

Title: Early years parenting mediates early adversity effects on problem behaviors in intellectual disability

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Abstract

A family developmental framework was applied to data from families of children with intellectual disabilities to understand the role of parenting in the path from early adversity to problem behaviors in mid-childhood. Data from nine months to 11 years tested the Family Stress Model in families of 555 children. Adversarial parenting between three and five years mediated the path from early adversity (family poverty and maternal psychological distress at nine months) to problem behaviours at seven and 11 years. Positive parent-child relationship only mediated the path to conduct problems. Multiple mediation was not present. Early adversity impacts both positive parent-child relationship and adversarial parenting between three and five, but the latter is crucial for problem behaviors in mid-childhood.

The Family Stress Model (FSM) is a theoretical framework that brings together several family variables to map the route to important child outcomes. At the start of the route is economic deprivation which affects child developmental outcomes through its effect on the parents' emotional well-being and their parenting behaviors (Conger, Conger, & Martin, 2010; Conger & Donnellan, 2007). The primary hypothesis in the FSM is that disrupted parenting will mediate the effect of parental emotional distress on child development (Conger et al., 2010). The present study aims to test this hypothesis in a population-based sample of families with a child with intellectual disability in an attempt to provide a more comprehensive account for the problem behaviours in this group of children.

Intellectual disability, a condition that affects 2-3% of children (Maulik, Mascarenhas, Mathers, Dua, & Saxena, 2011) is associated with significant limitations in cognitive and adaptive skills. Multiple research studies have shown that children with intellectual disability of all ages are more likely to present with problem behaviors than children without intellectual disability (e.g., Baker et al., 2002; Dekker et al., 2002; McIntyre et al., 2006; Rutter, Graham & Yule, 1970). This existing research is typically limited by the use of relatively small and/or non-representative samples (e.g., children referred for clinical input or attending specialist services; volunteer samples). However, studies of larger, nationally representative samples of children with and without intellectual disability find similar group differences. Across childhood and adolescence, from a population-based sample of over 18,000 5-16 year old children assessed using structured clinical interview methods, Emerson and Hatton (2007) found that the odds of children with intellectual disability having diagnosable levels of hyperactivity/ADHD (8.4 [95% CI; 6.1, 11.5]), conduct disorder (5.7 [4.6, 7.0]), or both behavior disorders (9.4 [6.5, 13.8]) were considerably higher compared to children without intellectual disability. Group differences in problem behaviors between children with and without intellectual disability emerge early in development. Data from a

behavior screening measure (Strengths and Difficulties Questionnaire; Goodman, 1997) for a population-based sample of 15,808 3-year-olds from the UK showed that the odds of children with intellectual disability scoring above clinical cut-off scores for hyperactivity/ADHD (3.71 [3.00, 4.58]), and conduct disorder (4.03 [3.25, 5.01]), were higher compared to children without intellectual disability (Emerson & Einfeld, 2010). Similar results were found for overall behavior problems in a national sample of 4,606 Australian 3-year-olds (OR 2.95 [1.84, 4.72]) (Emerson & Einfeld, 2010).

In existing research, three main categories of variable have been examined for their associations with problem behaviors in children with intellectual disability: socio-economic position (SEP), parental psychological distress, and parenting. In terms of SEP, a substantial element of the difference in problem behaviors in groups of children with and without intellectual disability has been shown to be associated with higher levels of exposure to poverty (Emerson & Hatton, 2007; Emerson & Einfeld, 2010). Families of children with intellectual disability are more likely to experience income poverty and material hardship (Emerson, Shahtahmasebi, Lancaster, & Berridge, 2010) which is the inability to afford a minimum number of socio-culturally defined necessities. Both poverty indicators have been associated with the experience of increased financial pressure (subjective poverty or strain; Shahtahmasebi, Emerson, Berridge, & Lancaster, 2011).

Parental psychological distress is higher in parents of children with intellectual disabilities (Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011) and has been associated with child problem behaviors (Baker et al., 2003; Hastings et al., 2006; Neece, Green, & Baker, 2012) and the family's socio-economic circumstances (Emerson, 2003; Emerson et al., 2010). In terms of parenting, there is evidence that, in families of children with intellectual disability, parenting is more likely to be negative (intrusive, harsh, negative parental affect towards child) and less likely to be positive (a warm, close relationship with

child) (Brown, McIntyre, Crnic, Baker, & Blacher, 2011; Norona & Baker, 2017; Rodas, Zeedyk, & Baker, 2016; Totsika, Hastings, Vagenas, & Emerson, 2014). Parenting behaviors and parent-child relationships have also been explored as a predictor of later problem behaviors in children with intellectual disabilities. Where parents are more critical, engage in harsh discipline, or have relationships in which they are in conflict with their children, the problem behaviors of their children with intellectual disability get more severe over time (Emerson, Einfeld, & Stancliffe, 2011; Hastings et al., 2006; Rodas et al., 2016; Totsika et al., 2014). A positive mother-child relationship has also been shown to predict later reductions in problem behaviors in young children with intellectual disability (Norona & Baker, 2017; Totsika et al., 2014). In addition, targeting changes in parenting behavior through parenting interventions has been shown to lead to short-term reductions in problem behaviors in children with intellectual disability (McIntyre, 2013; Petrenko, 2013; Tellegen & Sanders, 2013).

Research on the problem behaviors of children with intellectual disability clearly establishes that dimensions of family context (SEP, parental psychological distress, parenting) are important predictors and could inform attempts to better support or prevent problem behaviors (Hastings, 2016). However, theoretical development in the field has been lacking. There is recognition of potential pathways between parental distress, parenting, and child problem behaviors in intellectual disability research (e.g., Hastings, 2002; Guralnick, 2005). However, there has been little or no attempt to bring a comprehensive developmental theoretical lens to the understanding of problem behaviors in children with intellectual disability, especially a lack of theorizing about the inter-relationships and developmental pathways linking SEP, parental adjustment, parenting, and child problem behaviors.

The FSM (Conger, et al., 2010; Conger & Conger, 2002; Conger & Donellan, 2007) was formulated primarily to explain how children exposed to poverty early in their lives

ended up with a range of poorer outcomes, including problem behaviors. FSM proposes that the pathway to children's poor outcomes begins from economic hardship. Parents' experience of economic pressure leads to increased psychological distress which, in turn, disrupts parenting and, subsequently, negatively affects children's wellbeing. Existing research on the FSM has focused on samples of children not selected for having intellectual disability or significant developmental delays. The full FSM pathway (or sections of the pathway) has been supported in research on children's problem behaviors in several countries using multiple data collection points throughout the early years and into later childhood (e.g., Linver, Brooks-Gunn, & Kohen, 2002; Newland, Crnic, Cox, & Mills-Koonce, 2013; Rijlaarsdam et al., 2013; Solantaus, Leinonen, & Punamaki, 2004; Yeung, Linver, & Brooks-Gunn, 2002). However, even within typical development, tests of the FSM have not always employed appropriate epidemiological frameworks for examining the relationships between the different parts of the model (c.f., Conger et al., 2010; Conger & Donnellan, 2007), in particular, for ensuring that the temporal sequencing of proposed risk factors and mediators matches the operationalisation of causal chains proposed by epidemiology (Kraemer, 2010; Kraemer et al., 2001). The present study aimed to address this limitation by ensuring that the measurement of proposed risk factors preceded outcome measurement, while the measurement of hypothesized mediators preceded the measurement of child outcomes and also temporally followed the measurement of the proposed risk factors.

