International Journal of Developmental Disabilities

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/yjdd20

Cross-lagged associations between inter-parental relationship satisfaction and sibling relationship quality in families of children with intellectual disabilities

Caitlin A. Williams, Paul A. Thompson & Richard P. Hastings

To cite this article: Caitlin A. Williams, Paul A. Thompson & Richard P. Hastings (30 Aug 2023): Cross-lagged associations between inter-parental relationship satisfaction and sibling relationship quality in families of children with intellectual disabilities, International Journal of Developmental Disabilities, DOI: 10.1080/20473869.2023.2250933

To link to this article: https://doi.org/10.1080/20473869.2023.2250933

Cross-lagged associations between inter-parental relationship satisfaction and sibling relationship quality in families of children with intellectual disabilities

Caitlin A. Williams, Paul A. Thompson and Richard P. Hastings

Centre for Research in Intellectual and Developmental Disabilities (CIDD), University of Warwick, Coventry, UK

Background: A family systems perspective hypothesises that the well-being of all family members is interconnected. However, limited research has examined the association between inter-parental conflict and sibling relationship quality in the context of intellectual disabilities. The aim of this study was to build on existing literature using longitudinal data, exploring potential (bi)directional associations between sibling relationship quality and inter-parental relationship satisfaction in families of children with intellectual disabilities.
Methods and procedures: Primary caregivers ($n = 223$) of children with intellectual disabilities (M age at Wave 1 = 8.36 years, $SD = 2.33$) with at least one sibling (M age at Wave 1 = 8.45 years, $SD = 2.47$) completed the same online survey, 2 years 9 months apart. The survey measured inter-parental relationship quality and sibling relationship quality. A cross-lagged panel design was used to determine the directional associations between both subsystems.
Outcomes and results: The final autoregressive and cross-lagged models had good model fit. However, we found no evidence of any directional associations between sibling relationship quality and inter-parental relationship satisfaction.
Conclusions and implications: The results from the current study contrast with previous literature, exhibiting the need for further research exploring factors associated with subsystem relationships in families of children with intellectual disabilities.

Keywords: Sibling conflict; sibling warmth; inter-parental relationship; behavioural and emotional problems; family economic adversity; structural equation modelling; family systems; intellectual disabilities

Introduction

In the intellectual disabilities field previous literature has largely focused on describing a narrative where the child with intellectual disabilities has a negative impact on their family (Hastings 2016). However, a family systems perspective has recently been more extensively adopted within the field. Family systems theories view families as structured organised systems (Cox and Paley 2003), hypothesising that the well-being of all family members is interrelated, and individuals and subsystems (e.g. sibling, inter-parental, and parent-child relationships) will all impact one another within the family (Cridland *et al*. 2014).

The concept of exploring outcomes in terms of family systems was partially developed by family therapists who noted that strains on the parent-child subsystem relationship quality would not improve unless inter-parental conflicts were resolved (Cox and Paley 2003). Previous research supports this observation in both non-disabled families and families of autistic children (Hartley *et al*. 2011, Hartley *et al*. 2018, Sherrill *et al*. 2017, Zemp *et al*. 2018). Additionally, exposure to poorer inter-parental relationship quality predicts increased externalising and internalising behaviour problems, mental health problems, and a decline in academic attainment in non-disabled children (Harold *et al*. 2013, Harold *et al*. 2016, Mannering *et al*. 2011, Rhoades 2008, Sturge-Apple *et al*. 2008). Similar findings have been obtained in research with families of

Correspondence to: Caitlin A. Williams Centre for Research in Intellectual and Developmental Disabilities (CIDD), University of Warwick, Coventry, UK. Email: Caitlin.Williams.7@warwick.ac.uk

Supplemental data for this article can be accessed online at https://doi.org/10.1080/20473869.2023.2250933.

autistic children. For example, using cross-sectional data, Langley *et al*. (2017) examined parental reports of inter-parental relationship satisfaction, parental depression, and children's behaviour problems in 146 couples living with their autistic child and a sibling. They found that higher levels of inter-parental relationship satisfaction were associated with lower levels of parental depression and lower levels of behaviour problems in the autistic child. There was no association between inter-parental relationship satisfaction and the behaviour problems of the sibling.

In concordance with family systems theories, cross-sectional and longitudinal non-disability research has found that inter-parental conflict is associated with more conflict and less warmth in the sibling relationship (Dunn and Davies 2001, Kim *et al*. 2006). For example, using cross-sectional data, Stocker and Youngblade (1999) examined the correlations between inter-parental conflict and children's sibling and peer relationships in 136 intact families of non-disabled children. They used a variety of data collection methods including the completion of survey measures and in person observations, finding that inter-parental conflict was associated with more conflict and less warmth in the sibling relationship. Additionally, Yu and Gamble (2008) found that higher inter-parental relationship quality predicted more warmth in the sibling relationship using structural equation analyses with cross-sectional data. Data were collected from 130 mothers regarding their child and a sibling close in age.

Family systems theories also draw upon spill over or compensatory hypotheses. The spill over hypothesis suggests that the behaviours and emotions experienced in one relationship 'spill over' to a separate subsystem within the family. For example, if there are more positive interactions within the inter-parental relationship, siblings may imitate this behaviour and display more positive interactions to one another (Erel and Burman 1995, Krishnakumar and Buehler 2000). This hypothesis has a direct link to Bandura's (1977) Social Learning Theory, which explains how children acquire their behaviours through imitation and reinforcement from an authority figure, such as their parents. Alternatively, the compensatory hypothesis refers to one subsystem relationship compensating for the issues in another relationship. For example, if more inter-parental conflict is present, siblings may support each other by displaying more prosocial behaviours to one another (Engfer 1988, Erel and Burman 1995). The compensatory hypothesis recognises good quality sibling relationships as a buffer for the negative outcomes that might result from exposure to inter-parental conflict (Modry-Mandell *et al*. 2007).

