Short reports

Short Report: Outcomes for siblings associated with sub-groups of autistic children with intellectual disability identified by latent profile analysis

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A B S T R A C T

Background: Recent research suggests that having a brother or sister with autism may contribute to increased positive or negative emotional or psychological impact on siblings.
Aims: To use a novel multidimensional data analysis method to further understand outcomes for siblings of autistic children.
Methods and Procedures: 318 siblings of children with a recorded autism diagnosis and an intellectual disability were included for latent profile analysis. Five variables (DBC disruptive and anxiety; VABS II communication, daily living, and socialization skills) were used to identify sub-groups of autistic children. Primary carers reported on sibling relationship quality (items from the Sibling Relationship Questionnaire warmth/closeness and conflict scales), and siblings' behavioral and emotional problems.
Outcomes and results: The profile groups differed in their levels of ID coupled with disruptive behavior, emotional problems and adaptive skills. Profiles included a severe ID, low behavior and emotional problems and low adaptive skills group; a group with mild ID coupled with high adaptive skills and low emotional and behavioral problems; and a mild ID group with high emotional and behavioral problems. Conflict in the sibling relationship differed across the profile groups (F (4304) = 15.13, p < .001).
Conclusions and implications: Siblings of autistic children with the highest support needs were reported to have the lowest conflict in their relationships. Conversely, siblings of the autistic children with the highest levels of externalizing behaviors and anxiety were reported to have the highest levels of conflict in the sibling relationship.

What this paper adds

When exploring the outcomes for siblings of children with autism, most researchers have considered different characteristics of the autistic child as independent indicators. In this study, we took a different approach where we first identified, through latent profile analysis, sub-groups of autistic children and then compared sibling psychological and relationship outcome across the emerging groups. This approach provides evidence that the profile of the autistic child is associated with sibling outcomes. Specifically, sibling

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dyads that may be particularly at risk for sibling relationship conflict, and so may inform where to target support to families.

1. Introduction

Drawing on predications made by family systems theory (Cridland et al., 2014; Kovshoff et al., 2017), having an autistic brother or sister may contribute to increased positive or negative emotional or psychological impact on other children in the family (siblings) (Guidotti et al., 2020). However, it is not entirely clear which characteristics of the autistic child, the siblings, or the sibling relationship that may be most strongly associated with sibling outcomes and sibling relationships. The present study explored whether sibling relationship quality and sibling behavioural and emotional problems are associated with different needs profiles of the autistic child in the family.

The autistic spectrum is associated with variation of presentation in individuals, including cognitive, adaptive and social aspects (Rosello et al., 2021). In examining the putative impact of living with an autistic child it is, therefore, important to account for some of that variation in presentation. The effects on family members and family relationships are unlikely to be uniform since autism is not uniform.

Recently, we proposed a novel methodological approach to address the question of which characteristics of the autistic child may be associated with sibling outcomes (Rixon et al., 2021). Cluster analysis was used to create sub-groups of autistic children, with a five-cluster solution resulting. Results suggested that the siblings of the children with the most complex care needs had lower internalizing and externalizing problems, and less conflict in their sibling relationships. The group of siblings of children with relatively high levels of adaptive skills but high levels of internalizing and externalizing problems, had higher levels of conflict in their sibling relationships. We suggested the emotional tone of the family, the beliefs, behaviours and emotions within the family unit, may contribute to conflict in sibling relationships, as opposed to having a family member with an autism diagnosis per se.

The purpose of the current study was to replicate and extend the Rixon et al. (2021) findings using a different statistical method and a different sample of children which enabled us to focus on the siblings of autistic children with an intellectual disability. Rixon et al. (2021) explored the outcomes of siblings of children with autism across the spectrum. In the current study, we were interested in

Table 1
Participating family demographics.