We are not aware of any research that has tested the applicability of the FSM to understand developmental pathways for children with intellectual disability, and specifically to understand the development of their problem behaviors. Such research is crucial for four reasons. First, a developmental perspective on intellectual disability (cf. Hodapp et al., 1990) suggests that developmental pathways affecting children generally are likely to apply to children with intellectual disability. However, this perspective needs to be explicitly tested

through the application of a general developmental theory such as the FSM. Second, if developmental theories such as the FSM are to be fully tested they do need to be able to explain development in a variety of populations. This is a population where difficulties (poverty, parental mental health problems, parenting difficulties and child problem behaviors) are attenuated. Robustly testing developmental theory in this population is thus a significant step. Third, as we have seen, the FSM explains how key risk factors already identified in the intellectual disability problem behaviors research literature (SEP, parental psychological distress, and parenting) inter-relate to affect development. Thus, the FSM represents a good potential match for children with intellectual disability. Fourth, there is a desperate need for developmentally informed research in intellectual disability and problem behaviors, since parenting interventions have already been developed or adapted and tested with this population. However, given the lack of research on developmental pathways for problem behaviors in children with intellectual disability, these existing parenting interventions have not been fully informed by theoretically driven research.

Therefore, in the current study, our main aim was to evaluate the fit of the FSM with families who have a child with intellectual disability. In particular, we examined whether the effect of early life adversity (i.e., poverty and parental psychological distress at 9 months) on later child problem behaviors (7 and 11 years) was mediated by adversarial parenting in the pre-school period (3-5 years), positive parent-child relationship, or both aspects of parenting. As a construct, adversarial parenting refers to harsh parenting practices, frequent use of disciplining and conflict in the parent-child relationship. Positive parent-child relationship indicates closeness in the relationship and warm, supportive parenting practices. We examined these different aspects of parenting since they have been shown to have different associations with problem behaviors in young children with intellectual disability (e.g., Totsika et al., 2014). We also examined different types of problem behaviors. This is because

a distinction between externalizing and internalizing problems has led to different patterns of findings in research on the FSM for children without intellectual disabilities (e.g., Solantaus et al., 2004), and this internalizing—externalizing distinction has been associated with different longitudinal patterns of association with parent-child relationship dimensions in intellectual disability research (e.g., Hastings et al., 2006). We hypothesised that, similarly to the evidence from the overall population (c.f., Conger & Donnellan, 2007), parenting would mediate the effect of early adversity on later problem behaviours. We also hypothesised that both dimensions of parenting would mediate the path to problem behaviors on the basis of previous evidence that both dimensions of parenting are associated with child problem behaviors (c.f., Totsika et al., 2014).

Method

The study draws on data from the Millennium Cohort Study (MCS), a longitudinal birth cohort in the UK that started in 2000 with the aim of describing the development of a nationally representative sample of UK children in the new millennium. Most MCS participants entered the study at 9 months (wave 1, N=18,885), with a small top-up sample of families who had been deemed eligible for inclusion at wave 1 but had not participated recruited at wave 2 (n=692). MCS followed a two-stage complex stratified sampling design with oversampling from disadvantaged and ethnic minority areas, using the Child Benefit Records to randomly select participants. At the time of the study commencement, Child Benefit was a non-means tested benefit with a near universal coverage of UK children. The present study draws on data from wave 1 (child aged 9 months), wave 2 (child age 3 years), wave 3 (age 5 years), wave 4 (age 7 years) and wave 5 (age 11 years). Similar to the full MCS sample, most children with intellectual disability entered the study at 9 months (N=518) and a small number entered at age 3 years (wave 2 N=37).

Participants

Intellectual Disability. Identification of intellectual disability was based on standardized cognitive assessments available in MCS, supplemented by parent and teachers reports of significant limitations. The process is explained in detail in the Online Supplement. A total of 555 children among all 19,244 MCS children were identified as having intellectual disability, indicating an overall sample prevalence in MCS (waves 1-5) of 2.7% (weighted to account for the sampling method of MCS; 2.9% unweighted), a prevalence rate consistent with estimates from a meta-analysis of epidemiological research (Maulik et al., 2011).

Sample description. Children with intellectual disability came from all four UK countries: 66% England, 15% Wales, 10% Scotland, and 10% Northern Ireland. At 9 months of age, 65% of the children were boys, consistent with the 0.4 male to female ratio in children reported in a meta-analysis by Maulik et al. (2011). Seventy three per cent lived with two parents. About 17% of the households included two adult carers who were both not working, and 67% of households were below the UK's income poverty threshold (Department for Work and Pensions, 2018). Overall, 99% of main respondent interviews were conducted with the child's biological mother. The average age of main respondents was 28 years (range 16 to 46, SD: 6.3).

Measures

Age 9 months. When the child was 9 months old, early adversity was captured with data about the family's financial status and parental psychological distress.

Family's financial status. Using household total income, income poverty status was defined using OECD criterion of income below 60% of the median equivalized national level at the time of data collection. Main respondents also reported on subjective poverty (i.e., how well they felt that they manage financially). Further, material hardship was gauged by an index of

durable asset ownership where main respondents reported how many of a total eight items they had in their household (refrigerator, freezer, washing machine, microwave, dishwasher, home computer, video recorder, and tumble dryer). These three indicators were considered to measure household poverty. Main respondents were also asked whether their own parents helped out financially in a number of different ways: buying essential items for the baby or paying for childcare, giving cash or monetary gifts, paying for household costs, or lending money. If any of these types of help were reported, we captured this information in a binary variable measuring financial support from grandparents (yes/no) to be used as a control variable in the analysis since this has been a factor hypothesized to reduce the impact of early family poverty on parental distress (Conger & Conger, 2002).

Psychological distress. MCS measured psychological distress using a short-form of the Malaise Inventory (Rutter, Tizard, & Whitmore, 1970). The nine items included in the MCS focused on psychological symptoms (e.g., often worried about things, often miserable or depressed; suddenly scared for no good reason). The internal validity of the 9-item version has been reported as good (Cronbach's $\alpha = .77$) in an independent UK study (NESS, 2005). Internal reliability in the current sample was .78.

Age 3 and 5 years. In the pre-school period, MCS captured parenting using a combination of direct observations and questionnaires completed by main respondents.

Discipline practices. Main respondents filled in the Conflict Tactics Scale (Straus & Hamby, 1997), designed to measure parents' disciplining practices when there is conflict with the child (e.g., if the child is naughty... how often do you ignore the child, shout at the child, take away treats, smack the child, send to bedroom). Seven items scored on a 5-point scale (never to daily) were used to measure frequent disciplining at age 3 years (Cronbach's $\alpha = .68$) and 5 years ($\alpha = .72$).

HOME. Interviewers who visited respondents' homes to conduct interviews were trained to observe and score the Home Observation of the Environment Scale (HOME; Caldwell & Bradley, 1984) at age 3 years. Items used in the MCS were selected from the Short Form 0-3 and 4-6 versions to assess physical environment, responsiveness of the mother, and organisation of the environment (Johnson et al., 2015). HOME subscales were not captured in full, so among available HOME items we identified three that measured harsh discipline (mother scolded more than once, used physical restraint on the child, slapped/spanked child more than once; alpha: .47) and five that captured positivity (mother praises the child spontaneously; uses positive voice when speaking to the child; answers child's questions verbally, converses at least twice with the child; caresses or kisses the child; alpha=.68). The harsh discipline subscale had low internal consistency most likely because it only included three items, but it was used in this study as the three observed indicators provide relatively unambiguous demonstrations of harsh parenting when they occur.

Parent-child relationship. At age 3, respondents completed the Child-Parent Relationship Scale (Pianta, 1992). This 15-item scale measures closeness (7 items; e.g., I share an affectionate, warm relationship with this child) and conflict (8 items; e.g., this child and I always seem to be struggling with each other) in the parent-child relationship. Each item is rated on a 5-point scale ranging from 1 (definitely does not apply) to 5 (definitely applies). For the present sample, internal consistency was .77 for closeness and .82 for conflict. In MCS wave 3 (child age 5), main respondents were asked to indicate how close they felt their relationship with their child was. Respondents rated a single item on a 1 (not at all close) to 4 (extremely close scale).