Closer sibling relationships acting as a buffer for negative outcomes is especially important for sibling dyads where one has intellectual disabilities. Siblings can provide friendship, advocacy, and emotional support for their sibling with intellectual disabilities experiencing discrimination and exclusion in their communities (Hayden and Hastings 2022). Additionally, maintaining a strong sibling relationship can increase the likelihood of a non-disabled sibling being willing to take on caring responsibilities for their disabled sibling in the future (Burke *et al*. 2012). Therefore, understanding the mechanisms towards maintaining closer sibling relationships in these sibling pairs has implications from policy and practice perspectives.

Compared to research outside of the disability field, research exploring the associations between inter-parental relationship quality and sibling relationship quality in families of children with intellectual disabilities is sparse. However, we did find one cross-sectional study that used regression models to explore the associations between sibling relationship quality and inter-parental relationship quality. Rivers and Stoneman (2003) found that stress in the inter-parental relationship was associated with compromised sibling relationship quality, in 50 families of autistic children. Longitudinal data, larger samples and more complex statistical designs are required to determine the directional relationship between these two subsystems.

Therefore, in the current study, we build on Rivers and Stoneman's (2003) research, by employing cross-lagged models, using longitudinal data and a larger sample to explore potential (bi)directional associations between inter-parental relationship satisfaction and sibling relationship quality in families of children with intellectual disabilities. Although broader literature did not determine a bidirectional relationship between the subsystems, family system theories would suggest a bidirectional association between inter-parental relationship satisfaction and sibling relationship quality over time in families of children with intellectual disabilities.

Methods

Participants

Respondents were primary caregivers from 223 families of children with intellectual disabilities aged between 4 and 15 years 11 months drawn from the first two waves of the 1000 Families Study (Hastings *et al*. 2020). The primary caregiver also reported about a sibling within the same age range. If there was more than one sibling in the family, the primary caregiver was asked to report on the sibling closest in age to the child with intellectual disabilities to ensure that siblings in multi-child families shared this experience and also to manage participant burden (i.e. not requesting data about all siblings).

Around half of the primary caregivers were educated to degree level ($n = 122$) and most primary caregivers described themselves as White British ($n = 197$) during Wave 1 data collection. Table 1 summarises the descriptive statistics at both waves for the primary

Table 1. Primary caregiver and family demographic information ($n = 223$).

	Wave 1	Wave 2
Primary caregiver relationship to child (%)		
Biological mother	199 (89.2%)	200 (89.7%)
Biological father	9 (4%)	9 (4%)
Adoptive mother	10 (4.5%)	9 (4%)
Stepmother	1 (.4%)	1 (.4%)
Grandmother	3 (1.3%)	3 (1.3%)
Other	1 (.4%)	1 (.4%)
Primary caregiver gender (%)		
Female	213 (95.5%)	214 (96%)
Male	9 (4%)	9 (4%)
Prefer not to answer	1 (.4%)	–
Primary caregiver marital status (%)		
Married and living with spouse/ civil partner	189 (84.8%)	198 (88.8%)
Living with partner	34 (15.2%)	25 (11.2%)
Primary caregiver ethnicity (%)		
White British	197 (88.3%)	200 (89.7%)
White other (Irish, Travelling community, Other)	10 (4.4%)	11 (4.9%)
Asian/ Asian British	6 (2.6%)	7 (3.1%)
Black (African/Caribbean/ Black British)	2 (.9%)	2 (.9%)
Remaining ethnic groups (mixed/multiple ethnicity, Arabic, etc)	5 (2.1%)	2 (.8%)
Missing information	3 (1.3%)	1 (.4%)
Primary caregiver employment status (%)		
In a job working for an employer	74 (33.2%)	103 (46.2%)
Looking after home and family	96 (43%)	85 (38.1%)
Self-employed	19 (8.5%)	17 (7.6%)
Voluntary work	11 (4.9%)	6 (2.7%)
Full-time student	4 (1.8%)	4 (1.8%)
Maternity/ paternity leave from a job	3 (1.3%)	1 (.4%)
Doing something else	15 (6.7%)	6 (2.7)
Unemployed	0 (0%)	1 (.4%)
Missing information	1 (.4%)	–
Primary caregiver qualifications (%)		
Degree level	122 (54.7%)	131 (58.7%)
Below degree level	92 (41.2%)	91 (40.8%)
No qualifications	1 (.4%)	1 (.4%)
Missing information	8 (3.6%)	–
UK median weekly household income (%)		
Above median (more than £700)	93 (41.8%)	119 (53.5%)
Below median (less than £700)	123 (55.1%)	99 (44.4%)
Missing information	7 (3.1%)	5 (2.2%)

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

Table 2. Sibling and child with intellectual disability descriptive information ($n = 223$).

	Child with intellectual disability		Sibling	
	Wave 1	Wave 2	Wave 1	Wave 2
Mean age (*SD*)	8.36 (2.33)	11.41 (2.37)	8.45 (2.47)	
Birth order (%)				
Sibling older			105 (47.1%)	
Sibling younger			110 (49.3%)	
Missing information			8 (3.6%)	
Gender (%)				
Male	147 (65.9%)		122 (54.7%)	
Female	76 (34.1%)		101 (45.3%)	
Additional diagnoses (%)				
Autism	121 (54.3%)	129 (57.8%)		
Down syndrome	36 (16.1%)	37 (16.6%)		
Autism and Down syndrome				
Sibling has longstanding illness or disability			51 (22.9%)	80 (35.9%)
Missing information			3 (1.3%)	1 (.4%)

Note: *SD*: standard deviation.

caregiver. During Wave 1, the children with intellectual disabilities had a mean age of 8.36 years and the siblings had a mean age of 8.45 years. Around 67% of the children with intellectual disabilities ($n = 147$), and 55% of the siblings ($n = 122$) were boys. Table 2 summarises the descriptive statistics at both waves for the children with intellectual disabilities, and their sibling.

