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Modelling triadic relationships in families of children with intellectual disability

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Abstract

Background: Existing research has predominately focused on dyadic relationships in families of children with intellectual disabilities. The aim of this study was to build on emerging literature exploring triadic relationships between a mother, sibling, and child with intellectual disability, investigating how they influence each other's well-being.

Method: An online survey was used to collect information regarding the mother's mental health and the emotional and behavioural problems of the sibling and the child with intellectual disability in 573 families.

Results: Using structural equation modelling, we found that maternal psychological distress was associated with higher levels of behaviour problems in the sibling, and the behaviour problems of the child with intellectual disability were associated with higher levels of maternal distress.

Conclusions: Family member well-being is inter-related in families of children with intellectual disabilities. Clinical interventions that improve the behaviours of children with intellectual disabilities should be considered.

KEYWORDS
family systems, intellectual disability, mother, siblings, triadic relationships, well-being

1 | INTRODUCTION

Family system theories, derived from General Systems Theory (Becvar & Becvar, 1982), describe family units as complex social systems in which one family member's behaviour influences the outcomes of another. Family system theories can adopt either a macroscopic or microscopic approach; the former focuses on the family system in relation to other systems, whilst the latter draws attention to specific sub-systems within the family (e.g., mother–child, father-child, mother–father, child-sibling; Cridland et al., 2014). A family systems approach contends that individuals need to be understood within the context of their wider family system and sub-systems. For researchers and others interested in children and adults with intellectual and developmental disabilities and their families, a systems approach is clearly very relevant theoretically and methodologically (Cridland et al., 2014), although systems-focused research questions and analyses are still rare in intellectual and developmental disability research (Hastings, 2016).

Existing research has focused on a variety of dyadic relationships in the families of children with intellectual and developmental disabilities. For example, several longitudinal studies have demonstrated a bidirectional relationship between dimensions of the well-being of children with intellectual and developmental disabilities (e.g., behavioural and emotional problems) and the well-being of their parents (e.g., stress, mental health; Baker et al., 2003; Hastings et al., 2006; Lecavalier et al., 2006; Neece & Baker, 2008). Researchers have also explored how the quality of sub-system relationships (especially parent–child relationship) is associated with child behaviour problems

over time (Baker et al., 2011; Emerson et al., 2011; Smith et al., 2008; Totsika et al., 2014). Moreover, existing literature has explored marital relationship quality and its association with outcomes for the child with intellectual and developmental disabilities (Essex, 2002; Rivers & Stoneman, 2003; Robinson & Neece, 2015).

Alongside the parent–child dyad, researchers have examined associations between the behaviours of the child with intellectual and developmental disabilities and the adjustment of their typically developing sibling (Hastings, 2007; Neece et al., 2010; Petalas et al., 2012). Although the impact of the child with intellectual and developmental disabilities on the typically developing sibling has remained the focus of sibling–child dyad research, a family systems perspective suggests a bidirectional relationship between the adjustment of both children. Previous research into typically developing sibling pairs has demonstrated this bidirectionality (Brody et al., 2003; Criss & Shaw, 2005; Snyder et al., 2005). Data from intellectual and developmental disabilities research also suggest siblings influence each other. For example, more positive sibling relationship quality has been shown to be associated with better outcomes for the child with intellectual and developmental disabilities (Floyd et al., 2009; Hastings & Petalas, 2014). Additionally, pressures of other family sub-systems have been shown to influence the sibling relationship (Rivers & Stoneman, 2003), demonstrating the complexity of intellectual and developmental disabilities family systems beyond a simple dyadic relationship.

Although the study of dyadic relationships is important in intellectual and developmental disabilities research, family systems are more than these dyadic relationships. More layers of systems need to be studied, but there are very few examples in intellectual and developmental disabilities research that move beyond dyads or the influence of one family sub-system (couple, sibling, parent–child) on one other family member (typically the individual with intellectual and developmental disabilities). A small number of intellectual and developmental disabilities research studies have addressed inter-relationships between three members of the family. For example, Hastings et al. (2005) investigated the relationships between the child and both parents, in a sample of 48 pre-school autistic children. They found maternal stress was positively associated with the behaviour problems of their autistic child, whilst paternal stress was not associated with the child's behaviour. Both maternal and paternal distress were positively predicted by their partner's depression.

Alongside mother–father–child triadic relationships, previous research has explored triadic relationships within families where the child with intellectual and developmental disabilities has a sibling. Hastings et al. (2014) investigated longitudinal outcomes in autism family triads involving an autistic child, their unaffected sibling, and their mother. This study recruited 60 family triads, finding that sibling behaviour problems exhibited two and a half to 3 years earlier predicted current behaviour problems in the autistic child. Maternal depression did not predict the autistic child's behaviour two and a half to three years later. Additionally, Hall et al. (2007) examined associations between maternal distress and the behaviour problems of children with fragile X syndrome and their unaffected sibling, using a cross-sectional design. Using data from a sample of 150 families, they found that the behaviour problems of both the child with fragile X syndrome and their unaffected sibling equally and directly affected maternal psychological distress. Maternal distress did not have any directional effects on the behaviours of either child.