Age 7 and 11 years. Child behavior problems were measured using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The SDQ measures behavioral and emotional difficulties in community samples (children aged 2 to 17 years old) and can

discriminate well children with clinical levels of problems (Goodman, 2001). The parent report version was used in the current study. It includes 25 items, each rated on a 0-2 scale. We focused on conduct problems (scale range 0-10), emotional symptoms (scale range 0-10), hyperactivity (scale range 0-10) and total behavior problems (scale range 0-40), which is a composite measure of hyperactivity, emotional symptoms, conduct problems, and peer relationship problems. Internal consistency in the present sample at ages 7 and 11, respectively, was .92 and .72 for emotional symptoms, .93 and .60 for conduct problems, .94 and .74 for hyperactivity, .98 and .80 for total behavior problems.

Analytic strategy

The overall analytic approach involved testing the fit of the FSM in our sample using a series of structural equation models (SEM). SEM is a multivariable statistical approach that combines factor analysis with regression and focuses on exploring the structure of theoretical constructs as well as inter-relationships between constructs (latent or observed) usually in the context of theory testing. SEMs can be visualized through path diagrams (e.g., Figure 1). Following descriptive exploration of the data, the first step was to build the latent factors for testing the hypothesized models. We created latent factors for poverty, adversarial parenting and positive relationship, the latter two being the hypothesized mediators (Muthén & Asparouhov, 2014). We then fitted a structural equation model (SEM) to test the proposed mediation of adversarial parenting (Figure 1, a). To address the second research question, we added a second potential mediator (positive relationship) to the first model (Figure 1, b). To examine whether the mediation path ran through adversarial parenting and positive relationship (multiple mediation), we fitted both variables in the same model (Figure 1, c), accounting for their inter-relationship by modelling their association. At each step, one model was fitted for each type of child problem behaviors (hyperactivity, conduct problems, emotional symptoms, and total behavior problems), to explore whether paths may be specific

to each problem behavior. Further information on model fitting can be found in the Online Supplement. Tables 2-4 present the coefficients estimated through SEMs.

Results

Descriptive statistics and construction of latent factors

Table 1 presents descriptive statistics for all observed variables in the study. The first step in the FSM is poverty (Conger & Donnellan, 2007). Data on the household's financial status when the child was 9-months-old was used to construct a poverty factor: income poverty, subjective poverty and an index of durable asset ownership. With three indicators, the model was saturated (RMSEA= 0.00 (90% CIs: .00, .00); CFI/TLI=1/1; WRMR=.002), and the standardized coefficients indicated a good association with the latent factor: income poverty =.80, $p<.001$, $\lambda = 1.00$; subjective poverty =.50, $p<.001$, $\lambda = .63$; and durable assets = -.60, $p<.001$, $\lambda = -.91$.

The latent factor of adversarial parenting included four indicators: frequent disciplining at 3 years and 5 years, observed harsh discipline at 3 years (HOME) and conflict in the parent-child relationship at age 3 (Pianta, 1992). High bivariate correlations (Table 1) between frequent disciplining at ages 3 and 5, and disciplining at age 3 with conflict at age 3 were initially allowed, but better fit was achieved with only one residual covariance specified between the two disciplining indicators ($\chi^2 = .30$, $p = .582$; RMSEA=0.00 (90% CIs =.00 to .09); CFI/TLI=1/1.02; WRMR=.01). Standardized factor loadings were: frequent disciplining at age 3 = .52, $p<.001$, $\lambda = 1.00$; frequent disciplining at age 5 =.41, $p<.001$, $\lambda = .66$, harsh discipline at age 3 = .34, $p<.001$, $\lambda = .05$; and conflict at age 3 = .92, $p<.001$, $\lambda = .97$.

The latent factor of positive relationship included three indicators: closeness in the parent-child relationship at age 3 (Pianta, 1992), closeness in the parent-child relationship at age 5, and observed positivity at age 3 (HOME). With three indicators, the model was

saturated (RMSEA=0.00 (90% CIs= .00, .00); CFI/TLI 1/1; WRMR= .001) and the standardized coefficients loaded as expected on the factor: closeness at age 3 = .44, $p=.004$, $\lambda = 2.19$, closeness at age 5 = .29, $p=.009$, $\lambda = .39$, and observed positivity at age 3 = .52, $p=.003$, $\lambda = 1.00$.

Does adversarial parenting mediate the path from early adversity to problem behaviors at 7 and 11 years?

Figure 1a presents the path diagram of the SEM fitted to address this question. A path was fitted from poverty to parental psychological distress at 9 months, controlling for any potential effects from financial support from parents' own parents (Conger & Conger, 2002). In the main part of the model, a path was specified from the latent factor poverty to parental psychological distress at 9 months, which in turn was assumed to be associated with adversarial parenting between the ages of 3 and 5 years, in line with the FSM. From there, a path was specified to children's problem behaviors at the ages of 7 and 11 years. A separate model was fitted for each child outcome and the standardized coefficients for each model are presented in Table 2. Results suggested that for child hyperactivity, conduct problems and total problem behaviors at age 7, the total indirect effect was significant (betas ranged from .18 to .16), and the total direct effect was not significant (betas ranged from -.07 to .06). Similarly, for child hyperactivity, conduct problems and total problem behaviors at age 11, total indirect paths were significant (betas ranged from .07 to .11) and total direct paths were not significant (betas ranged from -.04 to -.01). For child emotional symptoms, the indirect and direct effects were non-significant at both ages. Overall, these results indicate that poverty and parental psychological distress at 9 months (i.e., adversity) significantly impacted on child problem behaviors at 7 and 11 years, and the effect was mediated by adversarial parenting between the ages of 3 and 5 years.

As hypothesized by the FSM, the paths between poverty and psychological distress at 9 months were positive and significant, as were the paths from psychological distress to adversarial parenting at 3-5 years (Table 2). With the exception of emotional symptoms, the paths from adversarial parenting to child outcomes at 7 and 11 were positive and significant (Table 2), indicating that higher levels of adversarial parenting between 3-5 years were associated with elevated scores in total behavior problems, hyperactivity, and conduct problems at 7 and 11 years of age.

Finally, the models accounted for a small but significant part of the score variance of child problem behaviors at 7 years: hyperactivity R^2 : .13, $p=.013$; conduct problems R^2 : .22 $p=.001$; and total behaviour problems R^2 : .15, $p=.013$. The R^2 for emotional problems was very small and non-significant: .03, $p=.218$. The models accounted for a very small and non-significant part of the score variance of child problem behaviors at 11 years: hyperactivity R^2 : .06, $p=.143$; emotional problems R^2 : .01, $p=.572$; conduct problems R^2 : .03 $p=.317$; and total behavior problems R^2 : .06, $p=.153$. This is likely due to the long time lag between risk factors (10 years), mediator (six to eight years) and child outcomes. Substantial correlations between problem behaviors at ages 7 and 11 (correlation estimates were .39 for conduct problems, .40 for emotional problems, .64 for hyperactivity, and .59 for total behaviour problems) indicated significant stability over a period of 4 years.

Does positive parent-child positive relationship at 3-5 years mediate the effect of early adversity on later child behavior problems?

The model fitted at this step was identical to the previous one with positive parent-child relationship substituting adversarial parenting as the potential mediator (Figure 1b). There was a significant relationship from parental psychological distress at nine months to positive parent child relationship at 3-5 years (Table 3). In all models, psychological distress at 9

months was associated with a significant decrease in positive relationship scores of about a third of a standard deviation (standardized betas ranged from $-.27$ to $-.44$) for every one standard deviation increase in psychological distress. Positive relationship was not related to child emotional problems or hyperactivity at any age. Positive relationship significantly mediated the path to conduct problems and total behavior problems at 7 years, and the path to conduct problems at 11 years. In all cases, the effect of psychological distress on conduct problems and total behavior problems was mediated by reductions in positive relationship (all direct effects were zero whereas indirect betas were significant: conduct problems at 7 years: $.20$; 95% CIs: $.03$, $.33$; conduct problems at 11 years: $.09$, 95% CIs: $.01$, $.19$; total behavior problems at age 7: $.11$, 95% CIs: $.01$, $.26$).