Measures

Primary caregivers answered a single item measuring inter-parental relationship satisfaction rating how happy they are in their relationship on a scale of one (very unhappy) to seven (very happy) (University of London 2022).

Sibling relationship quality was assessed using an adapted and reduced version of the Sibling Relationship Questionnaire- Short Form (SRQ-SF; Furman and Buhrmester 1985) including key items used to create two subscales: warmth and closeness (six items; e.g. 'How much do the sibling and the child love each other?') and conflict (four items; e.g. 'How much are the sibling and the child mean to each other?'). Caregivers were asked to rate aspects of the sibling relationship on a five-point Likert scale ranging from one (hardly at all) to five (extremely much). McDonald's omega coefficients (Hayes and Coutts 2020) for the current sample at study Wave 1 were: Warmth and Closeness= .852, Conflict= .856; and coefficients for the sample at Wave 2 were: Warmth and Closeness= .868, Conflict= .882.

Primary caregivers completed the Strengths and Difficulties Questionnaire (SDQ; Goodman 1997) measuring the behavioural and emotional problems of the child with intellectual disabilities and their sibling using 20 items. These items (e.g. 'Often fights with other children or bullies them'; 'Many fears, easily scared') are rated on a three-point scale from zero (not true) to two (certainly true). The SDQ has good psychometric properties according to data obtained from a representative sample of children living in the UK aged between five and 15 years old (Goodman 2001), and effectively measures behaviour problems of children with intellectual disabilities (Murray *et al.* 2021). McDonald's omega coefficients for the current sample at study Wave 1 were: child with intellectual disability's Total Difficulties = .801, sibling's Total Difficulties= .916; and coefficients for the sample at Wave 2 were: child with intellectual disability's Total Difficulties = .793, sibling's Total Difficulties= .908.

Family economic adversity was a composite control variable based on the primary caregivers' responses to three items measuring the family's weekly income, subjective poverty, and ability to raise funds. Weekly income was used to determine whether the family were earning above or below the median weekly income in the UK. For subjective poverty, the primary caregiver answered the question: 'How well would you say you and your partner are managing financially these days?' using a five-point scale ranging from one (living comfortably) to five (finding it very difficult). This question has also been used in a nationally representative dataset of children born in the UK (McKenna *et al.* 2017). Additionally, the primary caregiver was asked: 'Suppose you only had one week to raise £2000 for an emergency, which of the following best describes how hard it would be for you to get that money?' They answered this question using a four-point scale ranging from one (I could easily raise the money) to four (I don't think I could raise the money). Using multiple subjective and objective measures allows us to indirectly measure family economic adversity using socio-economic information about a household and through the beliefs and perceptions of the primary caregiver themselves as well as an objective income indicator (Siposne Nandori 2014). A higher score on the overall composite variable indicates more family economic adversity experienced.

Procedure

This study used data from Wave 1 and Wave 2 of the 1000 Families Study; a UK-based longitudinal ongoing cohort study of over 1000 primary caregivers of children with intellectual disabilities at the first wave (Hastings *et al.* 2020). Recruitment at Wave 1 involved a multi-point method, with assistance from parent support organisations and special schools, as well as advertisements via websites, social media, and family support newsletters. The same families were contacted to complete the follow-up Wave 2 survey, including the same measures, approximately 2 years and 9 months later.

Those who took part in the 1000 Families Study were required to be living in the UK and living with at least one child with intellectual disabilities aged between 4 years and 15 years 11 months at both waves. Originally, participants did not receive any incentive. However, during Wave 2, primary caregivers were offered a £10 gift voucher as a thank you for taking part. The 1000 Families Study was granted full ethical approval by the National Health Service (NHS) West Midlands-South Birmingham Research Ethics Committee (REC reference number: 15/WM/0267) and informed consent was obtained from the primary caregiver (see Hastings *et al.* 2020 for more information regarding the study design).

A total of 650 primary caregivers completed both Wave 1 and Wave 2 of the 1000 Families Study. Five responses were removed as the child was under 4 years old during Wave 1 and so did not meet the inclusion criteria. The final sample size was obtained by excluding families where the disabled child did not have a sibling aged between 4 years and 15 years 11 months at Wave 1 ($n = 266$) and Wave 2 ($n = 64$); the primary caregiver was not living with a partner during Wave 1 ($n = 57$) and Wave 2 ($n = 21$); and the primary caregiver reported on a different sibling at Wave 2 ($n = 14$). The final sample size included 223 families of children with intellectual disabilities. To increase replicability of the analysis and remain transparent around the study design, the current study was preregistered on Open Science Framework [https://osf.io/xkh9w].

Statistical analysis

A cross-lagged panel design was used to examine the directional relationship between inter-parental relationship satisfaction and sibling relationship quality. The

cross-lagged model has two main components to quantify this relationship: autoregressive and cross-lagged effects. Any causal relation was determined statistically when cross-lagged effects were statistically significant in only one direction. Empirically and theoretically supported control variables were included in the original autoregressive and cross-lagged models, predicting the subsystem relationship outcomes, as specified on OSF [https://osf.io/xkh9w]. These were family economic adversity (Korja *et al.* 2016), the behaviour problems of the child with intellectual disabilities (Hastings and Petalas 2014), and the behaviour problems of the sibling (Cummings and Davies 2002).