The aim of the present study was to build on this emerging literature examining how three members of the family may influence each other's psychological outcomes in families of children with intellectual disability. We partially replicated the method of Hall et al. (2007) (cross-sectional design with relationships examined using Structural Equation Modelling). Extending Hall et al. (2007), the present study involved a larger sample, and alternative measures of maternal distress and the children's behaviours. We examined the relationships between maternal mental health and the (positive and negative) behaviours of a child with intellectual and developmental disabilities and their sibling. Given the small quantity of previous literature in this area, directional hypotheses were not developed. Instead, our focus was more conceptual—to examine how different family members' well-being inter-relates. However, with a family systems perspective in mind, we expected a bidirectional association between the behaviours of the sibling, and the behaviours of the child with intellectual disability. Additionally, we anticipated bidirectional associations between the behaviour problems of both children and maternal distress.

2 | METHOD

2.1 | Participants

Participants were mothers from 573 families of children with intellectual disability aged between 4 and 15 years and 11 months also included a sibling in the same age range. When the child with intellectual disability had more than one sibling in this age range, the parent was asked to provide information regarding the sibling closest in age to the child with intellectual disability. Tables 1 and 2 summarise the descriptive statistics from the mother–child–sibling triads.

2.2 | Measures

Maternal psychological distress was measured using the Kessler 6 (K6; Kessler et al., 2002). The K6 is a six-item questionnaire which asks individuals how often they have experienced symptoms, such as nervousness and hopelessness, over the last 30 days. Respondents answer on a 5-point Likert scale ranging from 0 (*none of the time*) to 4 (*all of the time*). Responses are summed to give an overall measure of psychological distress ranging from zero to 24. The K6 has good construct validity when compared to other validated measures of mental health and out-performs the General Health Questionnaire (GHQ-12) in screening for mood and anxiety disorders (Furukawa et al., 2003; Kessler et al., 2002). In the current sample, the maternal distress construct had very good reliability (McDonald's ω: 0.88; McDonald, 1999) (Hayes & Coutts, 2020). Additionally, the K6 has

TABLE 1 Mother and family information ($n = 573$)

Relationship to child (%)	
Biological mother	528 (92.1%)
Adoptive mother	30 (5.2%)
Grandmother	7 (1.2%)
Foster mother	4 (0.7%)
Stepmother	1 (0.2%)
Other	3 (0.5%)
Marital status (%)	
Married and living with spouse/civil partner	397 (69.3%)
Living with partner	70 (12.2%)
Divorced/separated/single/not currently living with partner	104 (18.2%)
Missing information	2 (0.3%)
Ethnicity (%)	
White British	500 (87.3%)
White other (Irish, Travelling community, Other)	27 (4.8%)
Asian/ Asian British	17 (3%)
Black (African/Caribbean/ Black British)	10 (1.7%)
Remaining ethnic groups (mixed/multiple ethnicity, Arabic, etc.)	12 (2%)
Missing information	7 (1.2%)
Employment status (%)	
In a job working for an employer	203 (35.4%)
Looking after home and family	226 (39.4%)
Self-employed	60 (10.5%)
Doing something else	78 (13.5%)
Unemployed	5 (0.9%)
Missing information	1 (0.2%)
Qualifications (%)	
Degree level	266 (46.4%)
Below degree level	273 (47.7%)
No qualifications	5 (0.9%)
Missing information	28 (4.9%)
UK median weekly household income (%)	
Above median (more than £700)	193 (33.7%)
Below median (less than £700)	360 (62.8%)
Missing information	20 (3.5%)

Note: All responses for the employment status question were mutually exclusive. Maternal caregivers selected their main occupation.

TABLE 2 Sibling and child with intellectual disability demographic information ($n = 573$)

	Child with intellectual disability	Sibling
Mean age (SD)	9.15 (2.67)	9.64 (3.18)
Birth order (%)		
Sibling older	–	292 (51%)
Sibling younger	–	249 (43.5%)
Missing information	–	32 (5.6%)
Gender (%)		
Male	391 (68.2%)	281 (49%)
Female	181 (31.6%)	282 (49.2%)
Missing information	1 (0.2%)	10 (1.7%)
Additional diagnoses (%)		
Autism	301 (52.5%)	–
Down syndrome	87 (15.2%)	–
Autism and Down syndrome	9 (10.3%)	
Sibling has longstanding illness or disability (%)	–	155 (27.1%)

Note: *SD*, standard deviation.

been successfully used in previous intellectual and developmental disabilities research (Grey et al., 2018; Weiss & Lunsky, 2011).

Mothers answered a single item measure asking them to rate their general life satisfaction on a scale of 1 (*completely dissatisfied*) to 10 (*completely satisfied*), to determine overall life satisfaction (DEFRA, 2011). This single item measure performs similarly to other psychometrically established measures of life satisfaction (Cheung & Lucas, 2014) and has been used successfully in studies of parents with children that have intellectual disability (e.g., Bailey et al., 2019; Langley et al., 2020).

Mothers completed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) to measure the behaviour and emotional problems and the prosocial behaviours of both children. The SDQ is a 25-item measure with items rated using a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*). Caregivers are asked to respond to statements referring to the child's problem behaviours (e.g., often has temper tantrums or hot tempers, often lies or cheats) and the child's prosocial behaviours (e.g., kind to younger children, considerate of other's feelings). The SDQ results in five subscales (*emotional problems*, *conduct problems*, *hyperactivity/inattention*, *peer relationship problems*, *prosocial behaviour*); the first four problem scores can be summed for a total problem score.