The models including positive relationship as the potential mediator had very little explanatory power for child problem behaviors: at 7 years the R^2 values were $.04$ for emotional problems, $.01$ for hyperactivity, $.21$ for conduct problems, and $.11$ for total behavior problems (all $p > .05$). At age 11, the R^2 values were $.01$ for emotional problems, $.00$ for hyperactivity, $.04$ for conduct problems, and $.03$ for total behavior problems (all $p > .05$). Similar to the previous models, substantial stability over time for the child outcomes was indicated by correlations: $.40$ for conduct and emotional problems, $.64$ for hyperactivity, and $.59$ for conduct problems.

Overall, it is interesting to note that although early adversity was associated with lower levels of positive parent-child relationship between three and five years, the latter was mostly not related to later child problem behaviors. However, conduct problems appear differentially susceptible to lower levels of positive parent-child relationship, and this susceptibility can be seen in the longer-term.

Does the route to child problem behaviors go through increases in adversarial parenting or reductions in positive relationship?

In the next step of the analysis, we fitted multiple mediation SEMs to examine whether mediation took place through adversarial parenting, positive parent-child relationship or both routes (Figure 1c). The two potential mediators were allowed to correlate as it was hypothesized that adversarial parenting would be negatively associated with positive relationship. The results of the multiple mediation SEMs are presented in Table 4. Overall, multiple mediation was not present for any child outcome. There was a clear trend for mediation to go through adversarial parenting for child outcomes at 7 years: betas were .16 for hyperactivity (95% CIs: .06, .29), .15 conduct problems (95% CIs: .05, .28), and .13 for total behavior problems (95% CIs: .03, .25). At age 11, mediation was taking place through adversarial parenting again but only for hyperactivity and total behavior problems (betas .13, and .09, respectively). Correlations between the two latent factors ranged from small: -.36 in the hyperactivity model, -.37 in the emotional symptoms model, -.35 total problem behaviors, and -.38 in the conduct problems model. Correlations between child problem behaviors were .39 for conduct and emotional problems, .64 for hyperactivity, and .59 for total problem behaviors.

Overall, the multiple mediation models suggested clearly that in the presence of low levels of positive relationship and adversarial parenting, adversarial parenting was the aspect of parenting that mediated the effect of early adversity on child problem behaviors, in particular problem behaviors more proximal to the measurement of parenting (i.e., at age 7).

Discussion

In the first robust test of the FSM in a longitudinal population-based sample of children with intellectual disability, we found clear support for the general application of this theoretical

perspective in understanding the pathways to problem behaviors in middle and later childhood. When children with intellectual disability were 9 months of age, a multi-indicator factor for family poverty was associated with increased parental psychological distress, which in turn increased parent reported and observed adversarial parenting at ages 3 to 5 years and reduced reported and observed positive relationship with the child with intellectual disability, both of which had some relationships with increased child problem behaviors at age 7 and 11 years. When both parenting factors were included in the same models as multiple mediators of the paths from parental psychological distress at 9 months to problem behaviors at 7 and 11 years, only adversarial parenting was identified as the mediating factor. These findings provided support for our first hypothesis (that parenting would mediate the effect of early adversity on problem behaviors) but did not support our second hypothesis (that both dimensions of parenting would be significant mediators). However, it is important to note that this pattern of results is still in line with predictions from the FSM. All three key factors identified in previous intellectual disability research as associated with child problem behaviors have a place in the FSM and the results confirm their significance in building our understanding of these problems. The current study also lends further general support to the FSM as this general developmental theoretical model has been shown to explain an aspect of development for a high risk population of children: those with intellectual disability.

These general conclusions about the application of developmental theory are encouraging and have the potential to increase our understanding of developmental processes in children with intellectual disability (cf. Crnic et al., 2017). The current research findings, however, have also revealed other clear patterns worthy of discussion. First, in the separate modelling stage of the analysis, adversarial parenting between 3 and 5 years of age was found to mediate relationships between earlier parental psychological distress and child conduct problems, hyperactivity, and total behavior problems at both age 7 and 11 years. In contrast,

positive relationship mediated the relationship between psychological distress and child conduct problems at both 7 and 11 years and total behavior problems at age 7 years. However, no paths to emotional problems or hyperactivity were significant at either age 7 or 11 years. Thus, adversarial parenting had the strongest effects on later problem behaviors and this was confirmed at the analysis stage where both parenting mediating variables were modelled together.

These findings are of note for two key reasons. First, using the MCS intellectual disability sample, Totsika et al. (2014) found evidence that inappropriate discipline at age 3 years did not predict child problem behaviors at age 5 but that a negative (conflict) and positive (closeness) dimension of parent-child relationship both predicted child problem behaviors at age 5 years. Parenting was not measured using the same constructs as the current study, but one hypothesis partially consistent with the results from both studies is that parent-child relationship dimensions (perhaps positive and negative) may be important mediators for problem behaviors in early to middle childhood, whereas adversarial parenting may have a longer-term influence on the problem behaviors of children with intellectual disability into middle and later childhood. This hypothesis would need to be examined in further research. In addition, these findings suggest that testing of the FSM beyond children with intellectual disability should also clearly differentiate between dimensions of parenting.

The second noteworthy aspect of the findings is that different pathways were found to be relevant for different dimensions of problem behaviors. Positive relationship when modelled without adversarial parenting explained later conduct problems but not other dimensions of problem behaviors. In contrast, adversarial parenting explained all dimensions of problem behaviors measured in this study, except for emotional symptoms. When both dimensions of parenting were modelled together, conduct problems at age 7, and hyperactivity and total behavior problems at any age were reliably associated with

developmental pathways through adversarial parenting only. When both dimensions of parenting were modelled together, there was no longer mediation of adversarial parenting for conduct problems at age 11, because the respective paths between mediator and outcome reduced substantially in the multiple mediation model, suggesting that the addition of positive parent-child relationship - while not a significant predictor for these outcomes - absorbed much of the explanatory power of adversarial parenting for these two outcomes. Child emotional problems could not be accounted for by any of the models, suggesting that early adversity, adversarial parenting or positive parent-child relationship are not associated with later emotional problems in children with intellectual disability. Thus, it is important for future research studies to examine different dimensions of the problem behaviors of children with intellectual disabilities, when modelling developmental processes.

When interpreting the findings of the current research, it is important to be mindful that the present findings would be mostly relevant to families of children with mild to moderate intellectual disability, as these would have been represented in the MCS sample. This is due to the overall very small prevalence of severe and profound intellectual disability in the population (Bourke, de Klerk, Smith & Leonard, 2016). If future studies include participants across a wider range of the disability spectrum, an important extension of the model will be to examine whether the level of the child's intellectual disability moderates the observed mediation paths.

Given that this research represented a secondary analysis of existing data, the study was limited by the measures available. Using an existing national longitudinal study had the strength of multiple measurement points that allowed a test of the FSM generally with temporal precedence established at each key point. The exception was that because parenting was measured at key time points (ages 3 and 5 years), we modelled family poverty and parental psychological distress at the same time (Wave 1 when children were 9 months of

age). Thus, future research also needs to adopt additional time points of data collection for children with intellectual disability that allow for unpacking the effect of adversity in the first few months of life. An additional challenge, however, with more data points over a longer period is that resulting models (as in the current research) may explain little of the variance in child problem behaviors. Likely, the low explanatory power of our models is related to the length of time between key predictors/mediators and problem behaviors at 7 years and especially by 11 years of age. However, this may also be an indication that additional variables should be examined in future research. In particular, it is important to explore other pathways to problem behaviors including biological factors. For example, it is clear that children with different genetic intellectual disability syndromes are at increased risk for problem behaviors and the relevant causal pathways may identify biological and social processes working in combination (Oliver et al., 2013).

