JIDR Journal of Intellectual Disability Research
Published on behalf of mencap and in association with IASSID

Journal of Intellectual Disability Research doi: 10.1111/jir.13082

VOLUME PART 2023

Special Issue Article

Pathways to social well-being of children with intellectual disability: testing the Family Investment Model

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Abstract

Background Social well-being, including prosocial and peer relationship skills, independence and co-operation, is a particularly important developmental outcome in intellectual disability (ID). The present study investigated pathways to social well-being through the early years' family environment, particularly the role of parental investments in mediating the path from family poverty to child social well-being.
Methods In line with the Family Investment Model (FIM), we tested whether parental investments between 3 and 5 years of age mediate the impact of family poverty at 9 months of age on children's social well-being at 7 years. Structural equation models were fitted to data from 555 children with ID identified from a UK population-based cohort.
Results Findings indicated that home learning investments and the structural home environment (though not play) significantly mediated the effect of family poverty on children's social skills, albeit in different directions. While all parental investments reduced in the presence of poverty, the home learning environment appeared to promote social well-being, whereas the structural home environment did not. Sensitivity analyses controlling for co-occurring autism confirmed the pattern of findings. Child gender, ethnicity and parental educational qualifications did not moderate the mediational relationships, suggesting that FIM pathways to social well-being were relevant to all families.
Conclusions The FIM provides a helpful framework to map developmental pathways for children with an ID. Parental investments related to home learning, the structural home environment and play are reduced in the presence of poverty although their impact on child social well-being appears to differ.

Keywords Family Investment Model, home environment, home learning, intellectual disability, play, social skills

Introduction

Social and prosocial skills are crucial for helping children navigate everyday situations such as school adaptation (Rabiner *et al.* 2016). In intellectual disability (ID), social skills are also linked to behaviour and mental health problems (Ratcliffe

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et al. 2015). Children with ID present with significant limitations in social and prosocial skills (Emerson 2003; Cook & Oliver 2011), and these are more pronounced when autism co-occurs with ID (Bailey *et al.* 2019). Despite their importance, there is limited understanding of environmental determinants of social well-being. In the present study, we investigate the longitudinal association between the social well-being of children with ID and the early years' family environment, with a focus on parental investments.

The parent–child relationship is one of the most significant aspects of parenting. It includes two separate but inter-related dimensions: the affective dimension referring to the emotional or affiliative bonds between parent and child, and the investment dimension encompassing all the actions that parents engage to care and provide for their child (Del Guidice & Belsky 2011). The affective dimension has been widely investigated in ID, mostly in relation to child behaviour problems (e.g. Smith *et al.* 2008; Totsika *et al.* 2014) and recently cognition and language (Vilaseca *et al.* 2019). However, the investment dimension has received less attention in ID.

Drawn from social economic theory and evolutionary psychology, parental investments describe purposeful parental behaviour that aims to promote child well-being through deliberate action (Trivers 1972; Coleman 1988). In developmental psychology, the concept of parental investment has been at the core of the Family Investment Model (FIM; Conger & Donnellan 2007; Conger *et al.* 2010), which proposes that parental investments mediate the effect of the family's economic resources on a range of child outcomes (Conger & Donnellan 2007; Conger *et al.* 2010). To the best of our knowledge, no study has examined whether FIM is a useful framework for mapping routes to social well-being (or indeed, any outcomes) in children with ID.

In the field of ID, research on proximal environmental influences on child social skills has tended to focus on parental mental health and affective dimensions of the family environment (Beck *et al.* 2004; Neece & Baker 2008; Wagner *et al.* 2017; Bailey *et al.* 2019). Some evidence has pointed to short-term associations with parenting stress (Beck *et al.* 2004; Neece & Baker 2008), but not in the longer term (Wagner *et al.* 2017). Parental mental health and over-time changes in parental mental health did not relate to the trajectory of prosocial skills in ID (Bailey *et al.* 2019). Wagner *et al.* (2017) found that affective dimensions of the family environment (conflict, expressiveness and cohesion) during adolescence did not mediate the effect of early childhood intelligence, executive functioning or internalising problems in young adults' socialisation. Overall, evidence from these studies has shown no longitudinal associations between these affective dimensions of the family environment and child social well-being in families of children with an ID, but there is no evidence on the role of parental investments to date.