Model fit indices were reported for both the baseline and the full model, and a likelihood ratio test was performed between them. Additionally, we report bootstrapped parameter estimates. Model fit was assessed using the Comparative Fit Index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardised root mean squared residual (SRMR). The 'rules of thumb' conventional cut-off criteria for goodness-of-fit measures has been debated amongst researchers. Hu and Bentler (1999) indicate that a relatively good fit can be established between the data and hypothesised model when CFI and TLI are close to .95, SMSR is close to .08 and RMSEA is near .06. However, Wang and Wang (2012) suggest the following rules regarding model fit evaluation: CFI and TLI >.9 indicates acceptable model fit, whereas >.95 represents good model fit; RMSEA <.05 represents close fit, .05–.08 represents fair fit, and .08–.10 represents mediocre fit; SRMR <.08 indicates a good fitting model. We reported the CFI and RMSEA using the usual (naive) bootstrap method, deviating from the preregistered plan that specified YHY bootstrap as the statistical software did not consistently report the YHY interval [https://osf.io/xkh9w].

As more complex models require larger sample sizes (Wang and Wang 2012), sensitivity analyses were used to assess the robustness of the cross-lagged effects whilst importing the remaining empirically selected control variables. A preregistered and iterative set of sensitivity analyses were conducted using three groups of control variables inserted in a theoretically justified order to predict the subsystem relationship outcomes, examining effects at each iteration: Group 1 – Whether the sibling also has a disability (determined using a single item: 'Does this sibling have a longstanding illness, disability or infirmity?'); Group 2 – Whether the child with intellectual disabilities is also autistic (Kaminsky and Dewey 2001, Santamaria *et al.* 2012) and whether the child with intellectual disabilities has an additional diagnosis of Down syndrome (Hodapp 2007, Hodapp and Urbano 2007); Group 3 – Whether the sibling was older or younger than the child with intellectual disabilities (Braconnier *et al.* 2018, Dyke *et al.* 2009), and sibling gender (Buist *et al.* 2013). This analysis was carried out using R version 4.1.1, utilising the Lavaan package (Rosseel, 2012). The amount of missing data was proportionately small (1.1%) and standardised model parameter estimates were reported for both models.

Results

Autoregressive model

The preregistered autoregressive model including the family relationship variables and the covariates did not display adequate model fit (χ^2 (12) =95.177; p<.001; CFI = .862 [95% CI .784– .903]; TLI = .585; SMSR = .116; RMSEA = .176 [95% CI .150–.230], AIC= 10,473.59). However, the subsystem relationship outcome variables showed stability across the two waves. Inter-parental relationship satisfaction (β=.61, p<.001), sibling conflict (β=.69, p<.001), and sibling warmth (β=.78, p<.001) at Wave 1 positively predicted parents' reports on the same outcome at Wave 2. In terms of the covariates, family economic adversity at Wave 1 significantly predicted sibling warmth at Wave 2 (β=.09, p=.039). Additionally, the child with intellectual disabilities' behaviour problems at Wave 1 positively predicted sibling conflict at Wave 2 (β=.15, p=.005).

Cross-lagged model

The preregistered cross-lagged panel model (Figure 1) including the family relationship variables and the controls did not demonstrate satisfactory model fit (χ^2 (3) =38.022; p<.001; CFI = .942 [95% CI .895– .975]; TLI = .301; SMSR = .071; RMSEA = .229 [95% CI .145–.316], AIC= 10,434.43). The paths between the subsystem relationship outcomes in the autoregressive model were related similarly in the cross-lagged model, with inter-parental relationship satisfaction (β=.63, p<.001), sibling conflict (β=.67, p<.001) and sibling warmth (β=.79, p<.001) at Wave 1 positively predicting the same outcomes at Wave 2. In terms of covariates, family economic adversity at Wave 1 positively predicted sibling warmth at Wave 2 (β=.10, p=.031), and the child with intellectual disabilities' behaviour problems at Wave 1 positively predicted sibling conflict at Wave 2 (β=.15, p=.008). The cross-lagged model included additional cross-lagged paths, demonstrating that sibling warmth at Wave 1 negatively predicted inter-parental relationship satisfaction at Wave 2 (β= −0.14, p=.019), and sibling conflict at Wave 1 negatively predicted sibling warmth at Wave 2 (β= −0.11, p=.025).

Exploratory analysis

The autoregressive and cross-lagged models were reduced to their simplest form to ensure sufficient base models with good model fit. Covariates were reintroduced back into the models sequentially. If adding a covariate resulted in reduced model fit, this covariate