Data obtained from a representative sample of British 5–15 year olds showed that the SDQ had satisfactory inter-rater agreement and retest stability (Goodman, 2001). The SDQ has also been shown to be a good measure of behavioural and emotional problems in children with intellectual disability (Murray et al., 2020). In the current sample of children with intellectual disability, the overall problem score and prosocial behaviour subscale had good internal consistency (McDonald's ω: 0.79 and 0.81, respectively).

Household poverty was assessed using mothers' responses to items measuring the family's weekly income, subjective poverty, and their ability to raise funds. Mothers provided their weekly household income, which was used to compute a new variable showing whether their weekly household income was above or below the median in the United Kingdom. Mothers were asked how they were financially managing with five possible responses ranging from *living comfortably* to *finding*

TABLE 3 Main variables and control variables included in measurement model

Main variables	Control variables
Maternal distress	Child has Down syndrome
Maternal life satisfaction	Child has autism
Child prosocial	Maternal education
Sibling prosocial	Maternal employment status
Child total problem	Single parent home
Sibling total problem	Birth order Sibling illness/disability/infirmity Neighbourhood deprivation (IMDDecile) Household poverty

it very difficult. Additionally, mothers were asked how hard it would be for them to raise £2000 in an emergency given 1 week's notice. The mothers were given four possible responses ranging from *I could easily raise the money* to *I don't think I could raise the money*. Finally, neighbourhood deprivation was defined as the family living in the most deprived 10% of UK neighbourhoods based on their Index of Multiple Deprivation (IMD) decile (Payne & Abel, 2012). The IMD uses census-derived data on housing, crime, employment, income, and education to determine the deprivation level of small areas in the United Kingdom.

2.3 | Procedure

Data were obtained from Wave 1 of the 1000 Families Study; a UK based longitudinal study which collected data from primary parental caregivers from a total of 1184 families of children with intellectual disability (Hastings et al., 2020). The final sample size for the current study was achieved by excluding families where the child with intellectual disability did not have a sibling ($n = 572$) and where the primary caregiver indicated that they were not a maternal parent ($n = 39$). There were 573 remaining families included in the analysis.

The maternal caregiver provided data via an online cross-sectional survey. Inclusion criteria required each family to be living in the United Kingdom and have one or more children with intellectual disability between the ages of 4 years and 15 years and 11 months. Recruitment involved the use of websites, social media, advertisements in family charity newsletters and contacting special schools and parent support organisations directly.

This study followed the ethical principles of the British Psychological Society, and full ethical approval was granted by the National Health Service (NHS) West Midlands- South Birmingham Research Ethics Committee. This research study involved minimal risk for the families. However, as challenging family difficulties may have been raised during the survey, caregivers were signposted to useful resources and family helplines at the end of the survey. Primary caregivers provided their informed consent and were informed how their data would be managed before taking part. Only members of the research team were able to access password protected participant data on University managed devices.

TABLE 4 Descriptive statistics for mother, sibling, and child with intellectual disability variables

	Mean	Range
Mother ($n = 572$)		
Kessler 6 total score (*SD*)	9.34 (5.33)	0–24
Life satisfaction (*SD*)	6.11 (2.03)	1–10
Child with intellectual disability ($n = 571$)		
Behaviour problems (*SD*)	21.43 (6.57)	4–37
Prosocial behaviours (*SD*)	3.92 (2.88)	0–10
Sibling ($n = 562$)		
Behaviour problems (*SD*)	12.75 (8.79)	0–39
Prosocial behaviours (*SD*)	7.44 (2.67)	0–10

Note: *SD*, standard deviation. We had one less response for the sibling's behaviour problems score ($n = 561$).

2.4 | Statistical analysis

Analyses were conducted using structural equation modelling (SEM). SEM is a multivariate technique incorporating latent variables into analyses (Bollen, 1989). SEM is visually demonstrated using circles to represent latent constructs and rectangles to represent directly observed variables. Two-headed arrows signify a correlational relationship whilst a single-headed arrow represents a dependence relationship between variables. SEM allows researchers to explore multiple research questions at once whilst testing complex theories (Hair et al., 2014). Statistical analyses were performed in Stata, Version 16.1 using maximum likelihood with missing values estimation. The amount of missing data was proportionately small but varied considerably, ranging from 0.2% to 2.6% for individual item variables.

Jöreskog and Sörbom (1993) distinguished three alternative modelling procedure types using SEM: confirmatory, alternative models, and model generating. The present study uses the model generating approach to explore family systems theories in the context of triadic family unit relationships. This is the most exploratory approach, which should encompass informed theories through previous literature prior to model development (Holbert & Stephenson, 2002). The variables in the original model were included through an empirically informed approach, although the outcome of the model was fully-data-driven after this point. The analysis involved two stages. Stage one used confirmatory factor analysis (CFA) to develop a measurement model, ascertaining the loadings of questionnaire items that were used to build the latent constructs of prosocial behaviour, household poverty, and maternal distress. The total problem score from the SDQ was used as an observed variable due to the large number of items (20) that would be needed to represent a latent construct, and in an effort to reduce model complexity and increase the chance of good model fit. Additionally, potential control variables were introduced at this stage, informed by previous research: birth order of the child with intellectual and developmental disabilities (Braconnier et al., 2018; Dyke et al., 2009; Estes et al., 2013), whether the children live in a single parent household (Olsson & Hwang, 2001),