In terms of distal factors, evidence has demonstrated that children with ID are more likely to grow up in families experiencing poverty (Emerson *et al.* 2010; Park *et al.* 2017). Poverty can have a negative impact on parental investments (Linver *et al.* 2002; Rijlaarsdam *et al.* 2013), and, in ID, poverty has been associated with higher levels of child conduct problems (Emerson *et al.* 2014), mental health problems (Emerson & Hatton 2007a) and poorer physical health (Emerson & Hatton 2007b). However, to date, there is no evidence on the impact of poverty on the social well-being of children with ID. In typical development, a small number of studies demonstrated a link between poverty and prosocial behaviour (Lichter *et al.* 2002) or co-operation (Koblinsky *et al.* 2000). The assumption is that poverty impacts children's social development indirectly through the parenting environment (Bradley & Corwyn 2002; Eisenberg *et al.* 2006).

To address these gaps, the present study tested whether parental investments in the early years (ages 3–5) mediated the effect of early life poverty on children's social well-being at the age of 7 years. The early years' family environment is particularly crucial for children's social skills, more so than later childhood years (Cavanagh & Huston 2008). The selection of parental investments was guided by the Conger & Donnellan (2007) definition and by expert stakeholders in ID and parenting. Conger & Donnellan (2007) organised parental investments into four general categories: (1) direct and indirect stimulation of learning (e.g. doing homework with your child or paying a tutor to support homework); (2) available materials in the home (e.g. accessible books and toys at home); (3) standard of living in terms of quality of housing, food and so forth (e.g. a well-lit, well-constructed, clean home); and (4) living in a location that supports good child development

(e.g. a neighbourhood close to a good school). Following consultation with expert stakeholders, we focused on stimulation for learning, the quality of the structural home environment and investment in child play. Our hypothesis was that the effect of the family's financial resources on child social well-being would be mediated by parental investments, such that higher levels of income poverty would reduce parental investments, which in turn would lead to lower child social well-being. We examined whether parental educational level, child gender and ethnicity moderated the proposed mediational relationship. While family poverty is associated with parental education, they are not interchangeable (Conger & Donnellan 2007). We therefore hypothesised that low levels of human capital afforded by education would disrupt FIM, such that the proposed mediation from poverty to low social well-being would only be present in families with low educational qualifications. In line with some evidence that FIM is not applicable to ethnic minority groups in the USA (Iruka *et al.* 2012), we examined whether the proposed mediational paths would be present in White British families and families from an ethnic minority background in the UK. We hypothesised that differences would be present between ethnicity groups, but in the absence of relevant evidence, no hypotheses were made about specific ethnicity groups. Finally, the evidence on divergence of social behaviour between boys and girls, as well as the gendered responses of parents (Pasterski *et al.* 2011), indicated the need to test whether the mediational path proposed by FIM would be similar between boys and girls with ID.

Methods

The study draws on data from the Millennium Cohort Study (MCS), a longitudinal UK birth cohort that started in 2000 to follow the development of a UK representative cohort of children. Most participants entered the study at 9 months (Wave 1, n = 18 885), with the addition of 692 families at Wave 2 who had been deemed eligible for inclusion at Wave 1 but had not participated. MCS followed a two-stage complex stratified sampling design with participants randomly selected from the Child Benefit records (at the time, a non-means tested universal benefit for all UK children). The design also included oversampling from disadvantaged and ethnic minority areas and the smaller countries of the UK. The present study draws on data from Waves 1 to 4, when children were aged 9 months, 3 years, 5 years and 7 years, respectively. We identified children with ID using a variety of survey data (see below). Most children with ID entered the study at the age of 9 months (N = 518) and a smaller number entered at the age of 3 years (Wave 2, N = 37). All descriptive statistics presented below are unweighted.

Participants

Participants included 555 children identified with ID; 66% of children came from England, 15% from Wales and 10% each from Scotland and Northern Ireland. Sixty-two per cent of the children were boys and 70%

Table 1 Descriptive statistics on study variables (N = 555)

Risk factor at age 9 months	**% (*n*)**
Family income poverty	67 (343)
Child social well-being at 7 years	**Mean (SD)**
Prosocial skills	7.46 (2.32)
Peer relationship skills	7.49 (2.09)
Independence/self-regulation	2.15 (0.46)
Co-operation	2.32 (0.44)
Potential mediators at 3 and 5 years	**Mean (SD)**
Home Learning Environment (age 3)	20.71 (7.90)
Home Learning Environment (age 5)	16.37 (4.15)
Help with schoolwork (age 5)	14.00 (3.46)
Regular routines (age 3)	6.15 (1.63)
Parent playing physically active games with child	3.30 (1.55)
Parent playing indoor games/toys with child	4.26 (1.57)
Parent taking child to park/playground	3.63 (1.19)
Playing with friends (ages 3 and 5)	1.26 (0.69)
Calm house (age 3)	10.42 (2.45)
Physical home environment (age 3)	3.52 (0.96)
Potential moderators	**% (*N*)**
Parents educated below degree level	85 (428)
Child male gender	62 (334)
White ethnicity	71 (388)
Pakistani/Bangladeshi ethnicity	17 (93)

came from a White ethnic background, while the remaining belonged to an ethnic minority group (mixed, Indian, Pakistani or Bangladeshi, Black or Black British, and other). The largest ethnic minority group was Pakistani and Bangladeshi (17%; Table 1). Nine per cent of children with ID were identified as autistic at age 7. At 9 months, 67% of households were below the UK's income poverty threshold, while in 85% of households, parental education was below university degree level (Table 1). Data were collected through interviews with main respondents, home observations and direct child assessment. Overall, 99% of main respondent interviews at 9 months were conducted with the child's biological mother.