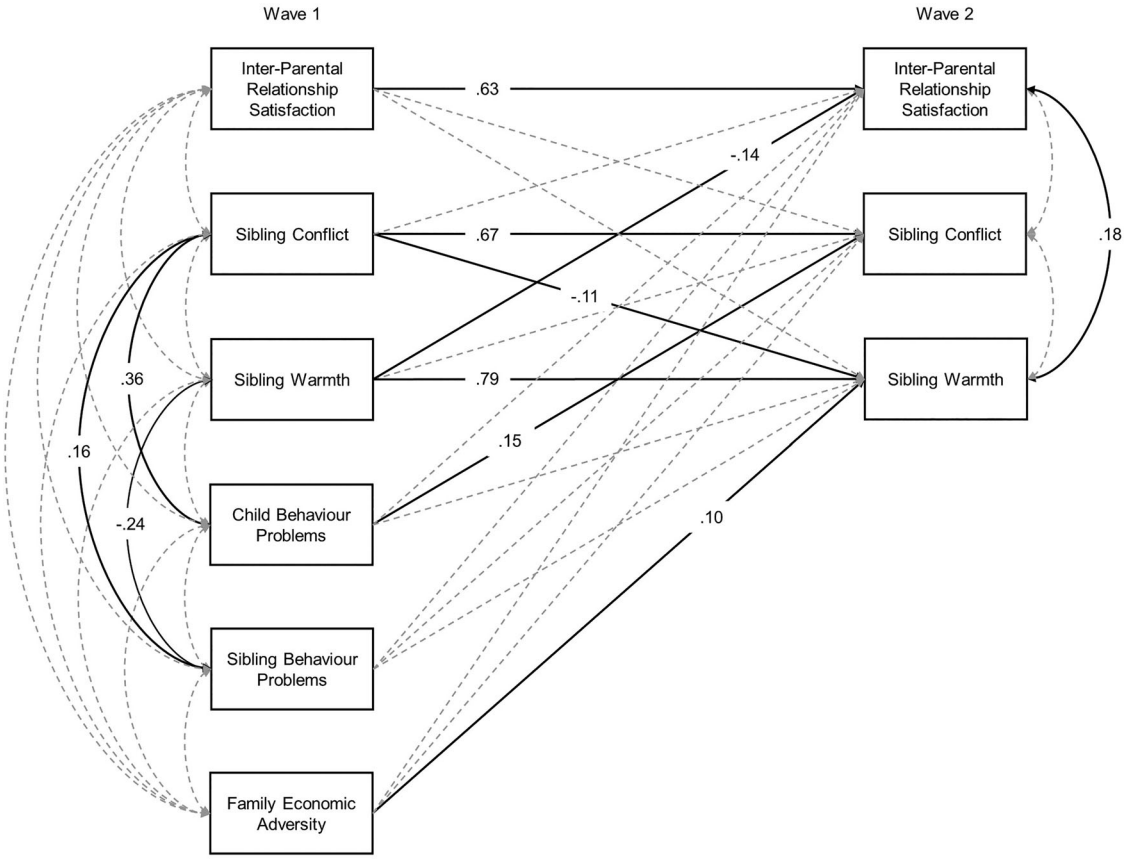

Figure 1. Preregistered cross-lagged model with control variables. ***Notes:*** **The preregistered cross-lagged model including inter-parental relationship satisfaction, sibling conflict, sibling warmth, and the theoretically supported control variables. Single headed arrows between the same variables measured at Wave 1 and Wave 2 represent autoregressive dependence relationships, whilst single-headed arrows between different variables at Wave 1 and Wave 2 represent cross-lagged dependence relationships. Two-headed arrows represent correlational relationships between variables measured at the same time point. Dashed arrows indicate paths that were estimated in the cross-lagged model but were non-significant.**

was removed. The covariances between the baseline covariates and autoregressed variables at Wave 1 were not reintroduced as we did not anticipate a high degree of correlation between them. Additionally, cross-lagged paths from the sibling relationship outcomes at Wave 1 to the sibling outcomes at Wave 2 were removed from the cross-lagged model. The fit statistics and order in which the covariates were reintroduced or removed from the models are reported in Supplementary Information (see Supplementary Materials; Table S1). Adding the covariates into the model resulted in reduced model fit with every step, and so the autoregressive and cross-lagged base models were carried forward when performing the sensitivity analyses (see Supplementary Materials; Table S1; Model a1 and Model c1). The fit statistics whilst performing the sensitivity analyses, building on Model a1 and Model c1, are also reported in Supplementary Information (see Supplementary Materials; Table S2).

Final autoregressive model

The final autoregressive model (see Supplementary Materials; Table S2; Model a1.4) displayed particularly good model fit (χ^2 (12) =16.677; p=.162; CFI = .991 [95% CI .920– .993]; TLI = .979; SMSR = .045; RMSEA = .042 [95% CI .041–.129], AIC= 6366.68). Inter-parental relationship satisfaction (β=.62, p<.001), sibling conflict (β=.73, p<.001) and sibling warmth (β=.79, p<.001) at Wave 1 positively predicted parents' reports on the same outcome at Wave 2. In terms of the covariates, sibling disability negatively predicted sibling warmth at Wave 2 (β= −0.09, p=.044).

Final cross-lagged model

The final cross-lagged model (Figure 2, see Supplementary Materials; Table S2; Model c1.4) had good model fit (χ^2 (8) =11.285; p=.186; CFI = .993 [95% CI .931– .998]; TLI = .978; SMSR = .037; RMSEA = .043 [95% CI .041–.144], AIC= 6369.29). As the autoregressive model demonstrated, inter-parental relationship satisfaction (β=.63, p<.001), sibling conflict (β=.73, p<.001) and sibling warmth (β=.79, p<.001) at Wave 1 positively predicted parents' reports on the same outcome at Wave 2. In terms of covariates, sibling disability negatively predicted sibling warmth at Wave 2 (β= −0.10, p=.041). The additional cross-