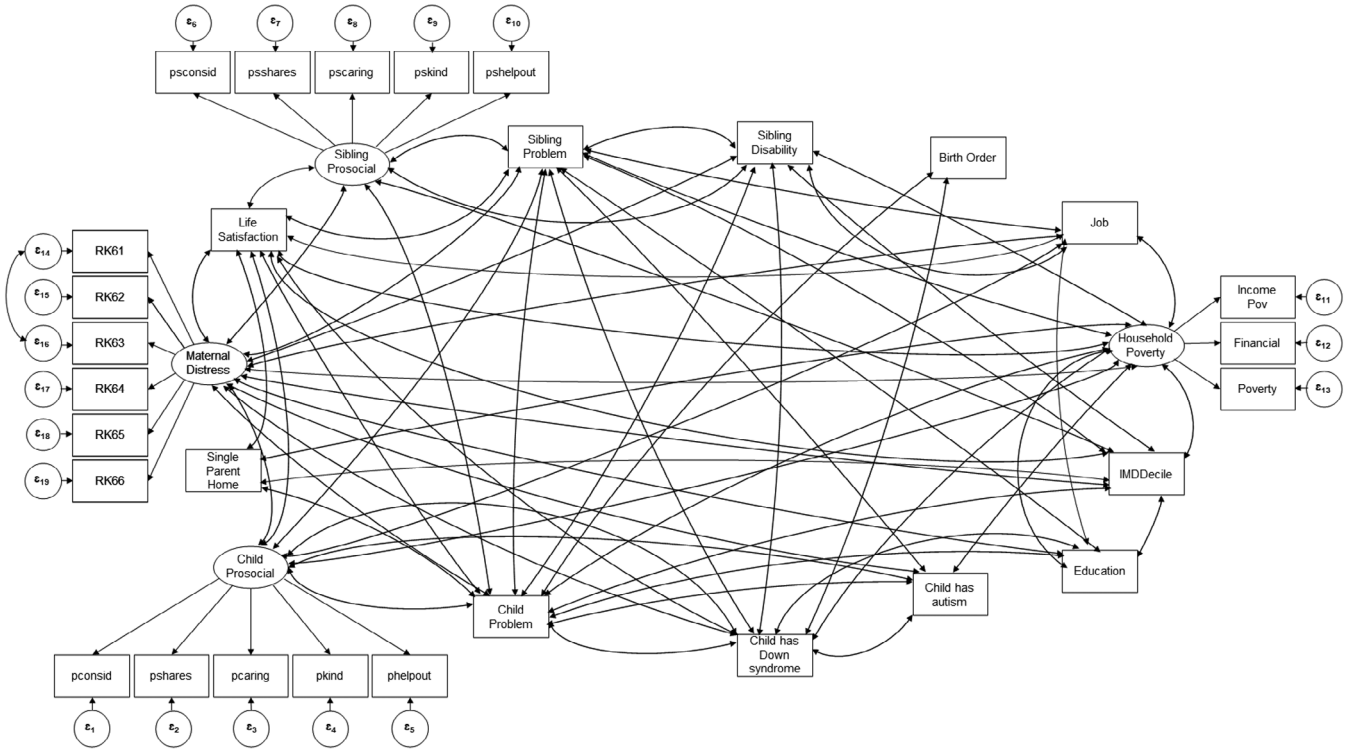

FIGURE 1 Final measurement model illustrating the correlations between maternal well-being factors, control variables, and the positive and negative behaviours of children with intellectual disability and their siblings. E1–E19 demonstrate the measurement error for the observed variables. Two-headed arrows represent correlational relationships whilst single-headed arrows represent dependence relationships. Only significant correlational paths ($p < .05$) are displayed

TABLE 5 Latent construct item loadings in the measurement model

Latent construct	Question	Item	Coefficient
Maternal distress	nervous?	RK61	0.64
	hopeless?	RK62	0.83
	restless or fidgety?	RK63	0.59
	so depressed that nothing could cheer you up?	RK64	0.83
	that everything was an effort?	RK65	0.74
	worthless?	RK66	0.80
Child prosocial	Considerate of other's feelings	pconsid	0.78
	Shares with other children	pshares	0.67
	Helpful if someone is hurt	pcaring	0.81
	Kind to younger children	pkind	0.68
	Often volunteers to help others	phelpout	0.65
Sibling prosocial	Considerate of other's feelings	psconsid	0.82
	Shares with other children	psshares	0.76
	Helpful if someone is hurt	pscaring	0.83
	Kind to younger children	pskind	0.68
	Often volunteers to help others	pshelpout	0.65
Household poverty	Income poverty	IncomePov	0.55
	Subjective poverty	Financial	0.73
	Ability to raise funds	Poverty	0.78

Note: All item loadings were significant at $p < .001$.

