Are child autism symptoms, developmental level and adaptive function associated with caregiver feelings of wellbeing and efficacy in the parenting role?

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Highlights

• Many parents of children with autism experience low mental wellbeing, which could be related to low self-efficacy in the parenting role.

• We investigated associations between aspects of child development and functioning, parental self-efficacy and mental wellbeing.

• The findings may indicate that parental self-efficacy is an important intervention outcome.
Are child autism symptoms, developmental level and adaptive function associated with caregiver feelings of wellbeing and efficacy in the parenting role?

A high proportion of parents of children with autism experience clinically significant levels of anxiety and depression (Bitsika & Sharpley, 2004), and elevated levels of stress (Duarte, Bordin, Yazigi, & Mooney, 2005). The rates of chronic stress and psychological distress in these parents is higher than observed in parents of typically developing children and children with other developmental conditions, such as Down’s Syndrome or Fragile X (Estes et al., 2009a; Hayes & Watson, 2013), with the results of a narrative review of the literature indicating that many caregivers of children with autism report feeling a lack of control over their child’s development and future (Hebert & Koulouglioti, 2010).

One psychological construct that may be related to mental wellbeing in parents of children with autism is parental self-efficacy, i.e., the caregiver’s perceptions of their ability to parent successfully (Coleman & Hildebrant Karraker, 2003; Jones & Prinz, 2005). Parental self-efficacy has been identified as a key predictor of psychological outcomes in parents of typically developing children, with low self-efficacy linked to depression, stress and distress (Halpern & McLean, 1997; Jones & Prinz, 2005; Teti, O'Connell, & Reiner, 1996) and high self-efficacy linked to parental self-competence and wellbeing (Albanese, Russo, & Geller, 2019; Jones & Prinz, 2005). While substantial research has been dedicated to understanding parental self-efficacy in the general population, the construct has been relatively less explored in samples of children with neurodevelopmental disabilities (Karst & Van Hecke, 2012). Nevertheless, higher self-efficacy has been associated with less parenting stress and distress, and greater mental wellbeing among parents of children with autism (Boyraz & Sayger, 2010; Hastings & Brown, 2002) similarly, low levels of parental self-efficacy are related to high rates of depressive symptoms in these parents (Kuhn & Carter, 2010).
Parenting an autistic child can be challenging (Hastings, 2016; Ooi, Ong, Jacob, & Khan, 2016) and parents of children with autism may experience low levels of self-efficacy because of their child’s complex care needs (Hebert & Koulouglioti, 2010). However, few studies have investigated the impact of specific child (e.g., behavioural difficulties, IQ, adaptive skills) characteristics on parental self-efficacy in caregivers of children with autism. Among studies that have examined these associations, there is an indication that child emotional and behavioural problems (Hastings & Brown, 2002; Rezendes & Scarpa, 2011), autism symptom severity (Hastings & Brown, 2002; Rezendes & Scarpa, 2011; Weiss et al., 2013) and higher child age (Giallo, Wood, Jellett, & Porter, 2013; Weiss, Tint, Paquette-Smith, & Lunsky, 2016) may all be associated with lower parental self-efficacy. However, the findings have been mixed, as Weiss et al. (2013) found that child age was unrelated to parental self-efficacy; Benson and Kersh (2011) showed that child problem behaviour was not associated with either parental self-efficacy or wellbeing; and Weiss et al. (2016) reported no association between autism symptom severity and parental self-efficacy.

The discrepant findings across studies may reflect differences in the operational definition of ‘self-efficacy’ and the measurement of this construct. Self-efficacy is often treated as synonymous with parenting self-competence, self-confidence and self-esteem, all of which are discrete but related constructs (Wittkowski, Garrett, Calam, & Weisberg, 2017). Previous studies of parental self-efficacy have tended to use either global measures, which provide an overall rating of self-efficacy in the parenting role (e.g. Giallo et al., 2013; Rezendes & Scarpa, 2011; Weiss et al., 2013; Weiss et al., 2016), or domain-specific measures, that assess parents’ beliefs in their ability to complete specific tasks of the parenting role (Hastings & Brown, 2002). The global measures yield total scores that encapsulate a range of factors related to caregiving, such as parents’ efficacy in accessing services, their perceived ability to care for their child, and their satisfaction in the parenting
role. In contrast, scores from domain-specific measures relate to specific aspects of parenting, such as parents’ self-reported ability to manage difficult behaviours. These latter measures may be more sensitive to specific parenting tasks than global measures of self-efficacy, and show links with specific aspects of child functioning (Wittkowski et al., 2017).