Measures

Intellectual disability identification

Identification was based mainly on standardised cognitive assessments administered by trained interviewers. The approach to identification was iterative: starting from age 7, age-standardised scores on cognitive assessments were subjected to factor analysis and ID was defined as a score at or below 2 standard deviations of the mean factor score. The process was repeated with standardised cognitive assessments at age 5 and then age 3 for children who had not been classified in later waves. A small number of children (n = 17) were identified by parent and teacher report to account for children who were excluded from cognitive assessments when interviewers suspected a developmental delay and did not test them (National Centre for Social Research 2009). The process is described in further detail in Totsika *et al.* (2020). Overall ID prevalence in MCS was 2.7% (weighted to account for the sampling design of MCS), within the expected range internationally for current estimates of ID in childhood (Anderson *et al.* 2019; Public Health England 2020).

Family resources

According to FIM, family economic resources are the distal risk factor for child developmental outcomes. We identified families that lived below the poverty line defined as households where the total income was below 60% of the median equivalised national income (DWP 2016). For parental education, all parents in MCS were asked to indicate their educational qualifications, and we recoded these into a variable indicating whether any of the parents (if more than one in the family) had an education below university undergraduate degree level versus at and above this level.

Parental investments

To identify parental investments among all possible variables collected by MCS when children were 3 and 5 years, a two-step process was followed. Initially, eligible variables were selected guided by Conger & Donnellan's (2007) definition of parental investments. Subsequently, using the same definition, we conducted a consultation engaging three UK-based large organisations that specialise in ID and family support. Representatives from these organisations rated proposed investment variables for their suitability to be considered as investments in this population. Final decisions were based on majority agreement including a discussion with the full research team. Investment measures are described below. In Analytical Strategy, we describe how they were combined into three latent constructs related to home learning, structural home environment and play.

Home Learning Environment. The Home Learning Environment (HLE) is an index of the frequency with which parents do certain activities with their children at home (Melhuish *et al.* 2008). Originally developed as a seven-item index (Melhuish *et al.* 2008), MCS used a six-item version at age 3 and a five-item version at age 5 (De la Rochebrochard 2012). Following stakeholder consultation, the item regarding visiting a library was excluded, and a five-item HLE was used at age 3: frequency of reading to child, playing with ABCs/letters, teaching numbers/shapes, songs/nursery rhymes and drawing/painting with the child (McDonald's omega = 0.60). Items were measured on a 7-point scale with the exception of reading (6-point), which was recoded to create the total HLE index (De la Rochebrochard 2012). HLE scores at age 3 ranged from 0 to 35, with higher scores indicating more frequent home learning activities. At age 5, HLE included four items: frequency of reading to child, telling the child stories, engaging in musical activities and drawing/painting with the child (omega = 0.59). Items were scored on a 6-point scale. HLE scores at age 5 ranged from 0 to 24, with higher

scores indicating more frequent home learning activities.

Help with schoolwork. At age 5, respondents were asked to indicate the frequency with which any adult at home helped the child with reading, writing and maths, on a 6-point scale ranging from never to every day. A three-variable composite was created by summing these items to indicate the frequency with which parents provided help with schoolwork (omega = 0.67). Scores ranged from 1 to 18 with higher values indicating more frequent help with homework.

Parent play with child. At age 5, respondents indicated the frequency they played games with their child: how often they played physically active games with the child, how often they played with indoor toys or games and how often they took the child to the park or playground. Items were rated on a 6-point scale from never to every day.

Playing with friends. At age 3, respondents were asked to indicate whether they had visited or received a visit by friends with young children in the last month. At age 5, respondents indicated the frequency the child spends time with friends outside school on a 6-point scale ranging from daily to never. This variable was recoded to capture the frequency of spending time with friends monthly or less often. The two variables were then combined to indicate whether children played with friends at least monthly. Scores ranged from 0 to 2 (highest score representing at least monthly meetings with friends at both ages).