whether the child with intellectual and developmental disabilities also has autism or Down syndrome (Estes et al., 2009; Hodapp et al., 2001), and whether the family live in poverty (Emerson, 2003; Totsika et al., 2020). In the present study, the latent variable for household poverty consisted of the measures of subjective poverty, ability to raise funds, and income poverty, with factor loadings ranging from 0.55 to 0.78. Neighbourhood deprivation was introduced as a separate control as this variable is conceptually distinct from family

TABLE 6 Fit statistics for potential structural models depicting relationships between family members

Structural model	$\chi 2$ (*df*)	CFI	TLI	RMSEA	All paths $p < .05$	Paths added	Paths removed
Model 1.10[a]	–	1	–	–	No	–	–
Model 1.11	937.981 (264)	0.883	0.868	0.067	Yes	–	Maternal distress to child total problem
Model 1.12[a]	–	1	–	–	No	Sibling total problem and maternal distress[b]	–
						Life satisfaction and child prosocial[b]	
Model 1.13	875.650 (261)	0.893	0.878	0.064	No	–	Sibling total problem to maternal distress
							Child prosocial to life satisfaction
Model 1.14	875.743 (262)	0.893	0.879	0.064	Yes	Household poverty to sibling total problem	–
						Down syndrome to maternal distress	
Model 1.15	870.390 (261)	0.894	0.879	0.064	Yes	Child prosocial and maternal distress[b]	–
Model 1.16	865.990 (260)	0.895	0.880	0.064	Yes		–
Model 1.17[a]	–	1	–	–	No		Household poverty to child total problem
							Household poverty to life satisfaction
Model 1.18	789.918 (238)	0.900	0.885	0.064	No		Household poverty to maternal distress
							Life satisfaction to child prosocial
							Child prosocial to maternal distress
						Child total problem and sibling total problem[b]	–
						Household poverty to maternal distress	
						Household poverty to child total problem	–
Model 1.19	792.681 (239)	0.899	0.885	0.064	Yes	–	
							Child total problem to sibling total problem
Model 1.20	779.212 (237)	0.901	0.887	0.063	Yes	–	Sibling total problem to child total problem
Model 1.21	717.206 (236)	0.913	0.899	0.060	Yes		
Model 1.22	697.446 (235)	0.916	0.902	0.059	No		
Model 1.23	699.743 (236)	0.916	0.903	0.059	No		
Model 1.24	702.342 (237)	0.915	0.903	0.059	Yes		

Note: Birth order, IMDDecile, single parent home, job and education did not have correlation coefficients above 0.3 and were removed from the structural model.

Abbreviation: *df*, degrees of freedom; CFI, Comparative Fit Index; RMSEA, root mean square error of approximation; TLI, Tucker Lewis Index.

[a]Convergence not achieved during the estimation of these models.

[b]Bidirectional paths were introduced.

TABLE 7 Correlation matrix from the measurement model in coefficient order

Covariances	Coefficients
Maternal distress, Household poverty	0.45
Sibling illness/disability/infirmity, Sibling prosocial behaviour	−0.45
Child total problem, Child has down syndrome	−0.40
Life satisfaction, Household poverty	−0.36
Child total problem, Child has autism	0.35
Child has autism, Child prosocial behaviour	−0.34
Child total problem, Maternal distress	0.33
Child has Down syndrome, Child prosocial behaviour	0.32
Child total problem, Household poverty	0.31
Sibling total problem, Maternal distress	0.29
Life satisfaction, Child prosocial behaviour	0.27
Sibling total problem, Household poverty	0.26
Child has Down syndrome, Maternal distress	−0.23
Maternal distress, Child prosocial behaviour	−0.20
Child total problem, Sibling total problem	0.18

Note: All $p < .001$.

level poverty. Additionally, whether the sibling had a longstanding illness, disability, or infirmity, was used as a control variable rather than removing siblings with a disability from the sample (Blackman et al., 2011; Kostev et al., 2019). Whether the mother had a job, and the mothers' level of education were additional control variables that could potentially contribute to maternal well-being (e.g., Totsika et al., 2013). Table 3 displays the extensive list of the variables included in the measurement model.

Stage two of the analysis involved developing structural models using the correlation matrix from the measurement model and additional paths suggested by modification indices. The value of a modification index represents the potential change in the chi-square statistic if the suggested association between parameters is added to the model (Whittaker, 2012). Structural models established the associations between sibling and child total problem scores, prosocial behaviour, and mother's distress and life satisfaction with the addition of directional and potential dependence relationships between variables. A forward data entry approach was adopted during this stage.

First, all covariances above 0.3 from the correlation matrix between the family unit variables and the predictor variables were entered into the initial structural model. This was done to reduce the number of estimated parameters pragmatically, as initially introducing too many variables, also known as overspecification, can cause problems with model fit (Hair et al., 2014). Bidirectional relationships were included in accordance with family systems theories. Directional relationships were added to the model iteratively. If the path was non-significant, it was not retained in the subsequent iteration. Following this, the next highest coefficient from the correlation matrix (below 0.3) was added into the model, this was done in order (e.g., 0.29, 0.28). Measurement and structural model fit were measured using the Comparative Fit Index (CFI; >.9; McDonald & Ho, 2002), the Tucker Lewis Index (TLI; >.9; Bentler & Bonett, 1980), and the Root Mean Square Error of Approximation (RMSEA; <0.06; Hu & Bentler, 1999). Additionally, 90% confidence intervals (CI) were used when reporting the RMSEA (Curran et al., 2003). The CFI, TLI and RMSEA are generally recommended and are less affected by sample size than the chi-square statistic (Tomarken & Waller, 2003).