The lack of consistent findings may also reflect heterogeneity in the samples and families included in prior studies (see Table 1 for a summary of select, relevant research studies, which include samples of children ranging in age from 4.2 years to 16.8 years, and do not consistently include descriptions of the children’s developmental level, cognitive ability, comorbidities, or adaptive skills). A more robust understanding of the associations between aspects of parental self-efficacy, parental wellbeing, and child development and functioning has important implications for clinical practice. Specifically, knowledge of these associations will help to identify key targets for intervention, which would both effectively and synergistically improve wellbeing and functioning within family units. Therefore, the aim of this study was to investigate associations between multiple measures of child development and functioning, global and domain-specific parental self-efficacy and parent wellbeing in families taking part in the Paediatric Autism Communication Trial-Generalised (PACT-G; Green et al., 2018). The PACT-G sample is a large, well-characterised sample of children with ‘core’ autism, many of whom also have a learning disability. We expected to replicate previous findings that higher levels of child emotional and behavioural problems are associated with lower parent wellbeing (Salamone, Settanni, Ferrara, Salandin, & Team, 2019) and global ratings of parental self-efficacy (Hastings & Brown, 2002; Hastings & Symes, 2002). We also hypothesised that child characteristics, such as high autism symptom severity, low adaptive skills and low language levels would be associated with low parent wellbeing and parental self-efficacy. It is possible that different aspects of the child’s profile
may be differentially associated with self-efficacy in discrete parenting domains and identifying the specific nature of these associations is an exploratory aim.

[Insert Table 1 about here]

**Method**

**Participants**

Two hundred and forty eight (197 male, 52 female) children, aged between 2 and 11 years, were recruited to the Paediatric Autism Communication Trial-Generalised (see Green et al., 2018 for the trial protocol; and Green et al., 2010 for a description of PACT therapy) between January 2017 and April 2018. PACT-G is a multisite, randomised controlled trial of a social communication intervention for children with autism, taking place in South London, Greater Manchester and the North-East of England. At all sites, children were recruited from local clinical and educational services. Children included in the trial had clinical diagnoses of autism, which were confirmed using the Autism Diagnostic Observation Schedule-2nd Edition (ADOS-2; Lord et al., 2012) and Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003). All children had nonverbal age equivalent scores of more than 12 months and those aged 5 years and older were between P3 and P8 on an English National Curriculum assessment of communication and language development². Parents were required to have enough spoken and written English to participate in the PACT-G assessments and intervention, which were delivered in English. Parents had no known hearing or visual impairments, significant psychiatric condition or learning disability (see Green et al., 2018 for full details of the trial eligibility criteria). Child and family characteristics are presented in Table 2. All procedures performed in this study involving human participants were in accordance with the ethical standards of the North West-Greater Manchester Central

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² In England, the P scales supplement the national curriculum by describing targets for children aged 5-16 years with special educational needs. Children at P3 are beginning to communicate with intent and P8 represents a language age equivalent of approximately 4 years in a typically developing child.
Research Ethics Committee (REF: 15/NW/0912). Parents provided informed, written consent before taking part in PACT-G.

Procedure and Measures

Cross-sectional data were collected at baseline, prior to randomisation and the delivery of any trial intervention. Assessments were administered over three or four sessions conducted at home, school and clinic or research laboratory, by trained postgraduate research assistants and postdoctoral research associates. Child assessments were usually administered in the clinic or research laboratory but could also be administered at home or school. Parent interviews were administered either at the home or research laboratory and parent questionnaires usually completed between visits.

Parental Self-Efficacy. The Tool to Measure Parental Self-efficacy (TOPSE; Kendall & Bloomfield, 2005) is 48-item questionnaire that provides a global self-efficacy score and subscale scores of self-efficacy across eight parenting domains: emotion and affection; play and enjoyment; empathy and understanding; control, discipline and setting boundaries; pressures; self-acceptance; and learning and knowledge. Each subscale contains six items rated on a scale of zero to 10, with total scores ranging from zero to 60 for each subscale. The possible total score ranges from zero to 480, with higher scores indicating greater self-efficacy.

Parental Mental Wellbeing. We measured parental mental wellbeing using the Warwick and Edinburgh Mental-Wellbeing Scale (WEMWBS; Tennant et al., 2007), a 14-item self-report questionnaire. Parents rated each statement on a five-point scale (‘none of the time’, ‘rarely’, ‘some of the time’, ‘often’ and ‘all of the time’). The total score was used as a measure of mental wellbeing, with possible scores ranging from 14 to 70. Higher scores indicate higher mental wellbeing.
**Autism Symptom Severity.** We used a combination of direct assessment (ADOS-2) and parent-report (SCQ, Repetitive Behaviour Questionnaire [RBQ; (Honey, McConachie, Turner, & Rodgers, 2012)]) measures of autism symptoms. The ADOS-2 is a semi-structured assessment that yields total scores for Social Affect (SA) and Restricted and Repetitive Behaviour (RRB) and calibrated domain total scores, which are standardised for the child’s age and verbal ability (Hus, Gotham, & Lord, 2014). The SCQ-Lifetime is a 40-item parent-report measure of an individual’s current and historical ASD symptoms, and the RBQ-2 a 33-item parent-rated measure of the frequency and severity of the child’s repetitive behaviours.

**Cognitive and Adaptive Skills.** The visual reception and fine motor subscales from the Mullen Scales of Early Learning (MSEL; Mullen, 1995), and the nonverbal composite score from the British Ability Scales (BAS; Elliott & Smith, 2011) were used as measures of nonverbal ability. As our sample included children older than 5 years, who were thus outside the age range to derive standard scores on the MSEL, we used the age equivalent scores from the MSEL or BAS to create a nonverbal developmental quotient (NVDQ; NVDQ = nonverbal age equivalent/chronological age x 100). The Adaptive Behavior Composite (ABC) score from the Vineland Adaptive Behavior Scales-2nd Edition, Survey Interview Form (VABS-II; Sparrow, Cicchetti, & Balla, 2005) provided a measure of the child’s everyday functioning.

