies that have examined the relation between adaptive behaviour and autism symptomatology have found varying trends, emphasising the need for additional research. Klin et al. (2007) examined the relation between adaptive behaviour and autism symptomatology in 187 cognitively higher functioning school-age and adolescent boys with ASD. Klin and colleagues, who characterised autism symptomatology as indicative of disability and adaptive functioning as indicative of ability, were among the first to document a weak and marginally significant negative correlation between these two constructs. In a multi-site study that investigated genetic features in simplex families of 1,089 relatively high-functioning youth with ASD aged 4–17, Kanne et al. (2011) were able to corroborate the weak association between adaptive behaviour and level of autism symptomatology by clinician observation. However,

they found a stronger association between adaptive behaviour and autism symptomatology as reported by parents, particularly in younger children. Based on these results, the authors concluded that there is a stronger relation between autism symptomatology and adaptive behaviour early in development, and that this association weakens with age.

In sharp contrast, Liss et al. (2001) found that symptom severity was significantly negatively correlated with adaptive functioning for children with higher functioning autism. Research conducted by Perry, Flanagan, Dunn Geier, and Freeman (2009) demonstrated that autism severity was moderately to strongly negatively correlated with adaptive scores in a sample of 290 preschool children with ASD of varying cognitive levels. Furthermore, the study showed that statistically unique variance in adaptive scores was attributable to autism severity, although more variance was accounted for by age and developmental level. Kenworthy, Case, Harms, Martin, and Wallace (2010) assessed the adaptive behaviour of 12- to 22-year-olds with high-functioning autism ($n = 40$) compared to matched controls ($n = 30$) and found significant deficits for the high-functioning group in overall adaptive behaviour, relative to controls. Higher ratings of ASD symptoms were associated with lower adaptive scores, consistent with other reports of a strong negative association between autism symptoms and adaptive behaviour.

There exists a possibility that in addition to child variables (e.g., age, IQ, autism symptom severity), familial history variables are a potential source of variability in adaptive behaviour in ASD. Studies have revealed that parental stress and depression are negatively associated with parenting self-efficacy, or parents' perceived feelings of competence in the parenting role (Kuhn & Carter, 2006; Teti, O'Connell, & Reiner, 1996). Women are very often the primary caregivers and the adverse effects of maternal depression on child development are well documented (e.g., Benson, 2006; Hastings & Brown, 2002). In their meta-analytic study, Lovejoy, Graczyk, O'Hare, and Neuman (2000) found maternal depression to be strongly associated with irritability and hostility toward the child, moderately associated with disengagement from the child, and weakly associated with rates of play and other active and pleasant social interactions.

Compared to parents of typically developing children, parents raising children with developmental disability experience more stress (Smith, Oliver, & Innocenti, 2001) and have higher rates of depression (Dumas, Wolf, Fisman, & Culligan, 1991; Hodge, Hoffman, & Sweeney, 2011). Even among parents raising children with developmental disability, parents of children with ASD report significantly higher levels of stress (Benson & Karlof, 2009; Dumas et al., 1991) and are more likely to experience depression (Abbeduto et al., 2004; Olsson & Hwang, 2001). Mothers of children with ASD are at an increased risk of depression, compared to fathers (Olsson & Hwang, 2001). In fact, mothers of preschool-aged children with ASD report lower psychological wellbeing and coping compared to mothers of children with Down syndrome, fragile X syndrome, and cerebral palsy (Eisenhower, Baker, & Blacher, 2005). Due to the nature of ASD, these findings are not surprising. Young children with ASD have more behaviour problems and less sociability than children with other developmental disability (Eisenhower et al., 2005), and the trend continues in older individuals with ASD (Blacher & McIntyre, 2006).