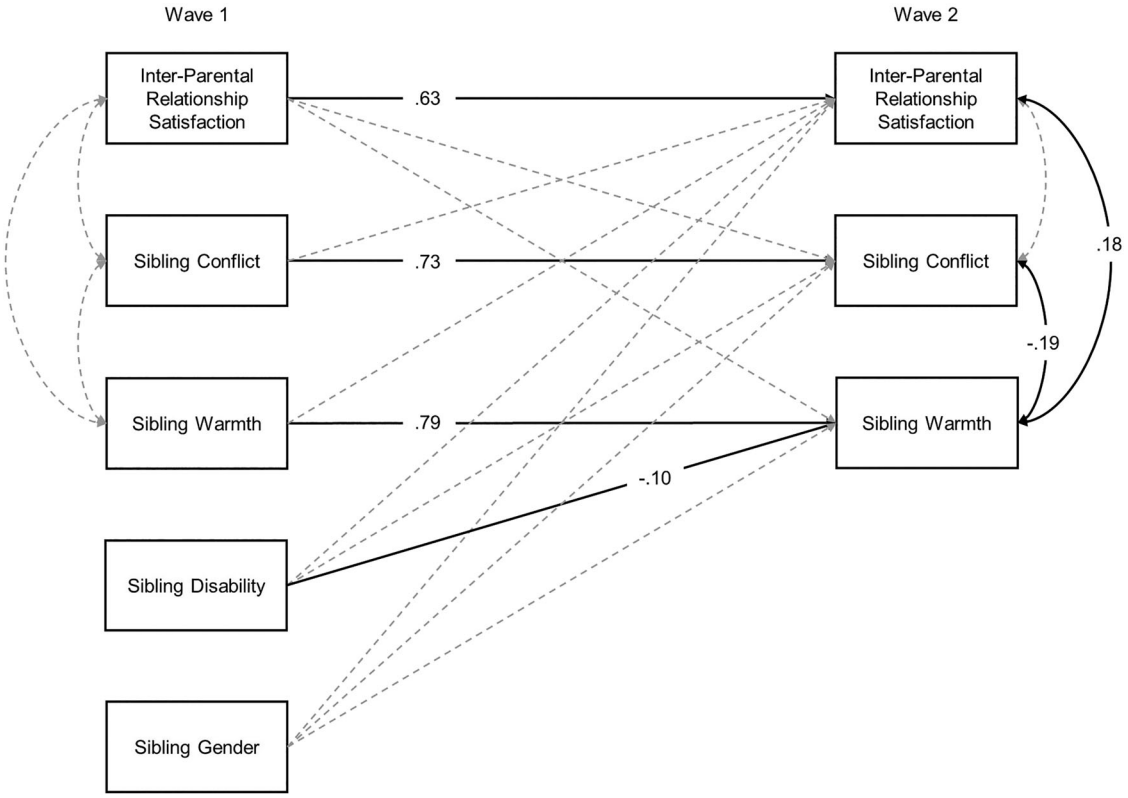

Figure 2. Final cross-lagged model after exploratory and sensitivity analysis. *Notes:* The final cross-lagged model including inter-parental relationship satisfaction, sibling conflict, sibling warmth, and the remaining empirically supported control variables inserted using sensitivity analyses. Single headed arrows between the same variables measured at Wave 1 and Wave 2 represent autoregressive dependence relationships, whilst single-headed arrows between different variables at Wave 1 and Wave 2 represent cross-lagged dependence relationships. Two-headed arrows represent correlational relationships between variables measured at the same time point. Dashed arrows indicate paths that were estimated in the cross-lagged model but were non-significant.

lagged paths showed no significant associations between the Wave 1 variables and Wave 2 variables.

Discussion

In the original preregistered cross-lagged analysis that did not demonstrate satisfactory model fit, we found that sibling warmth at Wave 1 significantly and negatively predicted inter-parental relationship satisfaction at Wave 2. This was an unexpected finding that supports the compensatory hypothesis in a direction we would not expect. It is possible that other variables that we did not explore in the current analysis may explain the presence of this relationship. Therefore, this finding must be interpreted with caution.

In a cross-lagged analysis in a final model with good fit, we found no evidence of the expected bidirectional relationship between inter-parental relationship satisfaction and sibling relationship quality. These results contrast with existing cross-sectional and longitudinal non-disability research which found that inter-parental relationship conflict was associated with more warmth and less conflict in the sibling relationship (Dunn and Davies 2001, Kim *et al*. 2006, Stocker and Youngblade 1999, Yu and Gamble 2008). These research studies utilised a sample of children from middle childhood, similar to the current study. However, Yu and Gamble (2008) collected data from children in early childhood, possibly contributing to contrasting findings. It is possible the current study found differing results due to the use of alternative measures to assess subsystem relationships. For example, Stocker and Youngblade (1999) also used observations from family interactions to measure the marital relationship quality. However, Stocker and Youngblade (1999) were unable to determine causal effect between the subsystem relationships as they did not use longitudinal data.

Families with children with intellectual disabilities are complex, and so other factors which we have not been able to capture could have influenced maternal responses over time or have had effects on the relationship's outcomes. For example, Langley *et al*. (2017) found that inter-parental relationship satisfaction was associated with parental depression and the behaviour problems of their autistic child. Additionally, Hayden and colleagues (2023) found that the prosocial and behaviour problems of both the child with intellectual disabilities and their siblings fed into the 'positive' and 'negative' aspects of the sibling relationship.

The current study results also contrast with Rivers and Stoneman's (2003) cross-sectional study examining

subsystem relationships in families of autistic children. Rivers and Stoneman (2003) used different measures of sibling relationship quality (completed by both the parent and the typically developing sibling) than were used in the current study. Additionally, Rivers and Stoneman (2003) and other research studies measure inter-parental relationship satisfaction using a multi-item measure. Multiple item scales can circumvent measurement error and specificities that derive from single items, increasing reliability and construct validity. The current study measured inter-parental relationship satisfaction using a single item, meaning the range of possible values on this single item was limited. This may have some effect on the quality of standard error estimates, hence using bootstrapping methods to estimate from the empirical distribution.

Future research studies exploring subsystem relationships should ensure the use of multiple item measures when measuring the quality of complex family relationships. Additionally, maternal responses alone are not enough to capture the complexity of all family member's experiences, and multiple informants should be addressed when assessing these subsystem relationships. Both child and sibling reports should be utilised when measuring the sibling relationship, when possible, as caregivers may subjectively interpret the siblings' interactions differently to how the siblings perceive the relationship themselves. Future research should also consider outcomes when there is more than one sibling in the family home. It is possible that the quality of the other non-reported sibling relationships would have been associated with inter-parental relationship quality in the current study. However, it is important to note that the SRQ-SF may not be the most effective measure to use in samples of children with intellectual disabilities (Hayden *et al*. 2023). Finally, further longitudinal research must be conducted with at least three waves of data, to consider mediating and moderating variables that may influence these subsystem relationships.