**Preverbal Communication and Language.** Language was assessed with the Expressive and Receptive One Word Vocabulary Tests (Martin & Brownell, 2011a, 2011b) and parent-reported receptive and expressive vocabulary scores were obtained from the Words and Gestures and Words and Sentences forms from the MacArthur-Bates Communicative

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3 The Mullen was administered to 246 of the children, with the BAS administered to only 2 of the participants in this sample.
Development Inventories (MCDI; Fenson et al., 1994)\(^4\). The Early Sociocognitive Battery (ESB; Roy & Chiat, 2019) was used to measure the preverbal social communication skills of social responsiveness, joint attention and symbolic comprehension.

**Child Behaviour.** Parent-reported emotional and behavioural problems were measured using the 25-item Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). Each item is rated on a scale of 0-3 and scores summed to create a Total Difficulties score that ranges from 0-40. Higher scores indicate increased levels of emotional and behavioural problems. The SDQ has good psychometric properties (Stone, Otten, Engels, Vermulst, & Janssens, 2010), but while it has been used extensively in studies of children with autism, its validity in this population has not been established (e.g. Simonoff et al., 2013).

**Statistical Analysis**

Data were prepared and analysed using Stata 15 (StataCorp, 2017). RBQ and WEMWBS data were missing for 13 participants, SDQ data missing for 12 participants and TOPSE data missing for 15 participants. These data were missing due to questionnaires not being returned or returned in an incomplete fashion (<60% of items completed) or being completed by a caregiver that was not an immediate family member (e.g., by a nanny). Where item-level data were missing and the measures were at least 60% complete, we prorated the total scores by imputing the item-level mean for each participant {Gardner, 2018 #664} {Salomone, 2018 #571}. We derived pro-rated total scores for the WEMWBS (n = 5) and RBQ (n = 26) and subscale scores for the TOPSE (n = 4). SDQ subscale scores were prorated according to the hand-scoring instructions (Goodman, 2001).

There were strong correlations between scores on the measures of receptive (.65 < r < .69, \(p < .01\)) and expressive (.82 < r < .87, \(p < .001\)) language, so we created receptive and

\(^4\) While the MCDI is not validated for children older than 30 months, many of the participating children had limited verbal language and scored at floor on this measure (e.g., 25% of the sample were reported to use no single words).
expressive language composite scores from the Vineland, MCDI and OWPVT prior to any analysis. These composites were created by first transforming the raw scores for each measure into z-scores to ensure that they were measured on a comparable scale, then taking the mean of the standardised scores to derive the composites. The expressive language composite was calculated by taking the mean of the z-scores for the Vineland-II Expressive Language Composite, Expressive OWPVT and MCDI Expressive Language scores. The receptive language composite was similarly calculated by taking the mean of the z-scores for the Vineland-II Receptive Language Composite, Expressive OWPVT and MCDI Expressive Language scores.

Several of the variables did not follow a normal distribution, so we used nonparametric tests (Spearman’s rank correlations) to examine the associations between age, nonverbal ability, language, autism symptoms, emotional and behavioural problems, parental self-efficacy and parental wellbeing. Within the parent self-efficacy domain, the correlations were calculated for the global and subscale total scores from the TOPSE. We subsequently ran a series of multiple linear regression analyses to investigate whether there were concurrent associations between any of the child characteristics, parental self-efficacy and mental wellbeing. We checked the assumptions of regression prior to running these analyses. We first plotted the residuals and found that these did not violate the assumption of normality. The linearity assumption was then tested, by plotting the standardised residuals against each of the predictor variables in the model. There was no clear departure from linearity. Thus, the data were acceptable for proceeding with regression analyses.

Variables were entered into the regression models as predictors if they were associated with TOPSE total or WEMWBS total scores at an alpha level of ≤.01 in the bivariate analysis. Outcome variables for the regression analyses were TOPSE total and subscale scores, and WEMWBS total scores. The regression models for both parental self-efficacy and
parental mental wellbeing were subsequently checked for multicollinearity using the variance inflation factor (vif). Both analyses yielded vif values <10, thus do not suggest that multicollinearity is present.

**Results**

Descriptive statistics for each measure are presented in Table 3. There was a strong positive correlation between WEMWBS and TOPSE total scores ($r_s = .580, p<.001$; see Table 4). Results of the bivariate analysis showed no significant associations between any measure of child behaviour and parental mental wellbeing (all $r_s < .20$, all $p$ values > .082). There was a significant negative association between SCQ ($r_s = -.271, p = .0001$) and RBQ ($r_s = -.164, p = .020$), and TOPSE total scores, indicating that fewer parent reported autism symptoms were associated with higher parental self-efficacy. We also found a significant positive association between Vineland ABC and TOPSE total scores ($r_s = .201, p = .0043$), which suggests that higher adaptive skills are associated with higher parental self-efficacy. We subsequently ran a multiple linear regression analyses to investigate concurrent predictors of parental self-efficacy (see Table 5). While the regression model for parental self-efficacy was significant, $R^2 = .073$, $F(3, 222) = 5.85, p = .001$, the effect was small and only SCQ scores showed a significant association with TOPSE total scores in this analysis.