An additional limitation relates to the common methods variance issue and, in particular, the fact that data for most variables in the present study were obtained by the same person (the child's primary caregiver either through interview or self-report). It has been proposed that this self-report bias might be more pronounced for negative affectivity (Podsakoff, McKenzie, Lee & Podsakoff, 2003), i.e., that individuals predisposed to experiencing negative emotions may be more likely to provide more negative ratings in other measures too. As psychological distress rates tend to be higher in parents of children with intellectual disabilities (Totsika et al., 2011), this might account for the stronger associations between adversarial parenting and child problem behaviours. An attempt to account for this issue was the inclusion of observational data (from HOME) in the latent factors of parenting. The availability of observational data on parenting is rare in population surveys, and although it is a strength methodologically, observations took place in only one visit. Future studies may consider additional observational points within the same measurement period to ensure

they are capturing robust data on parenting practices, especially when these are focused around harsh/angry parenting. In addition, other social processes could be important for the development of problem behaviors in children with intellectual disability. Alternative developmental theories such as the Family Investment Model (Conger & Donellan, 2007) suggest that family poverty instead (or additionally) may affect the ability of the family to invest directly in activities that promote child development and this then influences outcomes. Again, this model has not been applied to the development of children with intellectual disability, but may explain additional variance in the development of behavior problems in these children. This possibility should be examined in future intellectual disability research.

Although the main focus of this paper was to test the pathways hypothesized in the FSM, it is also important to consider developmental processes within broader research literature that dovetail with our findings here about the early lives of children with intellectual disability. First, exposure to negative events during sensitive periods of development is considered one of the two likely mechanisms for the development of adverse outcomes in later life (Shonkoff, Boyce, & McEwen, 2009). Findings here are consistent with this developmental theory and indicate that the experience of adversity (poverty, parental distress) during the first few months of a child's life has measurable effects on the child's problem behaviors by mid-childhood. The findings also indicated that one of the mechanisms of transmission for early life risk is parenting. Parenting is one of two hypothesised mechanisms of impact for the development of problem behaviours in children with intellectual disability (Crnic, Hoffman, Gaze, & Edelbrock, 2004), with the other being reduced self-regulatory skills of the developing child. The first five to six years in the life of a child with intellectual disability are a period of rapid behavior change (Dykens, Hodapp, & Evans, 1994; Fountain, Winter, & Bearman, 2012), making this a period where the impact of the social environment

(specifically that determined by parental behavior) is crucial. The evidence here suggests that the family environment during the pre-school years can carry over the risk from very early exposure to adversity in a way that shapes children's behavioral outcomes six to ten years after the exposure to risk. Although the results of the present research require replication, developmental pathways studies such as this one are likely to have direct implications for clinical practice and family support. First, a pathway of influence starting with family poverty, through early parental psychological distress, to parenting (as per the FSM) suggests several different points for intervention. Early intervention for children with intellectual disability might focus on reducing the impact of early family poverty on parental psychological distress, or on directly tackling parental psychological distress in the first year around the child's birth to prevent later effects on parenting. Addressing poverty might be addressed by targeted benefits or welfare for families of children with intellectual disability and/or by national efforts to reduce income inequality. Preventative approaches to help to reduce parental psychological distress in parents of very young children could be a combination of universal and targeted approaches, where support for post-natal depression in the general population could benefit those whose children already have or will be identified with intellectual disability combined with targeted support for parents of young children with intellectual disability (e.g., before the age of 3 years). A number of cognitive behavioral and mindfulness/acceptance interventions may be effective interventions in this context (Da Paz & Wallander, 2017; Lindo et al., 2016; Singer, Ethridge, & Aldana, 2007).

Also following the results of the present study and previous research (Totsika et al., 2014), to influence child behavior problems earlier in development (up to ages 5 to 7 years) practitioners will likely need to both improve parent-child relationship quality and reduce parents' use of adversarial parenting strategies. Reducing earlier behavior problems directly through intervention would also have the effect of reducing later child behavior problems

given the persistence of behavior problems in children with intellectual disability. To influence behavior problems in middle to later childhood, interventions might be most effective if focused primarily on reducing adversarial parenting in the pre-school period. Finally, practitioners might also target different developmental processes depending on the behavior problems that they are targeting. For example, those interested in reducing conduct problems in children with intellectual disability later might focus on both adversarial parenting and positive parent-child relationship. Similarly, practitioners focused on reducing hyperactivity in children with intellectual disability might focus primarily on reducing adversarial parenting.

In terms of extending general research on the FSM, our findings also have some implications. The FSM predicts that nurturing and involved parenting is the key mechanism through which early adversity affects child development (Conger & Donellan, 2007). Findings from the current study indicate that in families of children with intellectual disability there are two dimensions of parenting that early adversity affects: positive relationships, and adversarial parenting. These findings are in contrast to recent evidence from typical development suggesting that early adversity reduces sensitive parenting rather than increasing harsh parenting (Newland et al., 2013). However, in the Newland et al. study child outcomes were not modelled. Where different dimensions of parenting are considered as part of the same test of the FSM, the mechanism of risk for problem behaviors appears to go through harsh or negative parenting - especially for externalizing problem behaviors - more than other dimensions of parenting (Rijlaarsdam et al., 2013). Future research should extend further the FSM not only by comparing the mediation potency of these two different aspects of parenting but also by exploring whether alternative paths (such as moderated mediation) may provide a better fit. Findings from the current study support an extension of the FSM to indicate that early adversity impacts both positive and negative dimensions of

parenting in the early years, while it is the latter that mostly enables the transmission of negative effects on problem behaviors of children with ID.

References

- Baker, B. L., Blacher, J., Crnic, K., Edelbrock, C. (2002). Behavior problems and parenting stress in families of three-year-old children with and without developmental delays. *American Journal on Mental Retardation, 107*, 433-444.
- Baker, B. L., McIntyre, L. L., Blacher, J., Crnic, K., Edelbrock, C., & Low, C. (2003). Pre-school children with and without developmental delay: Behaviour problems and parenting stress over time. *Journal of Intellectual Disability Research, 47*, 217-230.
- Bourke, J., de Klerk, N., Smith, T., & Leonard, H. (2016). Population-based prevalence of intellectual disability and autism spectrum disorders in Western Australia. *Medicine, 95*(21):e3737.
- Caldwell, B. M., & Bradley, R. H. (1984). *Home observation for measurement of the environment*. Little Rock: University of Arkansas
- Conger, R.D., & Conger, K.J. (2002). Resilience in Midwestern families: Selected findings from the first decade of a prospective, longitudinal study. *Journal of Marriage and Family, 64*, 361-373.
- Conger, R.D., Conger, K.J., & Martin, M.J. (2010). Socioeconomic status, family processes, and individual development. *Journal of Marriage and Family, 72*, 685-704.
- Conger, R.D., & Donnellan, M.B. (2007). An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology, 58*, 175-199.
- Crnic, K.A., Hoffman, C., Gaze, C., & Edelbrock, C. (2004). Understanding the emergence of behavior problems in young children with developmental disabilities. *Infants and Young Children, 17*, 223-235.