Primary Carers (n = 318)		n =	%	Missing n =
Relationship to child	Biological mother	284	89.3%	1 (0.3%)
	Biological father	14	4.4%	
	Adoptive mother	11	3.5%	
	Step-parent	2	0.6%	
	Grandparent	5	1.6%	
	Other	1	0.3%	
Ethnicity	White British or White Other	288	90.6%	4 (1.2%)
	Other ethnic group	26	8.2%	
Education level	Post graduate / undergraduate	140	44.0%	18
	Higher Education	67	21.1%	
	GCSE / A levels	90	28.3%	
	No qualifications	3	1.0%	
Employment	Working full time	119	37.4%	
	Looking after home and family	121	38.1%	
Children with autism (n = 318)				
Child age	4 – 15 years 11 months			
	M = 9.27, SD = 2.64			
Gender	Male	242	76.1%	0
	Female	76	23.9%	
Intellectual disability	Mild to moderate	164	51.5%	3
	Severe to profound	151	47.5%	
Co-occurring conditions	Visual impairment	56	17.6%	
	Hearing impairment	25	7.9%	
	Epilepsy	33	10.4%	
Education	Mainstream school	108	34.0%	1 (0.3%)
	Special education unit in mainstream school	42	13.2%	
	Special school	149	46.9%	
	Educated at home	12	3.7%	
	Not in education	6	1.9%	
Autism siblings (n = 318)				
Gender	Male	151	47.5%	7
	Female	160	50.3%	
Living with child with autism?	All the time	301	94.7%	7
	Some of the time	9	2.8%	
	Never	1	0.3%	
Sibling disability?	Yes	92	28.9%	5
	No	221	69.5%	
Sibling age range	4 – 15 years			

whether meaningful sub-groups could be identified for children with autism who also had an intellectual disability (and any associations with sibling outcomes). Siblings of this population of children with autism have been researched less often than siblings of children with autism generally. In addition, there is some evidence that both psychological relationship outcomes may be particularly affected for siblings of children with autism and intellectual disability. For example, Petalas et al. (2009) found that siblings of children with autism and intellectual disability had more emotional problems than siblings of children with an intellectual disability only. Arias et al. (2018) found evidence of poorer quality interpersonal relationships and social inclusion in siblings of children with autism and intellectual disability when compared with siblings of children with an intellectual disability only.

We used latent profile analysis (LPA) instead of cluster analysis to identify groups of autistic children with intellectual disability with similar multi-dimensionally defined characteristics. The use of LPA, as a person-centred statistical method, identifies related cases from multivariate continuous data (Lanza & Cooper, 2016), using the individual as the unit of analysis (Bergman et al., 2003). We then compared siblings' behavioral and emotional problems and sibling relationship quality across the identified profile groups of autistic children.

2. Methods

2.1. Sample

Summary information about the participating families is presented in Table 1.

2.2. Measures

2.2.1. Autistic Child measures

The Development Behavior Checklist (DBC), 2nd edition, (Einfield & Tonge, 2002) is a 96-item questionnaire used for the assessment of behavioral and emotional problems in children and young people with developmental disabilities aged 4–18 years. Items are scored on a 0, 1 or 2 rating scale, 0 =not true, as far as you know; 1 =somewhat or sometimes true; 2 =very true, or often true. Two subscales were used representing key dimensions of externalizing and internalizing problems: Disruptive behavior, 27 items and Anxiety, 12 items.

The Vineland Adaptive Behaviour Rating Scales (VABS) 2nd Edition (Sparrow et al., 2005) was completed by the primary carers via a telephone interview. The VABS II assesses the adaptive skills of the child, gathering information on day-to-day self-help skills, personal independence, communication, and socialization skills. For the current analysis, communication, daily living, and socialization skills standard scores were used.

2.2.2. Sibling measures

Primary carers completed the Sibling Relationship Questionnaire – revised short form to assess positive and negative dimensions of the sibling relationship (Buhrmester & Furman, 1990). In the current study, items from the warmth and closeness subscale (6 items) and the conflict subscale (4 items) were used. Carers were asked to rate sibling relationships using a 5-point Likert scale, ranging from 1 (*very much*) to 5 *extremely much*. A higher score on the sub-scales gives an indication of a greater level of the specified quality in the sibling relationship.

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) is a 25-item questionnaire that was used to assess sibling behavior and emotional problems and pro-social behavior. Primary carers are asked to assess the extent to which each statement applies to the child's behavior over the preceding six months, using a three-point rating scale. Scores used were: pro-social behavior (5 items), externalizing problems (conduct and hyperactivity 10 items), and internalizing problems (emotional and peer problems 10 items).

Information regarding the internal consistency for each included questionnaire is provided in a cohort profile paper (Hastings et al., 2020).