We also ran bivariate correlation analysis to examine associations between child characteristics, parent wellbeing and each domain of parental self-efficacy (see Supplementary Tables S1 and S2 for correlation matrix). There were significant positive associations between parental mental wellbeing and self-efficacy, across all TOPSE subscales (all $r_s > .30$, all $p$ values < .0001). SCQ scores were significantly and negatively associated with the TOPSE domains of Emotion and Affection ($r_s = -.262, p = .0002$); Play and Enjoyment ($r_s = -.216, p = .0021$); Empathy and Understanding ($r_s = -.248, p = .0004$),
Control ($r_s = -.248, p = .0004$); and Discipline and Boundaries ($r_s = -.235, p = .0008$). This pattern of association indicates that higher levels of parent reported autism symptoms are associated with lower self-efficacy in each of these parenting domains. We also found significant positive associations between Vineland ABC scores and subscale scores for Empathy and Understanding ($r_s = .258, p = .0007$), Control ($r_s = .186, p = .0086$) and Discipline and Boundaries ($r_s = .223, p = .0015$). Thus, higher parent-reported adaptive skills were associated with higher perceived efficacy in these parenting domains. Higher child preverbal social communication skills (ESB) were related to lower ratings on the TOPSE Pressures subdomain ($r_s = -.207, p = .0033$), and higher receptive language with higher scores on the Control subscale ($r_s = .192, p = .0063$). We then ran a series of multiple linear regression analyses, with each of the TOPSE subscale scores entered as outcome variables (see Supplementary Tables S3-S5). All regression models reached significance (all $p$ values <.001). SCQ scores emerged as a significant predictor of TOPSE Emotion and Affection; Play and Enjoyment; Control; and Discipline and Boundaries subscale scores. Other predictor variables that reached significance in the supplementary analyses included receptive language, which, in addition to SCQ scores, predicted TOPSE subscale total scores for Control, and early sociocognitive skills, which predicted Pressures. Vineland ABC scores were a significant predictor of both Empathy and Understanding and Discipline and Boundaries.

**Discussion**

In this study, we investigated concurrent associations between child characteristics, parental self-efficacy and parent wellbeing. The results of our bivariate analyses indicate that it is not necessarily autism symptoms per se that are related to parental self-efficacy and wellbeing. While this finding did not play out in our multivariate regression analyses, in which SCQ scores emerged as the only predictor of parental self-efficacy scores, it is still
possible that co-occurring features of ASD, such as poor adaptive skills, may be associated with parental ratings of their efficacy in the caregiving role. In addition, our findings suggest that autism symptoms (SCQ and RBQ scores) and adaptive behaviour are associated with parental self-efficacy, but not parental mental wellbeing. This result adds to existing findings that parental mental wellbeing may not be directly associated with autism severity (Griffith, Hastings, Nash, & Hill, 2010; Hartley, Seltzer, Head, & Abbeduto, 2012; Salomone et al., 2018).

Despite the severity of the child’s autism symptoms in our study, the parents had similar levels of parental self-efficacy (Bloomfield & Kendall, 2012) and higher mental wellbeing (Salomone et al., 2018) when compared to samples from previous studies. However, relative to previous samples, ours differed in age and cultural diversity. Our sample had a younger average age than most other studies of parental self-efficacy in autism (see Table 1), and there is some evidence that younger age is associated with higher self-efficacy in parents of children with autism (e.g. Weiss et al., 2016). Caregivers of younger children are perhaps more resilient towards parenting challenges as their child’s difficulties may be less pronounced relative to their peers, and difficulties may be easier to manage at younger ages (Estes et al., 2009b; Estes et al., 2013; Salomone et al., 2018). The PACT-G sample also includes a lower proportion of Caucasian families (60%) compared to other studies (e.g., Bloomfield & Kendall, 2012, had 92% Caucasian families; Giallo et al., 2013 included 92% Australian-born mothers; and Rezendes & Scarpa, 2011 included 94% Caucasian families). Cultural norms, values and practices could affect caregiver’s appraisals of their parenting experiences and influence their ability to cope with parenting stressors, which may have downstream effects on caregiver mental wellbeing and parental self-efficacy (Bishop, Richler, Cain, & Lord, 2007; Dyches, Wilder, Sudweeks, Obiakor, & Algozzine, 2004; Pruchno, Patrick, & Burant, 1997). It is also possible that protective factors played a role in
bolstering parental wellbeing and self-efficacy. While we did not specifically address these, factors like adaptive coping strategies and social support are known to be positively associated with both mental wellbeing and parental self-efficacy in caregivers of children with autism (Benson, 2010, 2012; Salas et al., 2017; Weiss et al., 2013). Further research is needed to investigate the possible roles of these other factors when examining relations between features of the child’s developmental profile and parental self-efficacy in caregivers of children with autism.