- Crnic, K.A., Neece, C.A., McIntyre, L.L., Blacher, J., & Baker, B. (2017). Intellectual disability and developmental risk: promoting intervention to improve child well-being. *Child Development, 88*, 436-445.
- Da Paz, N. S., & Wallander, J. L. (2017). Interventions that target improvements in mental health for parents of children with autism spectrum disorders: A narrative review. *Clinical Psychology Review, 51*, 1-14.
- Dekker, M. C., Koot, H. M., van-der-Ende, J., & Verhulst, F. C. (2002). Emotional and behavioral problems in children and adolescents with and without intellectual disability. *Journal of Child Psychology and Psychiatry, 43*, 1087-1098.
- Department for Work and Pensions (2018). *Households below average income: An analysis of the UK income distribution 1994/95 – 2016/17*. Retrieved from <https://www.gov.uk/government/statistics/households-below-average-income-199495-to-201617>
- Dykens, E.M, Hodapp, R.M, & Evans, D.W. (1994). Profile and development of adaptive behavior in children with Down syndrome. *American Journal on Mental Retardation, 98*, 580-587.
- Emerson, E. (2003). Mothers of children and adolescents with intellectual disabilities : social and economic situation, mental health status and self-assessed social and psychological impacts of child's difficulties. *Journal of Intellectual Disability Research, 47*(4-5), 385-399.
- Emerson, E. & Einfeld, S. (2010). Emotional and behavioural difficulties in young children with and without developmental delay: a bi-national perspective. *Journal of Child Psychology and Psychiatry, 51*, 583-593.

- Emerson, E., Einfeld, S., & Stancliffe, R., (2011). Predictors of the persistence of conduct difficulties in children with cognitive delay. *Journal of Child Psychology and Psychiatry*, 52, 1184-1194.
- Emerson, E., & Hatton, C. (2007). The mental health of children and adolescents with intellectual disabilities in Britain. *British Journal of Psychiatry*, 191, 493-499.
- Emerson, E., McCulloch, A., Graham, H., Blacher, J., Llwellyn, G. M., & Hatton, C. (2010). Socioeconomic circumstances and risk of psychiatric disorders among parents of children with early cognitive delay. *American Journal on Intellectual and Developmental Disabilities*, 115, 30-42.
- Emerson, E., Shahtahmasebi, S., Berridge, D & Lancaster, G (2010). Factors associated with poverty transitions among families supporting a child with intellectual disability. *Journal of Intellectual & Developmental Disability*, 35, 224-234.
- Emerson, E., & Einfeld, S. (2010). Emotional and behavioural difficulties in young children with and without developmental delay: a bi-national perspective. *Journal of Child Psychology and Psychiatry*, 51, 583-593.
- Emerson, E., Einfeld, S., & Stancliffe, R. J. (2011). Predictors of the persistence of conduct difficulties in children with cognitive delay. *Journal of Child Psychology and Psychiatry*, 52, 1184-1194.
- Emerson, C., & Hatton, C. (2007). Mental health of children and adolescents with intellectual disabilities in Britain. *British Journal of Psychiatry*, 191, 439-499.
- Fiasse, C., & Nader-Grosbois, N. (2012). Perceived social acceptance, theory of mind and social adjustment in children with intellectual disabilities. *Research in Developmental Disabilities*, 33, 1871-1880.
- Fountain, C., Winter, A.S., & Bearman, P.S. (2012). Six developmental trajectories characterize children with autism. *Pediatrics*, 129, e1112-e1120.

- Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 38, 581-586.
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A Research Note. *Journal of Child Psychology and Psychiatry*, 38, 581-586.
- Goodman, R., (2001). Psychometric properties of the Strengths and Difficulties Questionnaire (SDQ). *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 1337-1345.
- Guralnick M. J. (2005). Early intervention for children with intellectual disabilities: Current knowledge and future prospects. *Journal of Applied Research in Intellectual Disabilities*, 18, 313–324.
- Hastings, R. P. (2002). Parental stress and behaviour problems of children with developmental disability. *Journal of Intellectual and Developmental Disability*, 27, 149-160.
- Hastings, R. P. (2016). Do children with intellectual and developmental disabilities have a negative impact on other family members? The case for rejecting a negative narrative. *International Review of Research in Developmental Disabilities*, 50, 165-194.
- Hastings, R. P., Daley, D., Burns, C., & Beck, A. (2006). Maternal distress and Expressed Emotion: Cross-sectional and longitudinal relationships with behavior problems of children with intellectual disabilities. *American Journal on Mental Retardation*, 111, 48-61.
- Hodapp, R. M., Burack, J. A., & Zigler, E. (Eds.) (1990). *Issues in the developmental approach to mental retardation*. Cambridge: Cambridge University Press.
- ICD-10 (1996). *ICD-10 Guide for Mental Retardation*. Division of Mental Health and Prevention of Substance Abuse. Geneva: World Health Organization.

- Jaswal, V. K., Akhtar, N., & Burack, J. A. (2016). Building bridges: Cognitive development in typical and atypical populations. *Journal of Cognition and Development, 17*, 549-552.
- Kraemer, H.C. (2010). Epidemiological methods: About time. *International Journal of Environmental Research and Public Health, 7*, 29-45.
- Kraemer, H.C., Stice, E., Kazdin, A., & Kupfer, D. (2001). How do risk factors work together to produce an outcome? Mediators, moderators, independent, overlapping and proxy risk factors. *American Journal of Psychiatry, 258*, 848-856.
- Lindo, E. J., Kliemann, K. R., Combes, B. H., & Frank, J. (2016). Managing stress levels of parents of children with developmental disabilities: A meta-analytic review of interventions. *Family Relations, 65*, 207-224.
- Linver, M.R., Brooks-Gunn, J., & Kohen, D.E. (2002). Family processes as pathways from income to young children's development. *Developmental Psychology, 38*, 719-734.
- Maulik, P. K., Mascarenhas, M. N., Mathers, C. D., Dua, T., & Saxena, S. (2011). Prevalence of intellectual disability: A meta-analysis of population-based studies *Research in Developmental Disabilities, 32*, 419-436
- McIntyre, L. L. (2013). Parent training interventions to reduce challenging behavior in children with intellectual and developmental disabilities. *International Review of Research in Developmental Disabilities, 44*, 245-279.
- McIntyre L. L., Blacher J. & Baker B. L. (2006). The transition to school: adaptation in young children with and without developmental delays. *Journal of Intellectual Disability Research, 50*, 349-361.
- Muthén, B., & Asparouhov, T. (2014). Causal effects in mediation modelling: An introduction with applications to latent variables. *Structural Equation Modeling: A Multidisciplinary Journal, 22*, 12-23.

- Neece, C. L., Green, S. A., & Baker, B. L. (2012). Parenting stress and child behavior problems: A transactional relationship across time. *American Journal on Intellectual and Developmental Disabilities, 117*, 48-66.
- Newland, R. P., Crnic, K. A., Cox, M. J., & Mills-Koonce, W. R. (2013). The Family Stress Model and maternal psychological symptoms: Mediated pathways from economic hardship to parenting. *Journal of Family Psychology, 27*(1), 96-105.
- Oliver, C., Adams, D., Allen, D., Bull, L., Heald, M., Moss, J., Wilde, L. & Woodcock, K. (2013). Causal models of clinically significant behaviors in Angelman, Cornelia de Lange, Prader-Willi and Smith-Magenis syndromes. *International Review of Research in Developmental Disabilities, 44*, 167-211.
- Pianta, R.C. (1992). *Child-Parent Relationship Scale*. Charlottesville, VA: University of Virginia.
- Petrenko, C. L. M. (2013). A review of intervention programs to prevent and treat behavioral problems in young children with developmental disabilities. *Journal of Developmental and Physical Disabilities, 25*, 651-679.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J-Y., & Podsakoff, N.P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended studies. *Journal of Applied Psychology, 88*, 879-903.
- Rijlaarsdam, J., Stevens, G.W.J.M, van der Ende, J., Hofman, A., Jaddoe, V.W.V., Machenbach, J.P., ... Tiemeir, H. (2013). Economic disadvantage and young children's emotional and behavioural problems: Mechanisms of risk. *Journal of Abnormal Child Psychology, 41*, 125-137.
- Rutter, M., Graham, P., & Yule, W. (1970). *A neuropsychiatric study in childhood*. London: SIMP/Heinemann.