Home regular routines. At age 3, respondents indicated the frequency with which the child has regular bedtime and meal times on a 4-point scale ranging from never to always. These two items were combined to indicate the frequency of home routines at age 3. Scores ranged from 2 to 8, with higher scores indicating higher frequency of regular routines.

Home atmosphere. The Confusion, Hubbub and Order Scale (CHAOS; Matheny *et al.* 1995) assesses the extent to which a home's atmosphere is chaotic and disorganised. MCS used three CHAOS items at age 3: 'It's really disorganised in your home', 'You can't hear yourself think' and 'The atmosphere at home is calm'. Items were coded on a 5-point scale from strongly agree to strongly disagree. After recoding the first two items, a three-item indicator of the extent of calmness in the household (omega = 0.74) was developed (range 3–15), with higher scores indicating a more calm and organised house.

Physical home environment. The Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley 1984) is a structured observation of the quality of the home environment. At age 3, trained MCS staff visiting participants' homes observed a number of items selected from the HOME. Four of those captured the quality of the physical environment: 'The interior of the home is dark or perceptually monotonous', 'All visible rooms of the house are reasonably clean', 'All visible rooms are reasonably uncluttered' and 'The child's in-home play environment is safe'. Items were rated as present/absent and combined to indicate whether the physical environment was of an acceptable standard, that is, safe, clean, uncluttered and bright (Kuder Richardson: 0.74). Scores ranged from 0 to 4, with higher scores indicating higher quality of the physical environment.

Child social well-being

Social well-being was assessed at age 7 and included measures of child prosocial skills, peer relationships and social skills.

Prosocial skills. Main respondents completed the Strengths and Difficulties Questionnaire (SDQ; Goodman 1997). Five of the 25 SDQ items (rated on a 0–2 scale) are summed to describe levels of prosocial skills: My child … 'is considerate of other people's feelings', 'shares readily with other children (toys, treats, etc)', 'is helpful if someone is hurt, upset or ill', 'is kind to younger children' and 'often volunteers to help others (parents, teachers, other children)'. Internal consistency was good (McDonald's omega = 0.77), and scores ranged from 0 to 10, with higher scores indicating a higher level of prosocial skills.

Peer relationships. These were also evaluated drawing on five items from the SDQ: 'My child … has at least one good friend, tends to play alone, often fights with other children or bullies them, is generally liked by

other children, gets on better with adults than with children'. Originally developed as a measure of peer relationship problems, we recoded items to measure positive skills. Internal consistency was deemed acceptable (omega = 0.56), and scores ranged from 0 to 10, with higher scores indicating stronger peer relationship skills.

Social skills. Main respondents rated their child's independence and co-operation using two sub-scales of the Child Social Behaviour Questionnaire (Sammons *et al.* 2003), a measure of children's social skills adapted from the Adaptive Social Behavior Inventory (Hogan *et al.* 1992). For independence (five items), main respondents indicated whether the child likes to work out things for himself or herself, does not need much help with tasks, chooses activities on his or her own, persists in the face of difficult tasks and moves to a new activity after finishing a task (omega = 0.68). For co-operation (five items), parents indicated whether their child is calm and easy going, works or plays easily with others, says please and thank you when reminded, waits for his or her turn in activities and co-operates with requests (omega = 0.66). Each item is rated on a 1–3 scale with 1 = not true and 3 = certainly true, while sub-scale scores are derived by obtaining the mean across five items. Sub-scale scores range from 1.00 to 3.00, with higher values indicating higher level of social skills.

Analytical strategy

Confirmatory factor analysis in Mplus 8.4 (Muthén & Muthén 1998–2015) was used to develop latent constructs for parental investments and child social well-being. Model fit was evaluated using proposed guidelines (Hu & Bentler 1999): non-significant χ^2, root mean square error of approximation (RMSEA) ≤ 0.06, comparative fit index (CFI) and Tucker and Lewis index (TLI) ≥ 0.95 and standardised root mean square residual (SRMR) < 0.08.

Social well-being was fitted as a first-order confirmatory factor analysis with prosocial skills, peer relationship skills, independence and co-operation as the four indicators. Fit was excellent: $\chi^2_{(2)} = 0.663$, $P = 0.718$, RMSEA = 0.000 [90% confidence interval (CI) 0.000, 0.007], CFI = 1.00, TLI = 1.00 and SRMR = 0.009. The standardised paths from the latent social well-being to indicator variables were 0.81 for prosocial skills, 0.52 for peer relationship skills, 0.61 for independence and 0.78 for co-operation. A similar approach was followed for the mediators. The home learning investment included HLE at 3 (standardised path: 0.51) and 5 years (standardised path: 0.61) and help with schoolwork at 5 years (standardised path: 0.55). Investment in the structural home environment included home atmosphere (standardised path: 0.52), regular routines (0.23) and physical home environment (0.49). Investment in play included playing with friends (standardised path: 0.23), playing physically active games (0.66), playing indoors (0.63) and taking child to park/playground (0.35). The two latent mediators with three indicators each (home learning and structural home environment) were saturated (i.e. the fit was perfect, and no fit indices are available). The fit of the play investment was very good with $\chi^2_{(2)} = 2.924$, $P = 0.234$, RMSEA = 0.029 (90% CI 0.000, 0.095), CFI = 0.992, TLI = 0.976 and SRMR = 0.017.