Not many studies have focused on the relation between caregiver depression and the child's adaptive behaviour. There is evidence of a familial influence on adaptive scores among siblings with ASD (Goin-Kochel, Mazefsky, & Riley, 2008; MacLean et al., 1999). Based on evidence of familial resemblance for adaptive scores in affected siblings, Mazefsky, Williams, and Minshew (2008) explored the relation between family history factors and adaptive functioning in 77 individuals with high-functioning autism aged 8–39 years. Findings revealed that a family history of autistic-like social dysfunction, shyness, and depression were significant predictors of adaptive behaviour. Furthermore, the authors found that a family history of depression significantly predicted lower scores in socialisation and daily living skills.

Purpose of the study

This study was built on past research that has identified patterns in adaptive behaviour scores for individuals on the autism spectrum as a group. Previous studies analysing the relation between adaptive behaviour and autism symptom severity have yielded inconsistent results, highlighting the need for additional research in this area. Preliminary evidence suggests that a family history of depression has a negative impact on child adaptive behaviour, warranting further investigation. Thus, the purpose of this study was to gain a better understanding of variability in adaptive behaviour (communication, socialisation, and daily living skills) in relation to autism symptom severity and caregiver depression in a sample of young children. Findings from this investigation may inform the development of interventions to enhance children's adaptive functioning, taking into consideration autism symptom severity and caregiver mental health.

Method

Research design

The study used a quantitative nonexperimental research design to analyse data and test the relations among variables (see Shadish, Cook, & Campbell, 2002). Communication, socialisation, and daily living skills (Vineland-II) served as the outcome variables for this study. The predictor variables were autism symptom severity (CARS2-ST) and caregiver depression (CES-D). Child age was selected as a covariate because of the influence of age on skill acquisition and the developmental nature of adaptive behaviour. Additionally, child age was selected for statistical control a priori to replicate previous studies that controlled for age of children with ASD when measuring adaptive behaviour using the Vineland scales (e.g., Kanne et al., 2011; Mazefsky et al., 2008; Perry et al., 2009).

The study was part of a larger project exploring child, family, and community variables associated with early identification and treatment of preschool-age children with ASD in the Northwest United States. The research assistants involved in this study were doctoral students in school psychology or special education and were trained and supervised by the project's principal investigator. Participating caregivers were informed about the study, signed consent forms, and understood that information provided would be kept confidential. This study received ethics approval from the University of Oregon's ethics panel (institutional review board; ethics approval #08212011.072).

Families were recruited through early intervention and early childhood special education or preschool programs. The recruitment letter contained a brief description of the study and contact information for project staff. Families wishing to participate were screened over the telephone to assess whether their child met the following inclusionary criteria: (a) the child had either a medical diagnosis of ASD or a special educational eligibility of autism, (b) the child was 6 years old or younger, and (c) the child lived with the primary caregiver for at least 1 year.

Upon eligibility determination, a phone interview and home interview with the primary caregiver were scheduled. Families were mailed a packet via postal mail containing the informed consent form and measures of parent wellbeing, including a measure of caregiver depression. Subsequently, a research assistant administered an adaptive behaviour measure as a phone interview lasting 30–45 minutes. Two research assistants completed a home visit to administer the remaining measures, including a measure of autism symptom severity. The home visit lasted approximately 90 minutes, and each participating family received a US \$50.00 gift card as a research participation honorarium.

Participants

Sixty caregivers with young children with ASD served as participants for this study. The average age of children was 53.78 months ($SD = 14.55$), or 4.48 years. Consistent with the male-to-female ratio for ASD, 83% of children were male. The majority of children in the sample were identified as White/Caucasian. Slightly more than half were in preschool programs, with fewer in kindergarten and early intervention programs. All children received special education under the disability category of autism and 78.3% of caregivers reported that their child also had a medical diagnosis of ASD. Approximately one-third of the sample was reported to have a comorbid diagnosis (intellectual disability, $n = 3$; attention-deficit/hyperactivity disorder, $n = 4$; seizure disorder, $n = 1$; other, $n = 6$; multiple disorders, $n = 6$).