- Shahtahmasebi, S., Emerson, E., Berridge, D & Lancaster, G (2011). Child disability and the dynamics of family poverty, hardship and financial strain: Evidence from the UK. *Journal of Social Policy*, 40, 653-673.
- Shonkoff, J.P., Boyce, W.T., & McEwen, B.S. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: Building a new framework for health promotion and disease prevention. *Journal of the American Medical Association*, 301, 2252-2259.
- Singer, G. H., Ethridge, B. L., & Aldana, S. I. (2007). Primary and secondary effects of parenting and stress management interventions for parents of children with developmental disabilities: A meta-analysis. *Mental Retardation and Developmental Disabilities Research Reviews*, 13(4), 357-369.
- Solantaus, T., Leinonen, J., & Punamaki, R-J. (2004). Children's mental health in times of economic recession: Replication and extension of the Family Economic Stress Model in Finland. *Developmental Psychology*, 40, 412-429.
- Tellegen, C. L., & Sanders, M. R. (2013). Stepping Stones Triple P—Positive Parenting Program for children with disability: A systematic review and meta-analysis. *Research in Developmental Disabilities*, 34, 1556–1571.
- Totsika, V., Hastings, R. P., Vagenas, D., & Emerson, E. (2014). Parenting and the behavior problems of young children with an intellectual disability: Concurrent and longitudinal relationships in a population-based study. *American Journal on Intellectual and Developmental Disabilities*, 119, 422-435.
- Yeung, W.J., Linver, M., & Brooks-Gunn, J. (2002). How money matters for young children's development: Parental investment and family processes. *Child Development*, 73, 1861-1879.

Table 1

Descriptive statistics of study variables

	9 months	3 years	5 years	7 years	11 years
Income poverty (%)	67.0%				
Subjective poverty (median , SD, range 1-5)	3.00 (1.00)				
Durable assets owned (mean, SD, range 1-8)	5.65 (1.21)				
Receiving financial help from grandparents (%)	71.7%				
Parental psychological distress (mean, SD, range 9-18)	11.21 (2.13)				
Frequent disciplining (mean, SD, range 1-35)		18.49 (5.59)	18.93 (4.75)		
1+ instances of harsh discipline observed (HOME)		22.0%			
Conflict in parent-child relationship (mean, SD)		18.70 (7.00)			
Closeness in parent-child relationship (mean, SD)		32.08 (3.70)	3.55 (0.64)		
Positivity observed (HOME; mean, SD)		3.97 (1.44)			
Child emotional problems (SDQ; mean, SD)				2.67 (2.31)	3.27 (2.48)

Child conduct problems (SDQ; mean, SD)				2.63 (2.00)	2.50 (1.89)
Child hyperactivity (SDQ; mean, SD)				5.86 (2.69)	5.56 (2.65)
Child total behaviour problems (SDQ; mean, SD)				13.63 (6.62)	14.28 (7.07)

Table 2

SEM models testing whether adversarial parenting mediates the effect of early psychological distress on child behaviour problems

Child outcome is:	Emotional Problems	Hyperactivity	Conduct Problems	Total Behaviour Problems
Paths ¹	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)
Parents help financially → Poverty @ 9m	-.04 (-.17, .08)	-.04 (-.17, .08)	-.04 (-.17, .08)	-.043 (-.17, .08)
Poverty @ 9m → Parent psychological distress @ 9m	.22 (.09, .35)	.22 (.09, .35)	.22 (.08, .34)	.22 (.09, .35)
Psychological distress @ 9m → Adversarial parenting @ 3-5yrs	.38 (.26, .50)	.41 (.27, .52)	.40 (.38, .51)	.41 (.28, .52)
Adversarial parenting @ 3-5yrs → Child outcome @ 7yrs	.15 (-.02, .31)	.39 (.21, .54)	.45 (.27, .60)	.38 (.21, .54)
Adversarial parenting @ 3-5yrs → Child outcome @ 11yrs	.09 (-.08, .28)	.26 (.06, .43)	.18 (.00, .35)	.26 (.07, .43)
<i>Mediation test for child outcome @ 7 yrs</i>				
Total Indirect effect	.06 (.00, .14)	.16 (.08, .26)	.18 (.10, .29)	.16 (.07, .27)
Total Direct effect	-.06 (-.08, .21)	-.07 (-.21, .06)	.06 (-.09, .19)	.01 (-.19, .15)
<i>Mediation test for child outcome @ 11 yrs</i>				
Total Indirect effect	.04 (-.03, .12)	.11 (.03, .20)	.07 (.00, .16)	.10 (.03, .20)
Total Direct effect	-.04 (-.10, .17)	-.04 (-.18, .09)	-.01 (-.13, .12)	-.02 (-.16, .11)

¹ Standardised betas in bold are statistically significant as estimated by their 95% CIs which were obtained through 5,000 bootstraps.

Table 3

SEM models testing whether positive parent-child relationship mediates the effect of early psychological distress on child behaviour problems

Child outcome is:	Emotional Problems	Hyperactivity	Conduct Problems	Total Behaviour Problems
Paths ¹	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)
Parents help financially → Poverty @ 9m	-.04 (-.17, .08)	-.04 (-.17, .08)	-.04 (-.17, .08)	-.04 (-.17, .08)
Poverty @ 9m → Parent psychological distress @ 9m	.22 (.09, .35)	.22 (.09, .35)	.21 (.08, .34)	.22 (.09, .35)
Psychological distress @ 9m → Positive relationship @ 3-5yrs	-.33 (-.74, -.06)	-.27 (-.77, -.05)	-.44 (-.71, -.16)	-.35 (-.69, -.07)
Positive relationship @ 3-5yrs → Child outcome @ 7yrs	-.21 (-.47, .06)	-.09 (-.32, .15)	-.45 (-.73, -.19)	-.33 (-.61, -.11)
Positive relationship @ 3-5yrs → Child outcome @ 11yrs	-.09 (-.34, .21)	-.02 (-.26, .32)	-.20 (-.46, -.01)	-.16 (-.40, .07)
<i>Mediation test for child outcome @ 7 yrs</i>				
Indirect effect	.07 (.00, .24)	.03 (-.01, .18)	.20 (.03, .33)	.11 (.01, .26)
Direct effect	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)
<i>Mediation test for child outcome @ 11 yrs</i>				
Indirect effect	.03 (-.03, .16)	-.01 (-.08, .07)	.09 (.01, .19)	.06 (.00, .19)
Direct effect	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)

¹ Standardised betas in bold are statistically significant as estimated by their 95% CIs which were obtained through 5,000 bootstraps.

Table 4

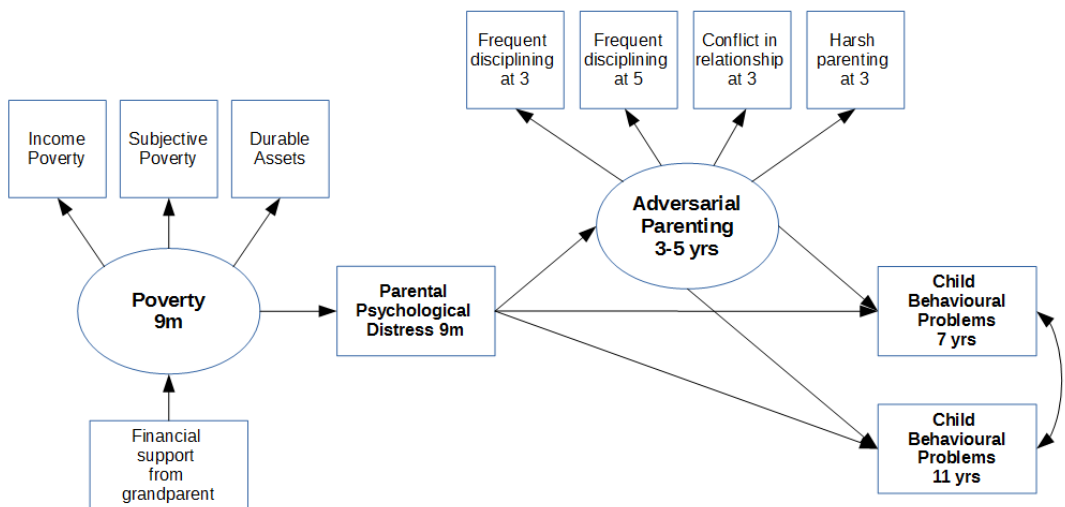
SEM results examining multiple mediation of parenting on the effect of early adversity on child behaviour problems