Structural equation models (SEMs) tested whether each of the three investments mediated the path from family income poverty to child social well-being (Fig. 1). FIMs were then submitted to a sensitivity analysis that controlled for the impact of co-presenting autism on social well-being. Finally, multi-group SEMs tested the potential moderation of child ethnicity, gender and parental educational level.

Across the four MCS data waves, between 1.4% (playing with friends) and 29% (prosocial skills), data were missing across all variables. For this, full information maximum likelihood estimation (FIML) was used to estimate SEM parameters. FIML is a more appropriate method for addressing missing data than imputation, particularly for data missing on both predictors and outcome and longitudinal data that may deviate from normality (Allison 2012; Yuan *et al.* 2012; Shin *et al.* 2017). Data were not missing completely at random [Little's missing completely at random test $\chi^2 = 375.24$ (224), $P < 0.001$]. We conducted missing data analysis by correlating missing outcomes with missing predictors and identified that none of the correlations exceeded 0.40, suggesting that data were missing at random (Schafer & Graham 2002), a requirement for FIML.

The SEM paths are reported as unstandardised beta coefficients (Hayes 2013). Ninety-five per cent bias-corrected CIs for the indirect effects were based

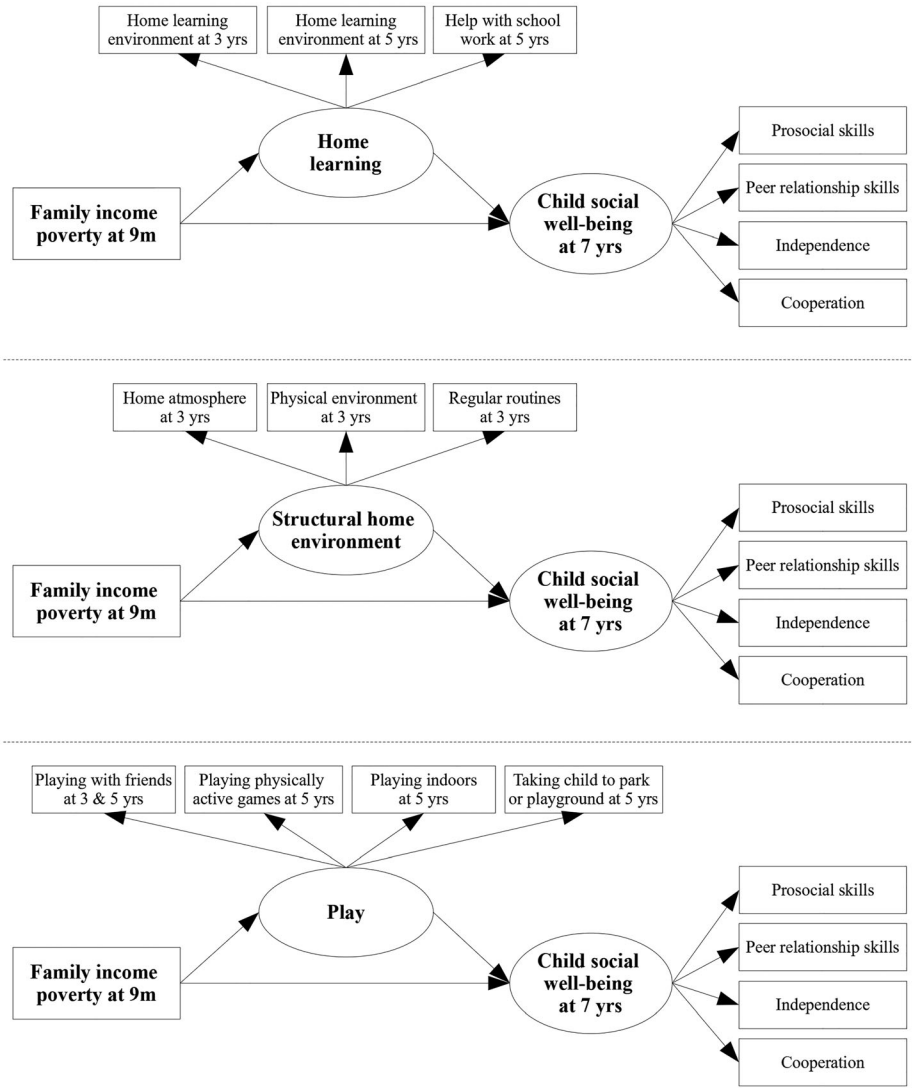

Figure 1. Structural equation models testing the Family Investment Model in intellectual disability.