3 | RESULTS

3.1 | Measurement model

The six items in the K6 were used to represent the latent construct of maternal distress. The prosocial behaviour latent factor for both the child with intellectual disability and their sibling consisted of the five items on the SDQ that represent prosocial behaviour. Descriptive statistics are displayed in Table 4. This model obtained an adequate fit (χ^2 (311) = 665.751; $p < .001$; CFI = 0.935; TLI = 0.921; RMSEA = 0.045 [90% CI 0.040–0.049]). Modification indices indicated that the measurement error for the K6 items 'so restless cannot sit still' and 'so nervous cannot calm down' should be correlated. This adjustment was made for the final measurement model in accordance with prior literature and given the similar item wording (Brooks et al., 2006; Shon, 2020). This produced an acceptable model fit for the final measurement model (χ^2 (310) = 627.588; $p < .001$; CFI = 0.942; TLI = 0.929; RMSEA = 0.042 [90% CI 0.038–0.047]). The final measurement model is presented in Figure 1. The item loadings for the latent constructs are displayed in Table 5. E1-E19 represent the measurement errors for the observed variables that load onto the latent constructs. For the Stata output and the full correlation matrix please see the additional supplementary information (StataOutput_SuppInfo; Table S1, Table S2; CorrelationMatrix_SuppInfo; Table S3).

3.2 | Structural model

Structural model development and corresponding model fit indices are displayed in Table 6. Birth order of the child with intellectual and developmental disabilities, neighbourhood deprivation, whether the children were living in a single parent home, maternal life satisfaction, maternal employment status, and maternal education level did not have correlation coefficients above 0.3 and were therefore excluded from the structural model. Model 1.10 included the coefficients above 0.3 in the correlation matrix (see Table 7). Convergence was not achieved for this model, and so the non-significant path from maternal distress to the child with intellectual disability's overall problem score was removed (see Table 6, Model 1.11). Model 1.12 saw the addition of a bidirectional relationship between the sibling's total problem score and maternal distress. The path from the sibling's total problem score to maternal distress was non-significant and convergence was not achieved. Therefore, this path was not retained. A bidirectional relationship was suggested between maternal life satisfaction and the