Child outcome is:	Emotional Problems	Hyperactivity	Conduct Problems	Total Behaviour Problems
	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)	Beta (95% CIs)
Parents help financially → Poverty @ 9m	-.04 (-.17, .08)	-.04 (-.17, .08)	-.05 (-.18, .07)	-.04 (-.17, .08)
Poverty @ 9m → Parent psychological distress @ 9m	.22 (.09, .35)	.22 (.05, .35)	.22 (.05, .35)	.22 (.09, .35)
Psychological distress @ 9m → Adversarial parenting @ 3-5yrs	.36 (.21, .49)	.40 (.27, .52)	.38 (.26, .50)	.40 (.27, .51)
Psychological distress @ 9m → Positive relationship @ 3-5yrs	-.25 (-.60, -.02)	-.28 (-.60, -.06)	-.29 (-.61, -.06)	-.26 (-.63, -.03)
Adversarial parenting @ 3-5yrs → Child outcome @ 7yrs	.12 (-.10, .31)	.40 (.17, .63)	.40 (.14, .598)	.34 (.05, .53)
Positive relationship @ 3-5 yrs → Child outcome @ 7yrs	-.06 (-.50, .19)	.12 (-.28, .53)	-.10 (-.45, .15)	-.07 (-.46, .23)
Adversarial parenting @ 3-5yrs → Child outcome @ 11yrs	.10 (-.10, .33)	.31 (.08, .63)	.10 (-.23, .31)	.23 (-.02, .44)
Positive relationship @ 3-5 yrs → Child outcome @ 11 yrs	.07 (-.29, .37)	.26 (-.25, .96)	-.19 (-.60, .11)	.00 (-.26, .45)
<i>Specific Indirect paths for outcome at 7 yrs</i>				
Psychological distress → Advers. parenting → Child outcome	.04 (-.03, .13)	.16 (.06, .29)	.15 (.05, .28)	.13 (.03, .25)
Psychological distress → Posit. relationship → Child outcome	.017 (-.03, .27)	-.03 (-.32, .02)	.03 (-.02, .32)	.02 (-.04, .37)

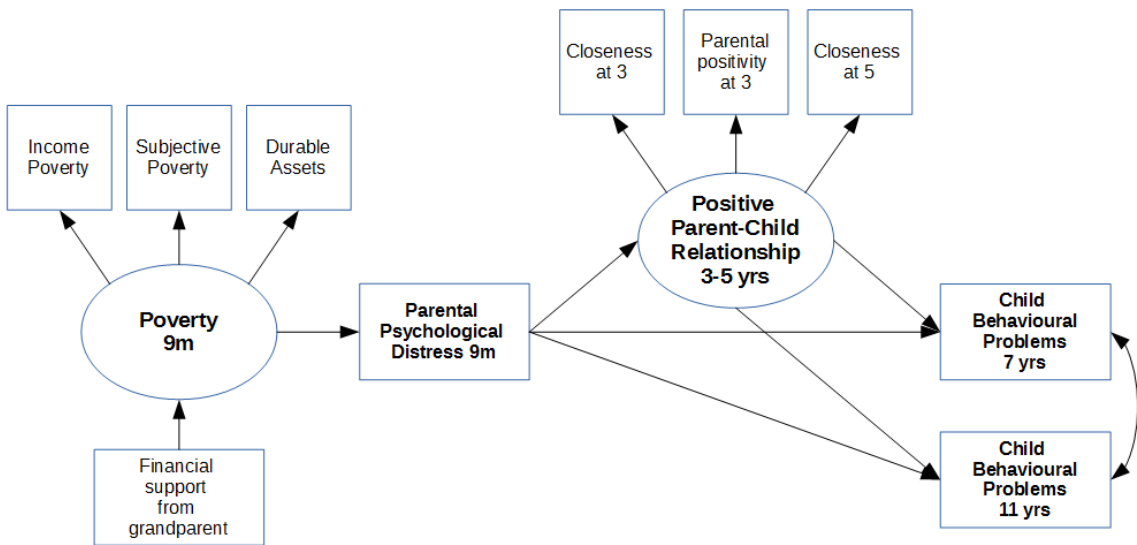
<i>Specific Indirect paths for outcome at 11 yrs</i>				
Psychological distress → Advers. parenting → Child outcome	.04 (-.03, .14)	.13 (.03, .29)	.04 (-.08, .13)	.09 (.00, .20)
Psychological distress → Posit. relationship → Child outcome	-.02 (-.24, .04)	-.07 (-.48, .02)	.06 (-.01, .40)	.00 (-.14, .09)

¹Standardised betas in bold are statistically significant as estimated by their 95% CIs which were obtained through 5,000 bootstraps.

(a)



(b)



(c)

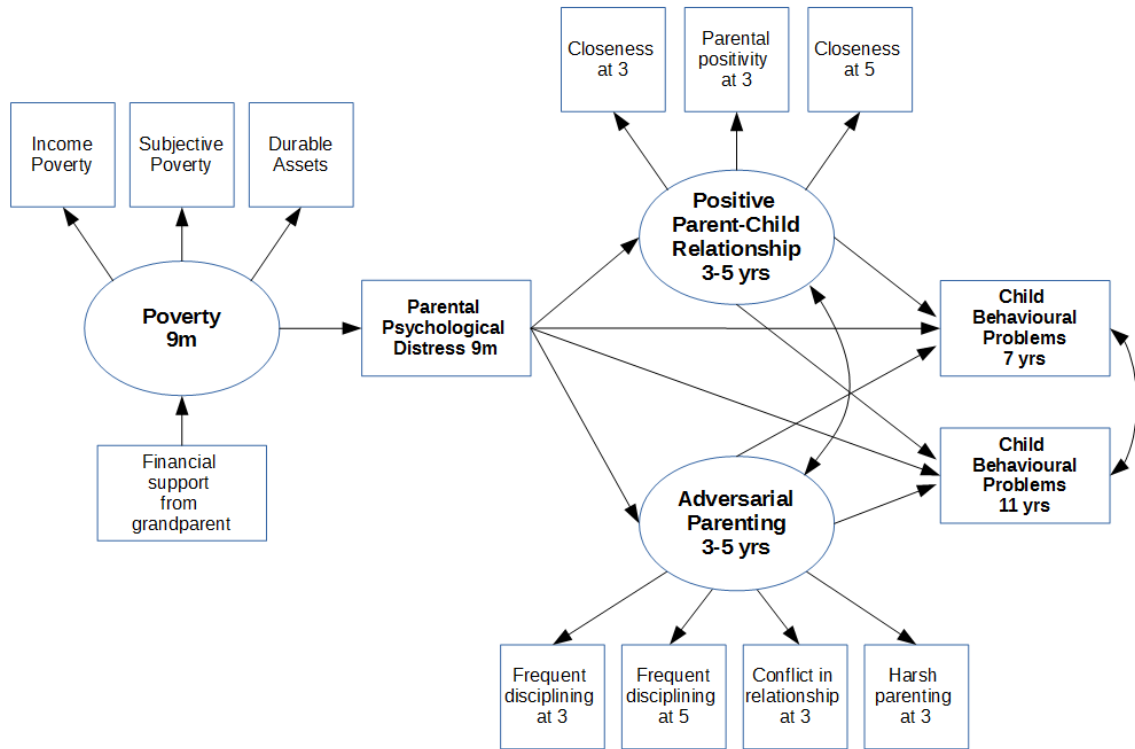


Figure 1. Conceptual models testing parenting dimensions as mediators of the impact of early adversity on the behaviour problems of children with intellectual disabilities.