The majority of the families had two-parent, married caregivers. In all but two families, the primary caregiver was the child's mother. The average age of caregivers was 35.23 years ($SD = 7.95$). Just over half of caregivers in the sample reported having a high school diploma or its equivalent as the highest degree earned, and 43% of all caregivers worked either full-time or part-time. The majority of children had siblings living at home. The average household size was four people, with a median annual income ranging from US \$25,000 to US\$34,999. Approximately 70% of participants reported a history of ASD, learning disability, or mental health problems in the immediate family (i.e., biological parents or biological siblings). Table 1 displays the demographic characteristics of the sample.

Measures

Demographics—A questionnaire was developed to gather information about child and family characteristics. Child variables included age, sex, race/ethnicity, medical diagnosis, and educational placement. Family variables included parents' age, education, and employment; household size and income; number of siblings; and immediate family history of ASD, learning disability, and mental health problems.

Adaptive behaviour—The Survey Interview Form of the Vineland Adaptive Behavior Scales – Second Edition (Vineland-II; Sparrow et al., 2005) was administered to assess the child's competence and independence in his or her daily living environment. The Vineland-II is a structured interview that assesses adaptive behaviour from birth through to 90 years in four domains: communication, daily living skills, socialization, and motor skills. The Vineland-II has moderate to high internal consistency, high test-retest reliability, and good inter-interviewer reliability (Sparrow et al., 2005). Raw scores are converted to v-scale scores, a standard score with a mean of 10 and a standard deviation of 3. Summed v-scale scores can be converted to normalised standard scores with a mean of 100 and a standard deviation of 15. For the purposes of this study, only the communication, daily living skills, and socialization domains were considered.

Autism symptom severity—The Standard Version of the Childhood Autism Rating Scale – Second Edition (CARS2-ST; Schopler, Van Bourgondien, Wellman, & Love, 2010) was administered to assess the child's autism symptomatology. The CARS2-ST is appropriate for use with children 2 years of age and older and can be completed based on information obtained from a parent interview. The psychometric properties of the CARS2-ST indicate high internal consistency and good interrater reliability (Schopler et al., 2010). Each item is rated on a 7-point scale by considering not only the child's chronological age, but also the peculiarity, frequency, intensity, and duration of his or her behaviour. Rating values are summed to produce a total raw score, which ranges from 15 to 60, with higher scores indicating greater severity. A score of 15–29 indicates minimal symptoms of ASD, 30–36.5 indicates mild to moderate symptoms of ASD, and 37–60 indicates severe symptoms of ASD.

Caregiver depression—The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was administered to measure caregiver depression. The CES-D is a 20-item scale that is designed to measure self-reported symptoms associated with depression experienced in the preceding week. The scale is appropriate for use with the general population and may be self- or interviewer administered in a relatively short time. The CES-D has high internal consistency and is a sensitive tool for detecting depressive symptoms and change in symptoms over time in clinical and community samples (Radloff, 1977). Response categories indicate the frequency of occurrence of each item, and are scored on a 4-point scale ranging from 0 (rarely or none of the time) to 3 (most or all of the time). Total scores range from 0 to 60, with high scores indicating greater depressive symptoms. A score of 0–15 indicates low depressive symptoms and a score of 16 or higher is the suggested cut-off score for high depressive symptoms in a general population (Radloff, 1977).

Statistical analyses—Zero-order and partial correlation coefficients were first computed among study variables. Statistical and graphical analyses were performed on the data to assess whether or not the assumptions of multivariate analysis of covariance (MANCOVA) were met. Assumptions of MANCOVA that were tested included multivariate normality, linearity, homogeneity of variance-covariance matrices, and multicollinearity. Once the assumptions were satisfied, a MANCOVA was then conducted to investigate if different levels of autism symptom severity and caregiver depression affected communication,

socialization, and daily living skills, after controlling for child age. All analyses were performed using SPSS for Windows (Version 20.0).

