Prosocial Behavior Is a Relative Strength in Siblings of Children with Physical Disabilities or Autism Spectrum Disorder

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Abstract

Research on siblings of children with developmental and physical disabilities has emphasized negative influences on siblings' mental health. Yet, such siblings may be more prosocial compared with siblings of children without disabilities, due to care responsibilities and their experiences with their brother's or sister's disability. We compared prosocial behavior between siblings of children with autism spectrum disorder (ASD; $n=47$), physical disabilities ($n=42$), and siblings of children without disabilities ($n=44$) using a multi-informant approach (i.e., child-, mother-, and father-report). Prosocial behavior was measured with the Strengths and Difficulties Questionnaire. Drawing on the theoretical and empirical sibling literature, we also examined whether siblings' internalizing and externalizing difficulties, adjustment to the sibling situation, and communication with parents correlated with siblings' prosocial behavior. Child-reported internalizing difficulties and mother–child communication significantly correlated with mother-reported prosocial behavior. Child-reported internalizing and externalizing difficulties significantly correlated with father-reported prosocial behavior. No significant correlates with child-reported prosocial behavior was identified. When adjusting for siblings' internalizing and externalizing difficulties and mother–child communication, siblings of children with physical disabilities scored significantly higher than siblings of children without disabilities on mother- and father-reported prosocial behavior. Siblings of children with ASD scored significantly higher on mother-reported prosocial behavior. We conclude that prosocial behavior may be a relative strength in siblings of children with developmental and physical disabilities, and that siblings' prosocial behavior may be influenced by type of disability, mental health, and family communication. Interventions targeting siblings' mental health and family communication may be helpful in promoting siblings' prosocial behavior.

Keywords Prosocial behavior · Autism spectrum disorder · Physical disabilities · Siblings · Adjustment

Being the sibling of a child with a developmental or physical disability (herein; siblings) is associated with increased risk of mental health difficulties (Shivers et al., 2019; Vermaes et al., 2012). The risks facing siblings are associated directly with features of the disability (e.g., behavior problems), as well as indirectly by associated risks facing other family members (e.g., parenting stress) (Hastings, 2006; Jones et al., 2019; Tudor et al., 2018). For example, Hastings (2006) found more behavior problems displayed by children with ASD predicted poorer psychosocial adjustment in siblings two years later. Further, Tudor et al. (2018) found maternal depressive symptoms, which were related to behavior problems displayed by children with ASD, also were associated with siblings internalizing difficulties. A risk and deficit focus in sibling research aligns with an important focus on the etiology of developmental and physical disabilities in medical research, including potential heritability among family members (Charman et al., 2017; Ozonoff et al., 2011). There is far less research on positive functioning for siblings relative to the risks (e.g., Vermaes et al., 2012). This is unfortunate, since despite the risks, the experience of having a brother or sister with a developmental or physical disability may also embed positive outcomes (Perenc et al., 2015; Shivers, 2019). In the current study, we focus on such a positive factor (i.e., siblings' prosocial behavior).

Prosocial behavior is voluntary behavior that aims to benefit, help, or care for someone else (Eisenberg et al., 2015). Prosocial behaviors can promote peer acceptance, academic achievements, and well-being, as well as protect against mental health difficulties (Layous et al., 2012; Memmott-Elison et al., 2020). Of particular relevance to sibling research, development of prosocial behavior is aided by modeling and scaffolding between older and younger siblings (Hughes et al., 2018). Since prosocial behavior can buffer against mental health difficulties, prosocial behavior may be of particular importance for siblings of children with developmental and physical disabilities, since these siblings are of greater risk of mental health difficulties (Vermaes et al., 2012). Because the interaction between siblings is affected when one child has a disability (Knott et al., 2007), prosocial learning may also be affected. In some instances, siblings may learn caretaking skills, to take the perspective of others, and to set the needs of others above own needs (Fjermestad et al., 2019; Perenc & Pęczkowski, 2018; Perenc et al., 2015; Shivers, 2019). In other instances, siblings may be deprived of important social and prosocial interactions with their brother or sister with a disability (Kaminsky & Dewey, 2001; Knott et al., 2007).