2.3. Procedure

Data for the current analysis were collected as part of a larger UK wide research study of families with a child with an intellectual disability, the 1000 Families Study (Hastings et al., 2020). Wave 1 data, used in this study, were collected between 2015 and 2017. A total of 1184 primary carers completed the online survey and were invited to take part in a telephone interview. Six hundred and forty-four primary carers took part in the interview, during which the DBC and VABS were completed. From this 644, 318 families met the criteria for this study: a child with intellectual disability also with a reported diagnosis of autism aged between 4 years and 15 years and 11 months, and a sibling within the family home aged between 4 years and 15 years and 11 months.

2.3.1. Data analysis

Data were analyzed using Stata version 16, using LPA person-centred mixed modelling analysis to identify sub-groups of autistic children. Five variables from the 1000 Families Study were used that provided a breadth of information regarding the child's emotional and behavioural well-being as well as adaptive behaviours (DBC Disruptive and Anxiety scales; VABS Communication, Daily Living and Socialization domains) and representing the only suitable measures in the dataset. Models of between 2 and 9 profiles were examined. To identify the best model for the latent profiles the Bayesian Information Criterion (BIC) was used and profiles were

retained when at least 5% of the sample were included in each profile identified. The best solution (balancing all criteria) was for five profiles.

In summary, the five profiles were:

1. (n = 25), 80% males, mean age 9.04 years, 96% with more severe to profound intellectual disability. Lowest scores across the VABS subdomains, low levels of disruptive behaviors and anxiety, relative to the other groups.
2. (n = 74), 78% males, mean age 9.80 years, 62.5% with severe to profound intellectual disability. A high disruptive behavior score, but less anxious profile with moderate scores in adaptive skills.
3. (n = 39), 69% males, mean age 8.68 years, 67% with a mild to moderate intellectual disability, moderate scores in adaptive skills and the highest levels of disruptive behaviors and anxiety across the groups.
4. (n = 56), 73% male, mean age 8.88 years, 80% with mild to moderate intellectual disability, the highest levels of disruptive behavior and relatively high anxiety, coupled with higher levels of communication skills.
5. (n = 124), 77% male, mean age of 9.38 years, 53% with mild to moderate intellectual disability. This group had the highest levels of daily living and socialization skills, relative to the other groups, and one of the highest scores for communication. This group had the lowest levels of disruptive behaviors and anxiety problems.

3. Results

Once the profile groups of children with intellectual disability and autism were identified (Table 2), sibling outcomes were analyzed using one-way ANOVAs across the five profile groups. Post hoc Bonferroni tests were used to identify between-group differences. Sibling outcomes are shown in Table 3. The only sibling outcome showing a group differences was the SRQ conflict score (F (4304) = 15.13, p < .001). Results for the other measures were not statistically significant: SDQ pro-social (F (4306) = 1.47, p = 0.21), SDQ internalizing (F (4302) = 1.28, p = 0.27), SDQ externalizing (F (4299) = 2.19, p = 0.07), and SRQ warmth / closeness (F (4303) = 1.67, p = 0.15).

For SRQ conflict scores, parent carers of the siblings whose brothers and sisters were in profile group 1 (M = 7.4, SD = 3.81) reported less conflict than group 3 (M = 14.26, SD = 4.22, p < .001), group 4 (M = 12.54, SD = 4.50, p < .001), and group 5 (M = 12.59, SD = 4.56, p < .001). The parent carers of the siblings whose brothers and sisters were in group 2 (M = 9.64, SD = 4.15) reported less conflict than group 3 (p < .001), group 4 (p.003) and group 5 (p < .001).

4. Discussion

In the current research, we extended our earlier research (Rixon et al., 2021) using LPA rather than cluster analysis and a different dataset. The identified profile groups of autistic children in the current study are likely sample dependent (all autistic children included also had an intellectual disability), but were not the primary focus of the study.

As in our earlier study (Rixon et al., 2021) conflict levels were lowest in the sibling dyads for the autistic children with the highest needs / most complex disability. Conflict levels may be lower because of the inability of the children with autism to fight or quarrel with their siblings, or because siblings recognize their brother or sister's disabilities and so treat them differently than they would other siblings. These issues need to be explored in further research.

The results also show that the siblings of the children with the most behavior problems (group 3) have the highest reported conflict. The sibling relationship in the most complex needs profile (group 1) had the lowest levels of conflict, and this profile was also associated with one of the lowest scores for behavior problems. However, it is not only behavior problems that appears to be associated with sibling conflict. High levels of conflict were also reported in group 5 where behavior problems are low but communication and socialization skills are high, coupled with a mild to moderate level of intellectual disability.