While our results indicate that autism symptom severity may be associated with parental self-efficacy, there were discrepancies in the associations across measures of similar constructs. Specifically, there was a significant association between parental self-efficacy and scores on the parent rated SCQ, but not the researcher-administered ADOS-2. Discrepancies between scores on these two measures are not uncommon but are particularly pertinent when considering parental self-efficacy. The SCQ may be susceptible to rater bias (Eaves, Wingert, & Ho, 2006; Johnson et al., 2011; Marvin, Marvin, Lipkin, & Law, 2017), and caregivers may base their responses on child emotional and behavioural difficulties or intellectual ability rather than autism traits (Charman et al., 2007; Hus, Bishop, Gotham, Huerta, & Lord, 2013). Aside from differences in methods of administration, the observation period which ratings were based on also varied across measures. Specifically, the SCQ-Lifetime version was used in this study, which captured autism characteristics across the child’s entire developmental history (Berument et al., 1999), whereas the ADOS-2 measured only the child’s current presentation during a brief interaction with an unfamiliar adult (Lord et al., 2012). This may suggest that historical autism symptoms may relate to parental self-efficacy over time.

We also set out to explore associations between child factors and domain-specific ratings of parental self-efficacy. Since this was an exploratory aim, we ran a large number of multivariate regression analyses, which must be interpreted with some caution. Nevertheless,
these preliminary results suggest that different features of the child’s behavioural profile may differentially affect domains of parental self-efficacy. For example, higher receptive language levels were associated with the TOPSE subdomain of Control, which asks parents about their ability to implement boundaries and help their child to behave well. In this context, parents may feel ineffective in implementing boundaries for children who do not understand or follow verbal instructions. In addition, higher levels of child emotional and behavioural problems were related to low perceived efficacy on the TOPSE subdomain of Pressures, which elicits information about whether parents feel pressure to meet others’ expectations of their parenting. This could relate to reports that behavioral problems in autistic children are often interpreted as ‘misbehaviour’, with parents judged as being unable to ‘manage’ their child (Gray, 1993). Parents may internalise these judgements and feel a combination of pressure to do more for their child, and guilt about their decisions regarding management strategies (Kuhn & Carter, 2010; Mak & Kwok, 2010). This guilt may be particularly pronounced in the context of receiving regular advice about what they “should” be doing for their child (Miller, Schreck, Mulick, & Butter, 2012).

Clinical and Research Implications

Our findings have implications for clinical practice. Importantly, clinicians should consider interventions that improve children’s language and adaptive skills, which may help to improve self-efficacy in some parenting domains. Caregivers may also benefit from protected spaces where difficult thoughts and feelings evoked from parenting a child with autism can be acknowledged, normalised, validated and processed (Leadbitter & Smallman, 2019; Phelps, Hodgson, McCammon, & Lamson, 2009; Woodgate, Ateah, & Secco, 2008). Approaches like acceptance and commitment therapy and systemic therapy have been suggested to be particularly relevant for the purposes of processing emotions and creating meaningful narratives which could incorporate complexities around caregiving for a child.
with autism (Blackledge & Hayes, 2006; Solomon & Chung, 2012). Addressing mental health and wellbeing in the context of parenting a child with autism is particularly important given the strong association between wellbeing and parental self-efficacy (e.g., Boyraz & Sayger, 2011; Kunseler, Willemen, Oosterman & Schuengel, 2014; Mark-Ribiczey, Miklosi & Szabo, 2016; Quimby & O’Brien, 2006).

Given that the autism intervention field is moving toward parent-mediated approaches (Oono, Honey, & McConachie, 2013), future research studies could investigate the potential mediating or moderating role of self-efficacy on child outcomes. Indeed, parental self-efficacy has been increasingly identified as both a primary intervention outcome and a construct that could be modified to achieve child outcomes (e.g. Hastings & Brown, 2002). Emerging evidence indicates that behavioural training programmes for parents of children with autism have short- and long-term effects on global ratings of parental self-competence (Iadarola et al., 2018; Zand et al., 2018) and efficacy (Kuravackel et al., 2018; Tellegen & Sanders, 2014; Whittingham, Sofronoff, Sheffield, & Sanders, 2008), and self-efficacy in managing difficult child behavior (Feldman & Werner, 2002; Hastings & Brown, 2002). The results of recent reviews also provide consistent evidence for reduced parental stress and improved self-competence following behavioural parent interventions (Colalillo & Johnston, 2016; Tarver et al., 2019). In behavioural interventions, autism symptom severity has been shown to affect maternal efficacy when delivering therapy, which has a downstream effect on child therapy outcomes (Hastings & Symes, 2002). With growing evidence supporting the efficacy of parent-mediated interventions in autism (see Oono et al., 2013 for a systematic review), parents are increasingly taking on a therapy role. Thus, it is important to understand parental self-efficacy in autism, as parenting self-competence, cognitions related to parenting and parents’ beliefs in their ability to promote developmental outcomes can all affect parental involvement in the therapy (Solish & Perry, 2008) and efficacy in the therapy role.
Limitations