The credibility of this research study is strengthened by preregistration before handling the data [https://osf.io/xkh9w]. Preregistering this study has helped us sustain clarity between the original research plan and the additional exploratory analysis of the data. This process has allowed the researchers to remain transparent throughout the development of the study, reducing bias and increasing replicability of the analysis and results (Nosek *et al*. 2018).

In terms of clinical implications, when supporting intact couples of a child with intellectual disabilities it might be important to consider how inter-parental relationship quality is associated with other subsystem relationships within the family. Although the results from the current study did not find an association between the subsystem relationship outcomes in a model with good model fit, other family relationships such as the parent-child relationship might play a more important role in predicting the quality of other subsystem relationships. Additionally, families of siblings that both have intellectual disabilities could be considered as a high-risk sub-group for poorer sibling relationship quality and so should be provided with adequate support to reflect this.

Acknowledgements

We would like to thank the families for participating in this research study, and to research team members at the University of Warwick who contributed to the design of, and data collection for, the 1000 Families Study. We acknowledge the support from Cerebra, UK in funding, helping to develop, and recruiting to this study.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The current research was supported by a PhD scholarship funded by Cerebra, UK, and the University of Warwick. The funding source was not involved in the overall development of this report.

ORCID

Caitlin A. Williams http://orcid.org/0000-0001-6442-3852

Paul A. Thompson http://orcid.org/0000-0001-9940-6913

Richard P. Hastings http://orcid.org/0000-0002-0495-8270

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.

References

Bandura, A. 1977. *Social learning theory.* Prentice Hall: Englewood Cliffs.

Braconnier, M. L., Coffman, M. C., Kelso, N. and Wolf, J. M. 2018. Sibling relationships: Parent–child agreement and contributions of siblings with and without ASD. *Journal of Autism and Developmental Disorders*, 48, 1612–1622.

Buist, K. L., Deković, M. and Prinzie, P. 2013. Sibling relationship quality and psychopathology of children and adolescents: A meta-analysis. *Clinical Psychology Review*, 33, 97–106.

Burke, M. M., Taylor, J. L., Urbano, R. and Hodapp, R. M. 2012. Predictors of future caregiving by adult siblings of individuals with intellectual and developmental disabilities. *American Journal on Intellectual and Developmental Disabilities*, 117, 33–47.

Cox, M. J. and Paley, B. 2003. Understanding families as systems. *Current Directions in Psychological Science*, 12, 193–196.

Cridland, E. K., Jones, S. C., Magee, C. A. and Caputi, P. 2014. Family-focused autism spectrum disorder research: A review of the utility of family systems approaches. *Autism*, 18, 213–222.

Cummings, E. M. and Davies, P. T. 2002. Effects of marital conflict on children: Recent advances and emerging themes in process-