on 10 000 bootstrapped samples (Hayes 2013). Mediation effect sizes were estimated as the ratio of the indirect effect to the standard deviation of the latent outcome (ab_{ps} = ab/sy; Miočević *et al.* 2017). These effect sizes demonstrate the size of the indirect effect in terms of standard deviations of the outcome for a one-unit change in the risk factor.

Results

Descriptive statistics for all indicator variables used in SEMs are presented in Table 1. Table 2 includes fit indices for the SEM models fitted to test the FIM (upper part) and the same models after controlling for the effect of autism on the outcome (lower part). Table 3 presents the results of the SEM mediation models. The results of the main mediation models can also be seen in Fig. S1.

Fit indices in Table 2 suggest that SEMs testing the FIM directly provided a good fit to the data (upper part of Table 2). The fit worsened when a control variable was added to the model to account for the potential impact of autism on social well-being scores (lower part of Table 2). As the results of the sensitivity

Table 2 Fit of structural equation models testing the Family Investment Model (FIM)

	χ^2 (*P*)	RMSEA (90% CI)	CFI	TLI	SRMR
Main mediation models					
FIM: home learning	28.952 (0.049)	0.035 (0.002, 0.057)	0.979	0.968	0.039
FIM: structural home environment	19.026 (0.390)	0.011 (0.000, 0.042)	0.998	0.996	0.028
FIM: play	41.866 (0.018)	0.036 (0.015, 0.055)	0.969	0.956	0.045
Sensitivity analysis: controlling for autism presence					
FIM: home learning	62.209 (<0.001)	0.054 (0.037, 0.071)	0.942	0.916	0.048
FIM: structural home environment	52.896 (<0.001)	0.047 (0.029, 0.065)	0.950	0.928	0.041
FIM: play	70.055 (<0.001)	0.047 (0.032, 0.062)	0.944	0.923	0.047

CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardised root mean square residual; TLI, Tucker and Lewis index.

Table 3 Testing the Family Investment Model in relation to the social well-being of 7-year-old children with intellectual developmental disability

	IV-Med path (a)	Med-DV path (b)	Indirect effect (ab)	Direct effect
Main mediation models				
Home learning	**−2.10**	**0.16**	**−0.33 (−0.65, −0.13)**	0.29 (−0.18, 0.78)
Structural home environment	**−0.29**	**−0.91**	**0.27 (0.07, 0.70)**	−0.25 (−0.79, 0.25)
Play	**−0.47**	0.07	−0.04 (−0.26, 0.13)	0.05 (−0.42, 0.54)
Sensitivity analysis: controlling for autism presence				
Home learning	**−2.10**	**0.14**	**−0.30 (−0.61, −0.11)**	0.36 (−0.12, 0.87)
Structural home environment	**−0.29**	**−1.08**	**0.31 (0.11, 0.78)**	−0.20 (−0.76, 0.32)
Play	**−0.48**	0.07	−0.03 (−0.25, 0.13)	0.15 (−0.34, 0.64)

All beta coefficients unstandardised. Coefficients with confidence intervals not crossing zero in bold. Parentheses include 95% bias-corrected accelerated confidence intervals.

analyses were almost identical to the results of the main analyses (Table 3), albeit with a worse fit, we will focus on the main SEMs (upper part of Table 3).

Findings suggested that a significant mediational relationship was observed for the FIM models with home learning and structural home environment as the mediating investment. Specifically, income poverty at 9 months led to a significant reduction in home learning parental investments between 3 and 5 years [$B = -2.10$ (95% CI −3.46, −1.04)]. The relationship between home learning and child social well-being was significant and positive [$B = 0.16$ (95% CI 0.07, 0.25)], and this resulted in an overall significant indirect effect of −0.33 (95% CI −0.65, −0.13). Thus, poverty at 9 months led to a significant reduction in child social well-being at 7 years through the reduction of home learning parental investments between 3 and 5 years.