Results

There was a wide distribution in the age range of children in the sample (21–83 months). Autism symptom severity scores, as measured by the CARS2-ST, ranged from 24 to 50.5 ($M = 39.12$, $SD = 6.51$). Using the cut-off scores provided in the CARS2-ST manual, 8.3% ($n = 5$) of children were characterised as having minimal autism symptoms, 25% ($n = 15$) as having mild to moderate autism symptoms, and 66.7% ($n = 40$) as having severe autism symptoms. Notably, the five children who were characterised as having minimal autism symptoms had scores very near the cut-off. Thus, in an effort to balance group sizes for subsequent multivariate analyses, the minimal and mild-to-moderate groups were combined and referred to as the mild autism symptoms group.

Caregiver depression scores, as measured by the CES-D, ranged from 0 to 46 ($M = 17.82$, $SD = 11.18$). Using the standard CES-D cut-off score of 16, 45% ($n = 27$) of caregivers were characterised as having low depressive symptoms and 55% ($n = 33$) as having high depressive symptoms. On average, adaptive behaviour scores, as measured by the Vineland-II, were nearly two standard deviations below the mean across domains. Mean standard scores for the communication, socialization, and daily living skills domains were 74.15 ($SD = 16.86$), 71.37 ($SD = 9.33$), and 75.57 ($SD = 12.24$), respectively. Pearson's zero-order correlations were first computed to examine associations among all the variables of interest. Next, partial correlations were generated, controlling for child age. With one exception, zero-order and partial correlations were virtually identical. The results showed that 8 out of the 15 correlations were statistically significant. Effect sizes for correlations were interpreted using Cohen's (1988) guidelines (.10 = small, .30 = moderate, and .50 = large). The results of the correlation analyses are summarised in Table 2.

Autism symptom severity and caregiver depression were considered as categorical variables in order to use manual recommended cut-off scores and to increase clinical utility with regard to interpretation of results and treatment considerations. A factorial MANCOVA was thus conducted with adaptive behaviour as the dependent variable and with two levels of autism symptom severity (mild and severe) and two levels of caregiver depression (high and low) as independent variables. As the interaction between autism symptom severity and caregiver depression was not significant, the main effect of each predictor was examined. Table 3 provides a summary of the factorial MANCOVA. Post-hoc univariate analysis of covariance (ANCOVA) on each of the three measures comprising the multivariate composite revealed statistically significant mean differences between autism symptom severity groups. Alpha was adjusted to .017 (i.e., .05/3) to control for Type I error. The results indicated that autism symptom severity had significant effects on communication, $F(1, 55) = 9.96$, $p = .003$, $\eta^2 = .15$; socialization, $F(1, 55) = 19.57$, $p < .001$, $\eta^2 = .26$; and daily living skills, $F(1, 55) = 12.01$, $p = .001$, $\eta^2 = .18$. The covariate, child age, had a significant effect only on socialization, $F(1, 55) = 9.49$, $p = .003$, $\eta^2 = .15$.

A within-group comparison of adjusted means revealed that children with mild autism symptoms showed more delays in socialization, and lesser delays in communication and daily living skills. On the other hand, children with severe autism symptoms showed more delays in socialization and communication, and lesser delays in daily living skills. A between-group comparison of adjusted means indicated that the difference between the two autism symptoms groups was the greatest for communication. Although both autism symptoms groups scored lowest on socialization, the deficit was more pronounced in children with mild autism symptoms. Figure 1 presents the adjusted group means for communication, socialization, and daily living skills by autism symptoms groups.