There may be a number of reasons for the lack of group differences for sibling outcomes other than relationship conflict. In particular, all sibling outcomes were reported by the primary parent carer, predominately the biological mother (89.3%). Different findings may have been obtained if sibling self-reports had been used. Discrepancies have been reported in previous research between parent and sibling reports of sibling relationships (e.g. Braconnier et al., 2018; Schmeer et al., 2021), and researchers have reported different findings for parent and sibling reported SDQ outcomes in families of autistic children (Rankin et al., 2017). Parental stress or caregiver burden, for example, may result in parents reporting more of the negative aspects of the sibling relationship, such as conflict, than the siblings themselves (Roper et al., 2014). Conflict may also be easier to identify, as an external viewer into a relationship, than

Table 2
Parent carer scores on study measures for children with autism and ID: group profiles.

Latent Profile	Profile 1 (n = 25)	Profile 2 (n = 74)	Profile 3 (n = 39)	Profile 4 (n = 56)	Profile 5 (n = 124)	
	Mean *(SD)*	Mean *(SD)*	Mean *(SD)*	Mean *(SD)*	Mean *(SD)*	p
DBC Disruptive	16.49 (1.83)	22.26 (1.35)	33.16 (2.03)	26.17 (1.40)	14.29 (3.94)	< .001
DBC Anxiety	4.98 (0.66)	6.74 (0.56)	12.37 (0.78)	8.78 (0.51)	4.60 (1.41)	< .001
VABS Communication	41.54 (2.77)	57.86 (1.24)	65.96 (1.67)	74.07 (1.06)	72.86 (3.10)	< .001
VABS Daily Living Skills	41.47 (1.62)	53.43 (0.93)	57.64 (1.56)	67.42 (1.06)	92.97 (2.87)	< .001
VABS Socialization	46.81 (1.43)	51.49 (0.90)	57.04 (1.44)	66.39 (1.21)	79.90 (2.97)	< .001

Table 3
Parent carer scores on study measures for siblings of children with autism and ID by group profile.

	Profile 1		Profile 2		Profile 3		Profile 4		Profile 5			
	Mean (SD)	(n =)	Mean (SD)	(n =)	Mean (SD)	(n =)	Mean (SD)	(n =)	Mean (SD)	(n =)	f	p
SDQ prosocial	7.52 (2.91)	25	7.85 (2.36)	72	6.81 (3.06)	38	7.41 (2.79)	54	6.93 (3.06)	122	1.47	0.21
SDQ Internalizing	8.42 (3.50)	24	8.56 (3.80)	71	9.68 (3.91)	38	8.70 (3.47)	54	9.51 (3.95)	120	1.28	0.27
SDQ Externalizing	7.52 (2.38)	25	7.31 (2.53)	70	8.29 (2.85)	38	7.37 (2.85)	51	8.28 (2.76)	120	2.19	0.07
SRQ warmth / closeness	16.48 (4.40)	25	16.36 (4.64)	72	16.21 (4.58)	38	18.52 (5.86)	53	16.84 (5.64)	120	1.67	0.15
SRQ conflict	7.40 (3.81)	25	9.64 (4.15)	72	14.26 (4.22)	38	12.54 (4.50)	53	12.59 (4.56)	121	15.13	< .001

warmth and closeness which may in part be a more internalized aspect of sibling relationships.

These findings suggest that an assumption that the more complex needs the child with autism, the poorer the outcomes for the siblings, may not hold true. Behavior problems alone may not be a risk indicator for increased conflict in the sibling relationship. We have also established the utility of a profile/cluster analysis approach to examining autism family research questions. The current findings suggest some profile groups that may be particularly at risk for sibling conflict and thus in need of targeted support.

The limitations of the present study relate to the reliance on parent carer reports versus siblings self-reports. As only primary carer reports were available, we were only able to assess the sibling relationship through their parents' eyes. Particularly when examining areas such as conflict and warmth/closeness, how a parent perceives a relationship may not reflect the innermost feelings and thoughts of the sibling themselves.Future research should, therefore, include siblings' self-reports.

Data Availability

The authors do not have permission to share data.

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