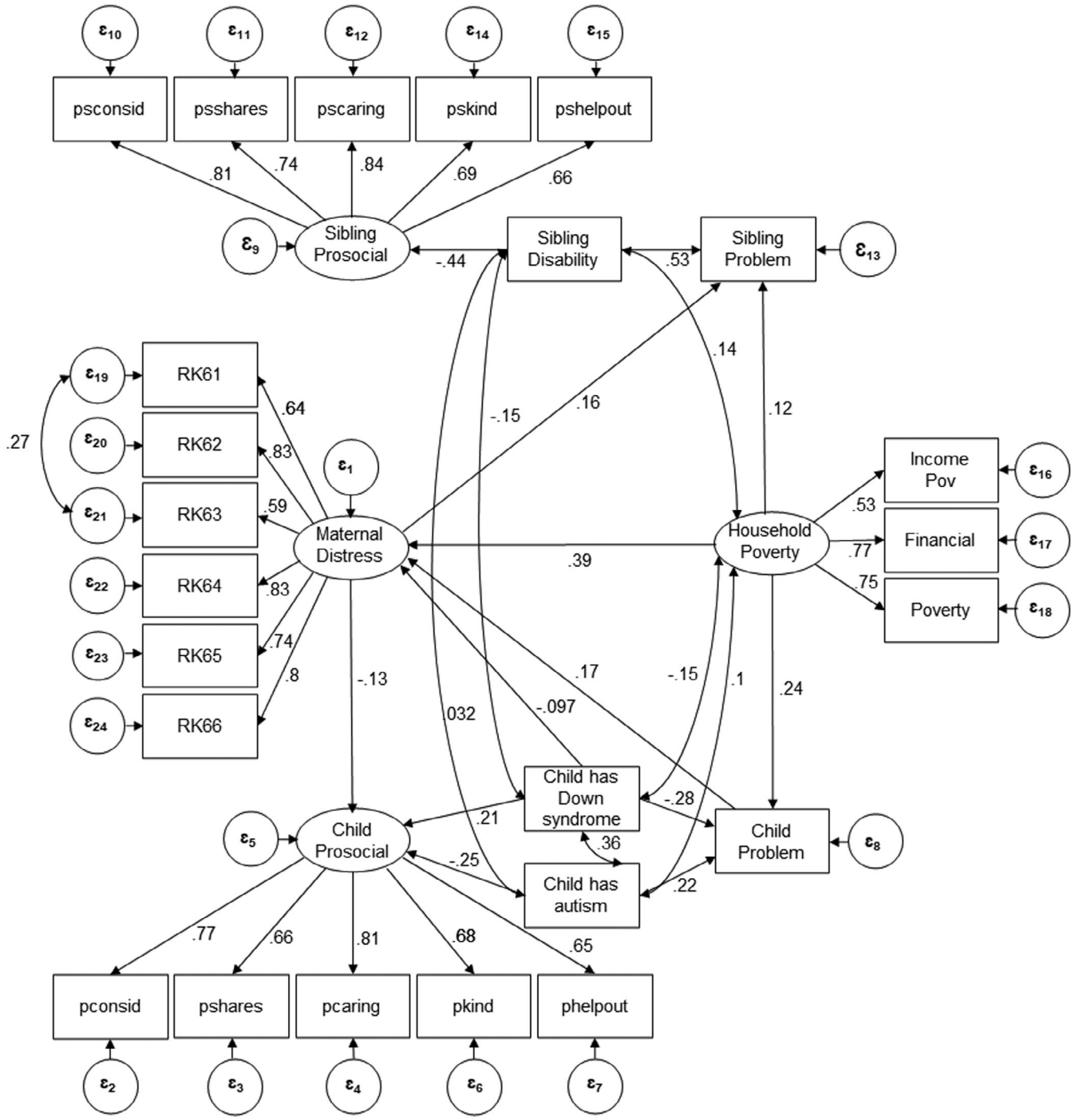

FIGURE 2 Final structural model depicting potential associations between the mother, child with intellectual disability and sibling. E1, E5, E8, E9, and E13 represent the measurement error for the latent constructs whilst the other error terms represent the measurement error for the observed indicators

child with intellectual disability's prosocial behaviour in Model 1.13. The child with intellectual disability's prosocial behaviour to life satisfaction was a non-significant path, and the relationship was removed (see Table 6, Model 1.14). Models 1.15 and 1.16 saw the addition of two significant dependence paths from household poverty to the sibling's total problem score and whether the child with intellectual disability had Down syndrome to maternal distress, respectively. Model 1.17 included a significant bidirectional relationship between the child with intellectual disability's prosocial behaviour and maternal distress. However, convergence was not achieved for this model. Model 1.18 involved removing several non-significant paths (household poverty to the child with intellectual disability's total problem score, household poverty to life satisfaction, household poverty to maternal distress, life satisfaction to the child with intellectual disability's prosocial

behaviour). Model 1.19 involved removing the non-significant path from the child with intellectual disability's prosocial behaviour to maternal distress. Model 1.20 included a significant bidirectional relationship between the child with intellectual disability's total problem score and the sibling's total problem score. Modification indices suggested adding paths from household poverty to maternal distress and the child with intellectual disability's total problem score (see Table 6; Model 1.21 and Model 1.22). Models 1.23 and 1.24 involved removing the non-significant paths from the child with intellectual disability's total problem score to the sibling's total problem score and the sibling's total problem score to the child with intellectual disability's total problem score, respectively. Modification indices suggested no further additional paths.

The final structural model is displayed in Figure 2 and had adequate model fit (χ^2 (237) = 702.342; $p < .001$; CFI = 0.915; TLI = 0.903; RMSEA = 0.059 [90% CI 0.054–0.064]). In the final model, all factor loadings were significant at $p < .05$. Examining the relationships between the three family members, maternal distress ($\beta = .16$, $p < .001$) was positively associated with the sibling's total problem score, and the child with intellectual disability's total problem score ($\beta = .17$, $p < .001$) was positively associated with maternal distress. Additionally, maternal distress ($\beta = -13$, $p = .006$) was negatively associated with the child with intellectual disability's prosocial behaviour. There was no association between the sibling's prosocial behaviour and the behaviours of the child with intellectual disability or with maternal well-being.

In terms of covariates, increased household poverty was associated with a higher total problem score for both the sibling ($\beta = .12$, $p = .011$) and child with intellectual disability ($\beta = .24$, $p < .001$), and with higher levels of maternal distress ($\beta = 39$, $p < .001$). Additionally, the child with intellectual disability having Down syndrome ($\beta = -.10$, $p = .026$) was negatively associated with the mothers' distress. Siblings who had a longstanding disability, illness or infirmity had lower levels of prosocial behaviour ($\beta = -.44$, $p < .001$), and higher levels of overall problem behaviour ($\beta = .53$, $p < .001$). Children with intellectual disability who also had autism had higher levels of overall problem behaviour ($\beta = .22$, $p < .001$) and lower levels of prosocial behaviour ($\beta = -.25$, $p < .001$). In contrast, children with intellectual disability who also had Down syndrome had lower levels of overall problem behaviour ($\beta = -.28$, $p < .001$) and higher levels of prosocial behaviour ($\beta = .21$, $p < .001$).

4 | DISCUSSION

We explored associations between the well-being of three members of the families of children with intellectual disability: the child, a sibling, and their maternal caregiver. Higher levels of maternal distress were associated with increased sibling total problem behaviours, and higher levels of total problem behaviour of the child with intellectual disability was associated with increased maternal distress. Lower levels of maternal distress were associated with increased prosocial behaviour of the child with intellectual disability. We found no associations between the sibling's prosocial behaviour and both maternal distress and the well-being of the child with intellectual disability.