Follow-up analyses

As findings demonstrated that only autism symptom severity had a significant association with adaptive behaviour, with socialization contributing the most to group differences, the Vineland-II socialization subdomains (i.e., interpersonal relationships, play and leisure time, and coping skills) were further analysed. A one-way MANCOVA was performed with child age as covariate. Outcome variables were interpersonal relationships, play and leisure time, and coping skills. Autism symptom severity, with two levels (mild and severe), was the predictor variable. The results of the one-way MANCOVA indicated that the main effect of autism symptom severity was significant, Wilks' $\Lambda = .70$, $F(3, 55) = 7.86$, $p < .001$, $\eta^2 = .30$, observed power = .99. The covariate, child age, significantly influenced the multivariate composite, Wilks' $\Lambda = .78$, $F(3, 55) = 5.05$, $p = .004$, $\eta^2 = .22$, observed power = .90. The results further indicated that autism symptom severity had significant effects on interpersonal relationships, $F(1, 57) = 18.29$, $p < .001$, $\eta^2 = .24$; play and leisure time, $F(1, 57) = 8.58$, $p = .005$, $\eta^2 = .13$; and coping skills, $F(1, 57) = 8.94$, $p = .004$, $\eta^2 = .14$. The covariate, child age, had a significant effect only on coping skills, $F(1, 57) = 12.15$, $p = .001$, $\eta^2 = .18$.

Discussion

This study sought to examine variability in adaptive behaviour in young children with ASD and the role of autism symptom severity and caregiver depression. Descriptive statistics revealed that children scored nearly two standard deviations below the mean, or in the moderately low range, across domains on the Vineland-II. Previous literature attesting to the adaptive deficits in autism dates back at least to Volkmar et al. (1987). Several later studies (e.g., Bölte & Poustka, 2002; Klin et al., 2007; Liss et al., 2001) have documented delays in adaptive behaviour development in individuals on the autism spectrum. Moreover, the typical profile described in past research for individuals with ASD as a group (e.g., Bolté & Poustka, 2002; Gillham et al., 2000; Liss et al., 2001), namely, lower socialization scores, intermediate communication scores, and higher daily living skills scores, was confirmed in the present study.

The results of the correlation analyses suggested that higher scores on the CARS2-ST were strongly related to lower scores on the Vineland-II domains, which is in contrast to Kanne et al.'s (2011) and Klin et al.'s (2007) reports of weak, negative relations between autism symptoms and adaptive behaviour, but is consistent with other reports of strong, negative

associations between autism symptoms and adaptive behaviour (e.g., Kenworthy et al., 2010; Liss et al., 2001; Perry et al., 2009). The results further indicated that higher scores on the CARS2-ST were moderately related to higher scores on the CES-D. It is established in the literature that parents with children with ASD report higher levels of parenting stress and depression as compared to parents of typically developing children and children with other developmental disability (Dumas et al., 1991; Eisenhower et al., 2005; Olsson & Hwang, 2001; Smith et al., 2001). At the same time, studies have shown that mothers experiencing depressive symptoms have difficulties attending to their child's needs, responding effectively, and maintaining high levels of involvement (Brennan et al., 2000; Lovejoy et al., 2000). Considered within the framework of the bioecological model (Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998), one can better appreciate the transactional nature of the relation between child and parent characteristics.

The zero-order correlations were virtually identical as the partial correlations, indicating the general robustness of the zero-order correlations. There was, however, one exception: the significant, negative correlation between autism symptom severity and socialization was strengthened after the influence of child age was partialled out. This difference is not surprising, given the significant, negative correlation between child age and socialization. This trend, also observed by Kanne et al. (2011) and Klin et al. (2007), implies that the gap in socialisation skills between children with ASD and their typical peers increase with age. As Klin and colleagues noted in their study, this result does not reflect a loss of skills over time; rather, it indicates that children with ASD fail to make gains in skills at a level commensurate with their gains in chronological age.

The MANCOVA indicated that after adjusting for child age, autism symptom severity explained 28% of the variance in a newly created linear combination of original adaptive measures. The adaptive measures were treated in combination in order to achieve a more "holistic" picture of adaptive behaviour and incorporate the intercorrelations of communication, socialization, and daily living skills (see Tabachnick & Fidell, 2007). The central finding of the MANCOVA was that there were significant group differences based on autism symptom severity, and that socialization was the most impacted of the three adaptive behaviour domains. Regardless of autism symptom severity, children scored relatively low on socialization in the present study. Klin et al. (2007) found that irrespective of cognitive potential, children scored relatively low on socialization, supporting the theory that, almost universally, children have difficulties translating cognitive skills to adaptive skills (Liss et al., 2001).