The results are limited by the measures, which were primarily caregiver-report measures of the child’s phenotype and their own internal states. First, the WEMWBS is a short, general population screen of wellbeing, rather than a detailed and clinically relevant measure of mental health problems. Therefore, this measure may not be sensitive to the pressures of raising a child with autism. In addition, while there are advantages to caregiver reports of child behaviours, as caregivers spend most time with their children and are able to provide detailed information about their children across contexts (Kasari, Brady, Lord, & Tager-Flusberg, 2013), reliance on a single informant might have introduced shared method variance, common rater bias and/or a halo effect. The results of previous studies indicate that there may be discrepancies in reports across informants, most notably among teachers and parents (Jepsen, Gray, & Taffe, 2012; Lecavalier et al., 2006; Murray, Ruble, Willis, & Molloy, 2009), and also among caregivers in the same family (Karst & van Hecke, 2012). The potential biases introduced by caregiver-report measures are important to consider when interpreting our results, as most of the significant associations reported in the current study involved measures that were completed by the parents. The bias may be particularly pronounced for the association between SCQ and TOPSE scores, as it is unclear whether low self-efficacy affects the parents’ interpretation of their child’s autism symptoms, leading to inflated estimations of these behaviours, or vice versa. To overcome this, future studies could consider adopting a multiple-informant approach which will allow studies to capture a more complete profile of child abilities (Wolery & Garfinkle, 2002).

In addition, we did not specifically include family SES as a predictor of parental self-efficacy in this study. Few studies have investigated the relations between family factors (e.g., socioeconomic status) and parental self-efficacy, but where these associations have been explored, correlations between family factors, including caregiver employment, marital
status, education level, family income and self-efficacy, have not been significant (Benson & Kersh, 2011; Giallo et al., 2013; Weiss et al., 2016).

Like most previous research examining parental self-efficacy (see Table 1), our sample consists of mostly (almost 90%) mothers. There is some limited evidence to suggest that, in the general population, predictors of self-efficacy differ between mothers and fathers (Murdock, 2013). In parents of children with autism, there are minimal reported associations in self-efficacy between parents of the same child (Hastings & Brown, 2002). In these same families, self-efficacy has been shown to mediate the association between child behaviour problems and anxiety and depression in mothers, but not fathers (Hastings & Brown, 2002). Greater improvements in self-efficacy have also been reported for mothers than fathers following interventions for behavioural difficulties in children with autism (Sofronoff & Farbotko, 2002). Together, these findings suggest that there are differences in parent-efficacy between mothers and fathers and that child characteristics may have different impacts on parents of the same child. As our sample consisted of primarily mothers, we are unable to establish whether associations between child characteristics and parental self-efficacy differed between mothers and fathers in this study.

Conclusions

In this study, we examined concurrent associations between child autism symptoms, developmental level and functioning, and parent wellbeing and self-efficacy. The findings indicate that parental and self-efficacy may be a potential treatment target in interventions for children with autism, especially for children with high SCQ scores and low adaptive skills. These results add to the existing literature regarding caregiving for children with autism and provide some direction regarding ways to support caregivers as they navigate some of the challenges associated with parenting a child with autism.
Table 1.
Summary of select previous studies of self-efficacy in parents of children with autism spectrum disorder, for a comparison of samples and measures

<table>
<thead>
<tr>
<th>Study</th>
<th>Child Characteristics</th>
<th>Parent Characteristics</th>
<th>Measures of Child and Family Functioning</th>
<th>Self-Efficacy Measure</th>
<th>Wellbeing Measure</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hastings and Symes (2002)</td>
<td>N = 85 88% male M age 4.96 years</td>
<td>85 mothers M age 36.78 years</td>
<td>Autism Behaviour Checklist</td>
<td>Bespoke measure of efficacy in the ABA therapist role</td>
<td>Friedrich Short form of the Questionnaire on Resources and Stress (Parent and Family Problems subscale)</td>
<td>High autism severity and high maternal stress associated with low self-efficacy.</td>
</tr>
<tr>
<td>Benson and Kersh (2011)</td>
<td>N = 142 86% male M age 8.7 years</td>
<td>136 Mothers M age 41.9 years</td>
<td>Nisonger Child Behavior Rating Form-Parent Version (problem behaviour and prosocial behaviour scales) Multidimensional Scale of Perceived Social Support</td>
<td>Family Empowerment Scale (parent efficacy subscale)</td>
<td>Center for Epidemiologic Studies-Depression Scale short form 3-item measure of psychological wellbeing Parenting Stress Index (Life Events scale) Depression Anxiety Stress Scale Questionnaire on Resources and Stress-Short Form</td>
<td>High parental self-efficacy associated with high parental wellbeing, child prosocial behaviour, social support and marital quality. No associations between parental self-efficacy and child problem behaviour, family SES or stressful life events.</td>
</tr>
<tr>
<td>Rezendes and Scarpa (2011)</td>
<td>134 80% male M age 9.17 years</td>
<td>134 Mothers M age 39.01 years</td>
<td>Strengths and Difficulties Questionnaire</td>
<td>Parenting Sense of Competence Scale</td>
<td></td>
<td>High levels of depression, anxiety and stress, and high autism symptom severity associated with low ratings of parental self-competence. High levels of child behaviour problems associated with high parental stress.</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Size</td>
<td>Gender</td>
<td>Age (years)</td>
<td>Measures</td>
<td>Findings</td>
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<td>Weiss et al. (2013)</td>
<td>N = 138</td>
<td>84%</td>
<td>M 13.13</td>
<td>Behaviour Problem Inventory-Short Form (Aggressive/Destructive Behaviour subscale), Negative Life Events Inventory for Family Protective Factors (Compensating Experiences subscale), Family Support Scale</td>
<td>Low family hardiness, social support and self-efficacy associated with high levels of family distress. No association between child age and any family or parenting factor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>M 44.28</td>
<td>Family Empowerment Scale (Family subscale), Brief Family Distress Scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giallo et al. (2013)</td>
<td>N = 50</td>
<td>88%</td>
<td>M 4.2</td>
<td>Developmental Behaviour Checklist, Parent Social support Index, Socioeconomic Indexes for Areas Index of Relative Socioeconomic Disadvantage</td>
<td>Low self-efficacy associated with high maternal fatigue, depression, stress, and need for social support. No associations between parental self-efficacy and child difficult behaviour.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>M 35.28</td>
<td>Fatigue Assessment Scale, Depression Anxiety Stress Scale-21, Pittsburgh Sleep Quality Index, Health Behaviour Scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weiss et al. (2016)</td>
<td>N = 324</td>
<td>81.8%</td>
<td>M 16.8</td>
<td>Social Communication Questionnaire, Current medical and psychiatric diagnoses, Revised Caregiver Appraisal Scale (Burden subscale), Revised Caregiver Appraisal Scale (Adapted Mastery subscale)</td>
<td>High self-efficacy associated with younger age of child, low barriers to service access, no child psychiatric comorbidity, and less caregiver burden.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>M 47.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2.