Income poverty at 9 months led to a reduction in structural home environment investments [$B = -0.2$ (95% CI −0.47, −0.15)]. The relationship between structural home environment investments and child social well-being was significant and negative [$B = -0.91$ (95% CI −2.07, −0.18)], and this resulted in an overall significant indirect effect of 0.27 (95% CI 0.07, 0.70). Thus, poverty at 9 months led to an increase in child social well-being at 7 years through a reduction in structural home environment investments at 3 and 5 years. Effect sizes for these mediational effects were small (0.14 for the home environment FIM and −0.18 for the home learning FIM).

Interestingly, the FIM through play investment showed no significant indirect effect [$B = -0.04$ (95% CI −0.26, 0.13)]. The path from poverty to play investments was significant [$B = -0.47$ (95% CI −0.75, −0.21)], but there was no association between

play investments and child social well-being at 7 years [B = 0.74 (95% CI −0.26, 0.51)].

Multi-group SEMs tested whether FIMs operated differently across different subgroups defined by child gender, ethnicity and parental educational level. In multi-group analyses, SEMs were fitted separately in each subgroup and a Wald test was used to examine whether the indirect effect was significantly different between groups. Table 4 presents the unstandardised coefficients of the indirect effects for each group and Wald test statistics with their P values. The main thing to note is that Wald tests indicated that indirect effects (i.e. mediational paths) were not significantly different between subgroups, suggesting that none of the proposed variables moderated the mediation. In the play models, all indirect effects were consistently non-significant. In the structural home environment and home learning models, the indirect effect was significant for White boys from less well-educated families, although it was not significantly different from the comparator conditions as CIs tended to be wide and overlapping.

Discussion

In a novel application of developmental theory focused on the FIM in ID, we examined paths to children's social well-being. Family income poverty at 9 months had a significant impact on the social well-being of 7-year-old children with an ID. This effect was mediated by parental investments in home learning and the structural home environment (between 3 and 5 years of life), albeit not investments in play.

As a latent construct, home learning captured the HLE at 3 and 5 years and help with schoolwork at 5 years. HLE was developed to capture clear parent-led learning opportunities at home (Melhuish *et al.* 2008). The early years' HLE has shown strong effects on typically developing children's academic and socio-behavioural outcomes (Sylva *et al.* 2008; Sylva *et al.* 2013). The association between home learning and social skills has also been demonstrated in children with special educational needs (Sammons *et al.* 2003). Our study is, to the best of our knowledge, the first to explore the role of HLE in the development of children with ID and, in particular, the development of their social well-being. Considering possible paths between home learning activities and social well-being, the social context of such structured interaction episodes likely includes opportunities for parents to model appropriate social and prosocial behaviour. An associated possibility is that these 1–1 interactions provide the child with an opportunity to demonstrate his or her social skills and

Table 4 Multi-group models comparing child gender, ethnicity and parent education

	FIM: home learning	FIM: structural home environment	FIM: play
Child gender			
Boy (n = 334)	−0.22 (−0.59, −0.03)	0.26 (0.03, 0.78)	−0.04 (−0.36, 0.13)
Girl (n = 207)	−0.65 (−1.55, 0.15)	−0.22 (−3.27, 0.79)	−0.07 (−0.48, 0.22)
Wald test (P)	1.78 (0.182)	0.68 (0.409)	0.07 (0.796)
White ethnicity			
White (n = 388)	−0.29 (−0.36, −0.05)	0.50 (0.12, 1.44)	−0.04 (−0.30, 0.12)
Ethnic minority (n = 162)	−0.48 (−1.78, 0.05)	−0.01 (−0.81, 1.72)	−0.06 (−0.85, 0.14)
Wald test (P)	0.36 (0.550)	2.92 (0.087)	0.02 (0.896)
Pakistani–Bangladeshi ethnicity			
Pakistani–Bangladeshi (n = 93)	−0.07 (−1.37, 0.98)	−0.03 (−3.65, 1.42)	0.01 (−0.35, 0.54)
Other ethnicity (n = 457)	−0.31 (−0.66, −0.13)	0.38 (0.07, 1.00)	−0.07 (−0.35, 0.11)
Wald test (P)	0.31 (0.576)	1.76 (0.184)	0.02 (0.896)
Parent educational qualifications			
University degree level or above (n = 77)	0.00 (−1.01, 0.87)	0.16 (−1.82, 5.06)	0.03 (−0.53, 1.36)
Below degree level (n = 428)	−2.75 (−0.62, −0.07)	0.19 (0.01, 0.75)	−0.07 (−0.34, 0.08)
Wald test (P)	0.556 (0.456)	0.00 (0.966)	0.24 (0.624)

Cells show unstandardised coefficients of indirect effects (ab) and 95% bias-corrected confidence intervals. FIM, Family Investment Model.

attract feedback. As family poverty reduced the frequency of home learning investments in the early years, there was an associated reduction in child social well-being of about 0.2 of a standard deviation 2 years later when children were 7 years old.