Interpersonal relationships were most impacted of the three socialization subdomains. These findings are in line with the few studies that have analysed subdomains of Vineland scales (e.g., Kanne et al., 2011; Klin et al., 2007). On the Vineland-II, interpersonal relationships tap into behaviours such as responding to others (e.g., shows interest in children the same age, shows preference for certain people and objects); expressing and recognising emotions (e.g., uses words to express own emotions, uses words or actions to show happiness or concern for others); imitating (e.g., repeats phrases heard spoken before by an adult, imitates actions as they are being performed by another person or several hours after watching someone else perform them); social communication (e.g., makes social contact, answers

when familiar adults make small talk); and friendship (e.g., demonstrates friendship-seeking behaviour with same-age peers, has best friend or shows preference for certain friends over others).

Given that a family history of depression significantly predicts lower scores in socialization and daily living skills (Mazefsky et al., 2008), this study sought to explore the relation between caregiver depression and adaptive behaviour in children with ASD. Multivariate analyses did not indicate that caregiver depression was significantly associated with any of the adaptive behaviour domains. This finding is surprising given that 55% of caregivers in the current sample reported symptoms on the CES-D that met the clinical risk cut-off score of 16. Although average CES-D scores found in community surveys have been found to vary between 8.0 and 8.5 (Aneshensel, Frerichs, Clark, & Yokopenic, 1982), the mean CES-D score in the current sample was twice that figure. It is worth mentioning, however, that 90% of the families in this sample had two-parent, married caregivers, which may have helped mitigate some of the negative outcomes associated with caregiver depression. Cairney, Boyle, Offord, and Racine (2003) found that single mothers, who may have to balance multiple roles, experience higher rates of depression and parenting stress.

Limitations and recommendations for future research

The present study does not imply any causal relations among variables of interest, and no causal inferences can be drawn from these results. Furthermore, there are several limitations that need to be considered when interpreting the findings. First, the data that were analysed were based solely on primary caregiver reports, which may have increased reporting bias. Moreover, many caregivers in the sample reported heightened depressive symptoms, which may have increased the size of the correlations. Future studies could address this problem by using additional raters as criterion raters. When using additional raters as criterion raters (e.g., fathers, teachers), it would be important for future studies to also document the context, length, and quality of the criterion rater's relationship with the child. Second, this study tapped into one dimension of caregiver depression, that is, severity. Future studies should include data on other dimensions of caregiver depression, such as chronicity and timing of depressive symptoms. Additionally, future studies should include a measure of parenting stress given its relation to depression in previous research. Third, caution should be used when generalising this data to all children with ASD due to the limited sample. As this sample was a relatively homogeneous sample of White, two-parent families drawn from one geographical region, future research should aim to include a more diverse sample. Fourth, similar to previous studies assessing adaptive behaviour in children with ASD, the present study focused on communication, socialisation, and daily living skills, but not on motor skills. However, as there is initial evidence of a direct relation between motor skills and autism severity (see MacDonald, Lord, & Ulrich, 2013), future research should replicate and extend these findings.

Contributions of the present study and implications

Limitations notwithstanding, the present study confirmed the magnitude of socialisation impairments in young children with ASD, which may be relevant for early identification and intervention. Children with mild autism symptoms, who may fall below the threshold for a

medical diagnosis or a special educational eligibility of autism, still need support in the area of socialisation. Consistent with findings from previous studies that have examined mothers with children with autism (e.g., Dumas et al., 1991; Kuhn & Carter, 2006; Olsson & Hwang, 2001), more than half of caregivers in the sample reported heightened levels of depression. This study contributed uniquely to the current body of literature by exploring the relation between caregiver depression and adaptive behaviour. Initial evidence that caregiver depression is not associated with adaptive behaviour in children with ASD represents a novel finding of the present study. It is worth mentioning here that although caregiver depression did not emerge as a significant predictor of child adaptive behaviour skills, it could have negative outcomes in other proximal and distal contexts, which could in turn influence child adaptive behaviour development (Malik et al., 2007). Therefore, from a research perspective, it would be important to identify mediating variables that better explain the relation between caregiver depression and stress with child adaptive behaviour. From a practitioner's standpoint, it would be important to examine the availability of support systems that promote parent mental health.