Demographic characteristics of PACT-G sample (N = 248)

<table>
<thead>
<tr>
<th></th>
<th>N (%)</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Chronological Age (months)</td>
<td>248 (100)</td>
<td>62.04</td>
<td>22.43</td>
<td>26.74</td>
<td>131.88</td>
</tr>
<tr>
<td>Child Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White-British</td>
<td>136 (55)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White non-British</td>
<td>13 (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed/Multiple ethnic backgrounds(a)</td>
<td>23 (9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Asian-British</td>
<td>30 (12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/African/Caribbean/Black British</td>
<td>40 (16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other ethnic group(b)</td>
<td>6 (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominated Parent Chronological Age (Years)</td>
<td>244</td>
<td>36.67</td>
<td>6.25</td>
<td>22.78</td>
<td>73.19</td>
</tr>
<tr>
<td>Caregiver Sex (N Female)</td>
<td>222 (89)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>40 (16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Cohabitng</td>
<td>190 (76)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated/Divorced</td>
<td>18 (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least one parent with post-16 education</td>
<td>194 (78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Children</td>
<td>2.04</td>
<td>.89</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Number of Adults</td>
<td>2.0</td>
<td>.86</td>
<td>1</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic Status(†)</td>
<td>139 (56%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: a. Includes mixed white and black Caribbean, white and black African, white and Asian, and any other mixed backgrounds. b. Includes Arab. c. NVDQ was based on Mullen scores for n = 246 and the BAS for n = 2. † Dichotomised as at least one parent in professional or administrative occupations (NS-SEC classes 1-3; https://onsdigital.github.io/dp-classification-tools/standard-occupational-classification/ONS_SOC_occupation_coding_tool.html) versus all others.
Table 3.

Descriptive statistics for measures of nonverbal ability, autism symptoms, preverbal social communication, language and adaptive skills, parental mental wellbeing and parental self-efficacy.

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVDQ</td>
<td>248</td>
<td>48.14</td>
<td>18.50</td>
<td>12.58</td>
<td>110.78</td>
</tr>
<tr>
<td>ADOS-2 SA Standardised Domain Score</td>
<td>248</td>
<td>7.62</td>
<td>1.55</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>ADOS-2 RRB Standardised Domain Score</td>
<td>248</td>
<td>8.21</td>
<td>1.49</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>SCQ Total Score</td>
<td>248</td>
<td>23.52</td>
<td>5.26</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>Vineland ABC Standard Score</td>
<td>247</td>
<td>61.92</td>
<td>9.64</td>
<td>40</td>
<td>86</td>
</tr>
<tr>
<td>RBQ Total</td>
<td>235</td>
<td>23.27</td>
<td>11.94</td>
<td>2</td>
<td>61</td>
</tr>
<tr>
<td>ESB Total Score</td>
<td>230</td>
<td>13.38</td>
<td>10.67</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>SDQ Total Score</td>
<td>236</td>
<td>15.61</td>
<td>4.12</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>WEMWBS Total Score</td>
<td>235</td>
<td>49.26</td>
<td>9.45</td>
<td>26</td>
<td>70</td>
</tr>
<tr>
<td>TOPSE Total Score</td>
<td>233</td>
<td>368.18</td>
<td>55.20</td>
<td>200</td>
<td>480</td>
</tr>
</tbody>
</table>

Table 4.
Spearman Correlations between measures of child autism symptoms, behaviour and functioning, parent wellbeing and parental self-efficacy