The present study was able to build on the emerging literature and demonstrates that different family members' well-being interrelates in families of children with intellectual disabilities. However, the results obtained in the current study differ from previous literature. Hall et al. (2007) found that the behaviour problems of both the child with fragile X syndrome and their unaffected sibling equally and directly affected maternal distress. Both the current research study and Hall et al. (2007) used SEM to model reciprocal relationships between child, sibling, and maternal caregiver well-being, using cross-sectional data. Additionally, the current study and Hall et al. (2007) included data from similar aged samples of children and used data from siblings closest in age to the child. However, there were also several differences between the current study and Hall et al. (2007), perhaps contributing to different study results. First, the present study used a larger sample size as this is needed when producing more complex models in SEM (Hair et al., 2014). Second, Hall et al. (2007) used a sample of children and their families from the USA. Families likely experience differences in financial, educational, and social support depending in which country they live. Additionally, Hall et al. (2007) did not control for household poverty or additional diagnoses of the child with fragile X syndrome. Previous research has shown both household poverty and additional diagnoses are associated with behaviour problems in children with intellectual and developmental disabilities and their mother's well-being (Abbeduto et al., 2004; Emerson et al., 2010; Totsika et al., 2011a). Moreover, Hall et al. (2007) used measures of maternal distress and child behaviour problems (measured by both parents and teachers) that were not used in the present study.

The current results also did not support longitudinal findings from Hastings et al. (2014) who found earlier sibling behaviour problems predicted later behaviour problems in the autistic child in a small-scale longitudinal study. However, Hastings et al. (2014) did not use SEM and the study focused only on families of autistic children. The current study should be replicated with longitudinal data to see if sibling-child behaviour relationships, and other associations within the family triad, are established over time rather than from cross-sectional data.

It is important to note that maternal life satisfaction was removed from the final structural model. Life satisfaction was measured using a single-item measure, perhaps leading to less variance in maternal responses. Alternatively, it may be that life satisfaction is not reliably associated with children's behavioural outcomes in families of children with intellectual and developmental disabilities. Bailey et al. (2019) also found that a single-item measure of maternal life satisfaction was not associated with behaviour problems in children with intellectual and developmental disabilities over time. Other factors, including perhaps other positive well-being characteristics of family members, may influence maternal life satisfaction. Additionally, it is noteworthy to mention that the mean behaviour problem scores of the children with intellectual disability were in the 'abnormal' range (17–40; Murray et al., 2020), whilst their prosocial behaviour scores were particularly

low. However, in samples of children with intellectual disabilities, higher scores on the behavioural and emotional problems domains of the SDQ are found consistently (Emerson, 2005; Totsika et al., 2011b).

The current findings also need to be considered in the light of a number of limitations. First, maternal primary caregivers completed all study measures. Future research studies should include child and sibling self-reports as well as proxy reported data. Second, we included only one sibling closest in age to the child with intellectual disability. However, children with intellectual disability may have more than one sibling and simplifying complex family structures to focus on a triad may have led to missing important relationships. Third, the current research study was cross-sectional and future research should use SEM to model triadic relationships using longitudinal data. The family system is also dynamic. Family and individual functioning changes over time, for example in relation to life events and transitional periods (Cridland et al., 2014). Fourth, the current results should be interpreted with caution due to the use of modification indices in this study. However, a large sample size was utilised which increases the likelihood of locating the correct model when using modification indices (MacCallum, 1986). Additionally, previous literature supports the inclusion of the paths suggested by modification indices, meaning these additions were not completely driven by the data alone (e.g., Brooks et al., 2006; Emerson, 2003; Shon, 2020; Totsika et al., 2020).

Regarding the direction of future research, further control variables such as family size, maternal age, and age and gender of both children could be explored in relation to their effect on maternal distress and children's behaviour and emotional problems. Inclusion of additional control variables such as these may change the pattern of the modelled relationships in future research. Furthermore, future research could include data about paternal or partner well-being and also extended family members such as grandparents, to capture the wider family system surrounding the child with intellectual disability. Additionally, although this study assumed direct and indirect relationships between the constructs, it is plausible that certain constructs act as moderators of these relationships. Future theory-informed research should consider mediating and moderating factors to deepen our understanding of the complex relationships between family members in family systems.

The results of the current study suggest that introducing clinical interventions that improve the behaviours of the child with intellectual disability may directly reduce maternal distress, indirectly reduce sibling's behaviour problems, and indirectly increase the prosocial behaviours of the child with intellectual disability. However, without longitudinal data, the directions of these relationships cannot be confirmed. Therefore, interventions could also focus on enhancing the child's prosocial behaviours. A particular focus should remain on the sibling of the child with intellectual disability. Siblings are often overlooked and may require additional support as they can be more at risk of maladjustment, especially when their sibling with intellectual disability exhibits more emotional and behaviour difficulties (Hastings, 2007; Hastings & Petalas, 2014). Additionally, the study results suggest that further support should be considered for families of children with intellectual disabilities experiencing household poverty. In supporting these families with additional financial support or advice, families may see a reduction in maternal distress and behaviour and emotional problems in both the sibling and the child with intellectual disability. However, the results should be interpreted with caution and require replication in future research. Support and interventions provided to families of children with intellectual disability needs to be adapted to include broader contextual factors such as financial and social support in the future.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Caitlin A. Williams designed the study, conducted the analysis of the data, and wrote up the manuscript. Tom Bailey and Richard P. Hastings contributed to the design of the study and edited the manuscript for publication. Tom Bailey supervised the data analysis.

DATA AVAILABILITY STATEMENT

Data from this research study are not available for sharing due to ethical approval requirements. Researchers interested in collaboration should contact the corresponding author with their expression of interest.

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