Most studies in the past have examined adaptive behaviour using samples of school-aged children and adolescents. Thus, an important contribution of this study is that it examined adaptive behaviour in a sample of young children with ASD, which has important implications for early intervention. Moreover, while much of the research on adaptive behaviour thus far has been based on the original Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984), this study used the updated Vineland-II to assess adaptive behaviour domains. The norm sampling for the Vineland-II included larger pools of individuals aged birth to 5, thereby increasing the scale's sensitivity and utility for this age group in particular (Sparrow et al., 2005). Therefore, the current study also added to existing literature on the Vineland-II.

In summary, identifying sources of variability in adaptive behaviour is useful in advancing our knowledge of adaptive development in individuals with ASD as well as identification of treatment targets. Research suggests that the consideration of child-specific attributes in combination with family characteristics leads to the development of intervention strategies that are more likely to be acceptable, effective, and sustainable. The needs and strengths of individuals with ASD are very heterogeneous. The current study highlighted the level of functional impairment that young children with ASD experience in relation to autism symptom severity, allowing for a deeper understanding of ASD with implications for treatment focus.

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Figure 1.
Pattern of adaptive behaviour at different autism symptom severity levels.

Table 1.Child and family demographics ($N = 60$).

Demographic	<i>n</i>	%
Child variables		
Sex		
Male	50	83.3
Female	10	16.7
Race/ethnicity		
White	42	70.0
Hispanic	3	5.0
Mixed	15	25.0
Special education diagnosis of autism	60	100.0
Primary medical diagnosis		
Autism	19	31.7
PDD or PDD-NOS	12	20.0
Asperger's syndrome	1	1.7
Other	15	25.0
No medical diagnosis of ASD	13	21.7
Educational placement		
Early intervention	10	16.7
Early childhood special education/preschool	32	53.3
Kindergarten	12	20.0
Other	6	10.0
Caregiver and family variables		
Marital status		
Married or living with partner	54	90.0
Divorced or separated	3	5.0
Single	3	5.0
Education		
Less than high school	4	6.7
High school or equivalent	32	53.3
Vocational or associate's degree	10	16.7
Bachelor's degree or beyond	14	23.2
Employment		
Not employed	34	56.7
Part-time	19	31.7
Full-time	7	11.1
Siblings at home		
None	11	18.3
One	31	51.7
Two or more	18	30.0
Immediate family history		

Demographic	<i>n</i>	%
ASD	24	40.0
Learning disability	35	58.3
Mental health problems	18	30.0

Note. PDD = pervasive developmental disorder; PDD-NOS = pervasive developmental disorder not otherwise specified; ASD = autism spectrum disorder.

Table 2.

Zero-order and partial correlations among study variables ($N = 60$).

Variables	1	2	3	4	5
1. Autism symptom severity	—				
2. Caregiver depression	.30* (.30*)	—			
3. Communication	-.49** (-.49*)	-.07 (-.07)	—		
4. Socialization	-.52** (-.60*)	-.15 (-.16)	.54** (.57*)	—	
5. Daily living skills	-.55** (-.58*)	-.18 (-.19)	.76** (.77*)	.70** (.69*)	—
6. Child age	-.13	-.03	.01	-.30*	-.18

Note. Partial correlations controlling for child age are shown in parentheses.

* $p < .05$
** $p < .01$

Table 3.

Multivariate analysis of covariance summary for adaptive behaviour ($N = 60$).

Source of variance	Wilks' lambda	df_1	df_2	F
Child age	.82	3	53	3.91 *
Autism symptom severity	.72	3	53	6.84 **
Caregiver depression	.93	3	53	1.32
Interaction	.95	3	53	0.90

*
 $p < .05$

**
 $p < .01$