Family poverty in the first 9 months of life also reduced the quality of the structural home environment. As a latent construct, investment in the structural home environment considered the physical home environment (well-lit, clean, safe and uncluttered house) and, also, home atmosphere and regular routines. Interestingly, there was a positive mediational effect of about 0.14 of a standard deviation, driven mostly by the negative association between structural home environment and child social well-being. As there is no prior evidence from ID research to contextualise this finding, available evidence from typical development has demonstrated no association between home atmosphere (often measured through CHAOS as in our study) and child social skills (Dumas *et al.* 2005; Asbury *et al.* 2006; Oliver *et al.* 2008; Hur *et al.* 2015; Berry *et al.* 2016). In support of current findings, Greenberg *et al.* (1999) also found a negative association between the physical home environment (using HOME as in our study) and child social competence. Therefore, even in typical development, there is no evidence of a positive association between the structural home environment and child social skills. Findings here suggest that a highly structured, organised home environment seems to reduce social well-being in ID. A likely mechanism for this may be through reductions in environmental enrichment and stimulation, known to promote positive outcomes in the developing brain through increased social stimulation (van Praag *et al.* 2000).

Parental investment in play through parent-led play and peer play opportunities was not a path that led to social well-being. Evidence from typical development suggests that playing with friends is associated with better social skills (Anand & Roupe 2016). The lack of association between the play investment and social well-being here might be because our latent measure included more parent-led play measures and fewer peer play ones. Parent-led play may be more structured and less creative than peer play. Brooks *et al.* (2015) found that the social competence of children with ID was associated with higher frequency of unstructured activities (e.g. playing with friends), as opposed to structured ones (e.g. doing sports). It will be important for future research to disentangle the role of peer play and parent-led play, as children with ID often have fewer friends and peer play opportunities compared with typically developing children (Tipton *et al.* 2013).

While prosocial skills tend to be lower when autism presents with ID (Bailey *et al.* 2019), their associations with environmental factors appear to be similar as, after controlling for autism, the mediational paths were identical. Child gender, White ethnicity, Pakistani/Bangladeshi ethnicity and parental educational qualifications did not moderate the models, suggesting that the mediational paths observed operate in the same way across boys and girls, children from different ethnic backgrounds and children whose parents had different levels of educational attainment. It is likely that, in some cases, the small sample sizes associated with large CIs did not allow any potential differences between subgroups to emerge. Replication is needed before any firm conclusions about the universality of the FIM framework can be drawn for this population.

The use of population-based data from the MCS allowed access to a relatively large, nationally representative group of children with ID and multiple data points to fully test mediation effects. Our operationalisation of ID within MCS likely captures children who also have an administratively defined ID. However, the method does not provide information on the level of ID, and we were thus unable to examine whether the associations identified might be moderated by severity of disability. Further, the identification of potential parental investments was restricted by what was available in MCS. MCS included a wealth of information, but for some investments, the level of detail was minimal compared with that which a custom-designed survey would have allowed. For this, we combined theoretical perspectives with those of non-academic stakeholders to select investments that UK families of children with ID can relate to.

Considering the practical implications, promotion of home learning activities will clearly benefit children's social well-being. A high-quality structural home environment might be important for other child outcomes (Marsh *et al.* 2020) but does not seem to promote social well-being in children with an ID while its effect on other child outcomes in ID remains to be investigated. An important direction for future

research would be to explore the role of peer play versus parent-led play so as to investigate the specificity of mediational paths.

Acknowledgements

We would like to thank our partners, the Royal Mencap Society, the Challenging Behaviour Foundation and the Foundation for People with Learning Disabilities, who, in the face of Sam Callanan, Beatrice Barleon, James Robinson, Jacqui Shurlock and Christine-Koulla Burke, kindly contributed to the discussions about parental investments.

Source of funding

The research was funded by a grant from the Baily Thomas Charitable Fund, UK (TRUST/VC/AC/SG/4016-6851). The views expressed in this manuscript are those of the authors and not necessarily those of the funder.

Conflict of interest

None.

Ethics approval

Ethical approval for the present study was provided by the Humanities and Social Sciences Research Ethics Committee, University of Warwick (reference number 53/15-16).

Data availability statement

The data that support the findings of this study are openly available in UK Data Service at https://ukdataservice.ac.uk/ (reference number SN 4683).

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Accepted 1 August 2023

Supporting Information

Additional Supporting Information may be found online in the supporting information tab for this article.

Figure S1 SEM paths showing unstandardised coefficients for the main mediation models. Coefficients with confidence intervals not crossing zero in bold. Parentheses include 95% bias-corrected accelerated confidence intervals.