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chronological Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2. NVDQ</td>
<td>-.571*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ADOS SA CSS</td>
<td>-.032</td>
<td>.0004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. ADOS RRB CSS</td>
<td>.229*</td>
<td>-.287*</td>
<td>-.068</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. SCQ Total Score</td>
<td>.256*</td>
<td>-.221*</td>
<td>.123</td>
<td>.019</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>6. Vineland-II ABC Standard Score</td>
<td>-.444*</td>
<td>.716*</td>
<td>.199*</td>
<td>-.261*</td>
<td>-.312*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7. RBQ Total Score</td>
<td>.106</td>
<td>-.001</td>
<td>-.007</td>
<td>-.098</td>
<td>.443*</td>
<td>-.114</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. ESB Total Score</td>
<td>.063</td>
<td>.537*</td>
<td>-.140</td>
<td>-.264*</td>
<td>-.115</td>
<td>.443*</td>
<td>.058</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Receptive Language</td>
<td>.178†</td>
<td>.480*</td>
<td>.172</td>
<td>-.129</td>
<td>-.067</td>
<td>.612*</td>
<td>-.002</td>
<td>.668*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Expressive Language</td>
<td>.048</td>
<td>.529*</td>
<td>.282*</td>
<td>-.131</td>
<td>-.064</td>
<td>.687*</td>
<td>.029</td>
<td>.616*</td>
<td>.903*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. SDQ Total Score</td>
<td>.057</td>
<td>.032</td>
<td>.053</td>
<td>.021</td>
<td>.142</td>
<td>.082</td>
<td>.433*</td>
<td>.113</td>
<td>.103</td>
<td>.145</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. WEMBS Total Score</td>
<td>-.036</td>
<td>.059</td>
<td>.013</td>
<td>-.044</td>
<td>-.103</td>
<td>.086</td>
<td>-.166</td>
<td>-.070</td>
<td>.009</td>
<td>-.009</td>
<td>-.123</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. TOPSE Total Score</td>
<td>-.145</td>
<td>.174</td>
<td>.026</td>
<td>-.002</td>
<td>-.271*</td>
<td>-.201*</td>
<td>-.164*</td>
<td>-.059</td>
<td>.111</td>
<td>.084</td>
<td>-.070</td>
<td>.580*</td>
<td></td>
</tr>
</tbody>
</table>

Note: Variables with missing data for any variable were excluded casewise, resulting in a sample of n = 200 for the correlation analysis. We ran these analyses both with- and without a Bonferroni correction for multiple comparisons. After applying the correction, we found that the only relevant correlations that remained significant a level of .05 were between TOPSE and WEMWBS scores, and TOPSE and SCQ scores. Since the Bonferroni correction may be too stringent and increase the risk of Type II errors, and the sizes of the correlation coefficients indicate small to medium effects (Cohen, 1988; see also Ferguson, 2016; Kraemer et al., 2003), we report them here without any correction for multiple comparisons. NVDQ – Nonverbal Developmental Quotient; ADOS-2 – Autism Diagnostic Observation Schedule-2nd Edition; SA – Social Affect; RRB – Restricted Interests and Repetitive Behavior; CSS – Calibrated Severity Score; SCQ – Social Communication
Questionnaire; ABC – Adaptive Behaviour Composite; RBQ – Repetitive Behavior Questionnaire; ESB – Early Sociocognitive Battery; SDQ – Strengths and Difficulties Questionnaire; WEMWBS – Warwick Edinburgh Mental Wellbeing Scale; TOPSE – Test of Parental Self-Efficacy.
*p<.01
Table 5.

Regression models for measures of child autism symptoms, behaviour and adaptive functioning, as predictors of TOPSE (n = 226) total scores

<table>
<thead>
<tr>
<th>TOPSE Total Scores</th>
<th>B</th>
<th>SE B</th>
<th>T</th>
<th>p</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCQ</td>
<td>-2.26</td>
<td>.792</td>
<td>-2.85</td>
<td>.005</td>
<td>-216</td>
</tr>
<tr>
<td>Vineland ABC</td>
<td>.594</td>
<td>.394</td>
<td>1.51</td>
<td>.133</td>
<td>.104</td>
</tr>
<tr>
<td>RBQ</td>
<td>.025</td>
<td>.326</td>
<td>0.08</td>
<td>.94</td>
<td>-.006</td>
</tr>
</tbody>
</table>

Note. SCQ – Social Communication Questionnaire; ABC – Adaptive Behavior Composite; RBQ – Repetitive Behaviour Questionnaire
References


StataCorp. (2017). Stata statistical software: Release 15. College Station, TX: StataCorp LLC.


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**作者信用声明**

JG, CA, TC, RE, VG, NH, PH, KL, ALeC, KL, HM, JP, AP, and VS设计了PACT-G研究。所有其他PACT-G联盟成员都参与了最终协议的发展。所有作者都参与了研究的构思和设计。材料准备和数据收集由Lauren J. Taylor、Heather L. Moore和Sze Y.L. Luk完成。分析由Lauren J. Taylor和Sze Y.L. Luk完成。第一稿由Lauren J. Taylor和Sze Y.L. Luk撰写。所有作者在前几版的草稿中都对最终手稿进行了评论。所有作者都阅读并批准了最终的手稿。LT、SYLL、KL和HLM没有相关的财务或非财务利益要披露。TC曾作为F. Hoffmann-La Roche Ltd.和Servier的付费顾问，并从Sage Publications和Guilford Publications获得版税。
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