oriented research. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 43, 31–63.
Dunn, J. and Davies, L. 2001. Sibling relationships and interparental conflict. In: J. Grych and F. Fincham, eds. *Interparental Conflict and Child Development: Theory, Research and Applications*. Cambridge: Cambridge University Press, pp.273–290.
Dyke, P., Mulroy, S. and Leonard, H. 2009. Siblings of children with disabilities: Challenges and opportunities. *Acta Paediatrica*, 98, 23–24.
Engfer, A. 1988. The interrelatedness of marriage and the mother-child relationship. In: R. Hinde and J. Stevenson-Hinde, eds. *Relationships within Families: Mutual Influences*. Oxford: Clarendon, pp.104–118.
Erel, O. and Burman, B. 1995. Interrelatedness of marital relations and parent-child relations: A meta-analytic review. *Psychological Bulletin*, 118, 108–132.
Furman, W. and Buhrmester, D. 1985. Children's perceptions of the qualities of sibling relationships. *Child Development*, 56, 448–461.
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. 2001. Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 1337–1345.
Harold, G., Acquah, D., Sellers, R., Chowdry, H. and Feinstein, L. 2016. *What works to enhance inter-parental relationships and improve outcomes for children*. London: Department for Work and Pensions, pp. 1–134.
Harold, G. T., Leve, L. D., Elam, K. K., Thapar, A., Neiderhiser, J. M., Natsuaki, M. N., Shaw, D. S. and Reiss, D. 2013. The nature of nurture: Disentangling passive genotype–environment correlation from family relationship influences on children's externalizing problems. *Journal of Family Psychology*, 27, 12–21.
Hartley, S. L., Barker, E. T., Seltzer, M. M., Greenberg, J. S. and Floyd, F. J. 2011. Marital satisfaction and parenting experiences of mothers and fathers of adolescents and adults with autism. *American Journal on Intellectual and Developmental Disabilities*, 116, 81–95.
Hartley, S. L., Papp, L. M. and Bolt, D. 2018. Spillover of marital interactions and parenting stress in families of children with autism spectrum disorder. *Journal of Clinical Child and Adolescent Psychology*, 47, S88–S99.
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. and Petalas, M. 2014. Self-reported behaviour problems and sibling relationship quality by siblings of children with autism spectrum disorder. *Child: Care, Health and Development*, 40, 833–839.
Hastings, R. P., Totsika, V., Hayden, N. K., Murray, C. A., Jess, M., Langley, E. and Margetson, J. K. 2020. 1000 Families Study, a UK multiwave cohort investigating the well-being of families of children with intellectual disabilities: Cohort profile. *BMJ Open*, 10, e032919.
Hayden, N., Hastings, R. and Bailey, T. 2023. Behavioural adjustment of children with intellectual disability and their sibling is associated with their sibling relationship quality. *Journal of Intellectual Disability Research*, 67, 310–322.
Hayden, N. K. and Hastings, R. P. 2022. Family theories and siblings of people with intellectual and developmental disabilities. *International Review of Research in Developmental Disabilities*, 63, 1–49.
Hayes, A. F., Coutts, J. J. 2020. Use omega rather than Cronbach's alpha for estimating reliability. But…. *Communication Methods and Measures*, 14, 1–24.
Hodapp, R. M. 2007. Families of persons with Down syndrome: New perspectives, findings, and research and service needs. *Mental Retardation and Developmental Disabilities Research Reviews*, 13, 279–287.
Hodapp, R. M. and Urbano, R. C. 2007. Adult siblings of individuals with Down syndrome versus with autism: Findings from a large-scale US survey. *Journal of Intellectual Disability Research*, 51, 1018–1029.
Hu, L. T. and Bentler, P. M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6, 1–55.
Kaminsky, L. and Dewey, D. 2001. Siblings relationships of children with autism. *Journal of Autism and Developmental Disorders*, 31, 399–410.
Kim, J. Y., Mchale, S. M., Wayne Osgood, D. and Crouter, A. C. 2006. Longitudinal course and family correlates of sibling relationships from childhood through adolescence. *Child Development*, 77, 1746–1761.
Korja, R., Piha, J., Otava, R., Lavanchy-Scaiola, C., Ahlqvist-Björkroth, S., Aromaa, M. and Räihä, H. 2016. Mother's marital satisfaction associated with the quality of mother-father-child triadic interaction. *Scandinavian Journal of Psychology*, 57, 305–312.
Krishnakumar, A. and Buehler, C. 2000. Interparental conflict and parenting behaviors: A meta-analytic review. *Family Relations*, 49, 25–44.
Langley, E., Totsika, V. and Hastings, R. P. 2017. Parental relationship satisfaction in families of children with autism spectrum disorder (ASD): A multilevel analysis. *Autism Research*, 10, 1259–1268.
Mannering, A. M., Harold, G. T., Leve, L. D., Shelton, K. H., Shaw, D. S., Conger, R. D., Neiderhiser, J. M., Scaramella, L. V. and Reiss, D. 2011. Longitudinal associations between marital instability and child sleep problems across infancy and toddlerhood in adoptive families. *Child Development*, 82, 1252–1266.
McKenna, C. S., Law, C. and Pearce, A. 2017. Financial strain, parental smoking, and the Great Recession: An analysis of the UK Millennium Cohort Study. *Nicotine & Tobacco Research*, 19, 1521–1525.
Modry-Mandell, K. L., Gamble, W. C. and Taylor, A. R. 2007. Family emotional climate and sibling relationship quality: Influences on behavioral problems and adaptation in preschool-aged children. *Journal of Child and Family Studies*, 16, 59–71.
Murray, C. A., Hastings, R. P. and Totsika, V. 2021. Clinical utility of the parent-reported Strengths and Difficulties Questionnaire as a screen for emotional and behavioural difficulties in children and adolescents with intellectual disability. *The British Journal of Psychiatry: The Journal of Mental Science*, 218, 323–325.
Nosek, B. A., Ebersole, C. R., Dehaven, A. C. and Mellor, D. T. 2018. The preregistration revolution. *Proceedings of the National Academy of Sciences of the United States of America*, 115, 2600–2606.
Rhoades, K. A. 2008. Children's responses to interparental conflict: A meta-analysis of their associations with child adjustment. *Child Development*, 79, 1942–1956.
Rivers, J. W. and Stoneman, Z. 2003. Sibling relationships when a child has autism: Marital stress and support coping. *Journal of Autism and Developmental Disorders*, 33, 383–394.
Rosseel, Y. 2012. Lavaan: An R package for structural equation modeling and more. Version 0.5–12 (BETA). *Journal of Statistical Software*, 48, 1–36.
Santamaria, F., Cuzzocrea, F., Gugliandolo, M. C. and Larcan, R. 2012. Marital satisfaction and attribution style in parents of children with autism spectrum disorder, Down syndrome and non-disabled children. *Life Span and Disability*, 15, 19–37.
Sherrill, R. B., Lochman, J. E., Decoster, J. and Stromeyer, S. L. 2017. Spillover between interparental conflict and parent–child conflict within and across days. *Journal of Family Psychology*, 31, 900–909.
Siposne Nandori, E. 2014. Objective and subjective poverty. In: A. C. Michalos, ed. *Encyclopedia of Quality of Life and Well -Being Research.* Dordrecht: Springer Netherlands, 4424–4428.
Stocker, C. M. and Youngblade, L. 1999. Marital conflict and parental hostility: Links with children's sibling and peer relationships. *Journal of Family Psychology*, 13, 598–609.
Sturge-Apple, M. L., Davies, P. T., Winter, M. A., Cummings, E. M. and Schermerhorn, A. 2008. Interparental conflict and children's school adjustment: The explanatory role of children's internal representations of interparental and parent-child relationships. *Developmental Psychology*, 44, 1678–1690.
University of London, Institute of Education, Centre for Longitudinal Studies. 2007. *Millennium Cohort study: second survey, 2003-2005: CAPI Questionnaire Documentation*. [Online]. London: Centre for Longitudinal Studies, 96–97.
Wang, J. and Wang, X. 2012. *Structural equation modeling: Applications using Mplus*. Hoboken, NJ: John Wiley and Sons.
Yu, J. J. and Gamble, W. C. 2008. Pathways of influence: Marital relationships and their association with parenting styles and sibling relationship quality. *Journal of Child and Family Studies*, 17, 757–778.
Zemp, M., Johnson, M. D. and Bodenmann, G. 2018. Within-family processes: Interparental and coparenting conflict and child adjustment. *Journal of Family Psychology*, 32, 299–309.