The prosocial learning opportunities for siblings may depend on the type of developmental or physical disability. For example, siblings of a child with autism spectrum disorders (ASD) may experience less prosocial interaction with their brother or sister (e.g., Knott et al., 2007). This is because children with ASD have difficulties with reciprocal social interaction and display less prosocial behavior than other children (e.g., Russell et al., 2012). In contrast to children with ASD, children with physical disabilities (i.e., chronic disorders affecting physical development and/or functioning; Miyahara & Piek, 2006) do not necessarily have problems with social interaction and prosocial behavior (e.g., Meijer et al., 2000). Siblings of children with physical disabilities may therefore not experience the same difficulties in social interactions with their brother or sister as siblings of children with ASD. We

propose that the subtle needs of a brother or sister with ASD (e.g., predictability, insistence on sameness) may be more difficult to understand than the specific care taking needs of a brother or sister with a physical disability (e.g., feeding, movement). Siblings of children with ASD may also be affected by the broader autism phenotype (Pisula & Ziegart-Sadowska, 2015). That is, siblings of children with ASD may have elevated levels of autism characteristics (Constantino et al., 2006), which have been found to be negatively associated with prosocial behavior (Petalas et al., 2012; Zhao et al., 2019).

There is an absence of comparative data on siblings of children across developmental and physical disabilities. For example, a recent meta-analysis found that few studies have directly compared siblings of children with ASD with siblings of children with physical disabilities (Shivers et al., 2019). Also, much sibling research does not differentiate between different types of disabilities but examine general risks for siblings of children with disabilities (e.g., Haukeland et al., 2020; Orm et al., 2021; Vermaes et al., 2012). However, the different disabilities can affect siblings differentially (Shivers et al., 2019). Therefore, comparative data are needed to advance our understanding of how distinct developmental and physical disabilities affect siblings' development and psychosocial adjustment in similar and/or different ways. This is also important in order to develop personalized interventions for siblings. In the current study, we focus on the prosocial behavior of siblings of children with ASD and siblings of children with a physical disability.

ASD and physical disabilities represent different hereditary (i.e., genetic) and environmental contexts for prosocial behavior development in siblings. The empirical findings regarding these sibling groups are mixed. One line of findings suggests that siblings of children with physical disabilities are more prosocial than siblings of children without disabilities (Perenc & Pęczkowski, 2018; Perenc et al., 2015). Another line of findings is more mixed, in that siblings of children with ASD have been found to display both higher, lower, and similar levels of prosocial behavior compared with peers. A couple of studies have found siblings of children with ASD are more prosocial than their peers (Shivers, 2019; Walton & Ingersoll, 2015). Other studies have found no significant differences (Benson & Karlof, 2008; Hastings & Pet al.,as, 2014). However, two studies with a combined sample size that was double compared to Shivers (2019) and Walton and Ingersoll (2015; i.e., $N=190$ versus $N=95$) found siblings of children with ASD displayed less prosocial behavior compared with their peers (Griffith et al., 2014; Hastings, 2003). Evidence is mixed, but the presence of the broader autism phenotype among many siblings is reason to expect that siblings of children with ASD will display less prosocial behavior than their peers (Petalas et al., 2012). However, given the scarcity of studies in the field, more research is needed to examine this.

To further advance the field, there is also a need for research on factors that may correlate with prosocial behavior. Conceptually, the development of prosocial behavior is proposed to be influenced both by dispositional traits (e.g., genetics, personality, temperament) and environmental factors (e.g., social reinforcement, rewards, learning; Malti & Dys, 2018). Additional child and parent factors have also been proposed to influence children's prosocial behavior. Child factors include personal distress and internalizing and externalizing difficulties,

which have been proposed to negatively influence prosocial behavior (Memmott-Elison et al., 2020; Trommsdorff et al., 2007). Parent factors include quality of the parent–child relationship, parental warmth, and parental style (i.e., authoritative), all proposed to positively influence prosocial behavior (Eisenberg et al., 2015). Despite the purported importance of child and parent factors, studies examining these factors as correlates of prosocial behavior among siblings are scarce. Among siblings of children with ASD, Hastings (2003) found girls displayed significantly more prosocial behavior than boys, and older siblings of the child with ASD more than younger siblings. Giallo and Gavidia-Payne (2006) found prosocial behavior was significantly and positively associated with siblings' self-ratings of positive affect when their brother or sister with a disability showed developmental progress. Thus, further studies of correlates of siblings' prosocial behavior are needed.

Our first aim in the current study was to examine degree of overlap and the scores for prosocial behavior between siblings, mothers, and fathers. This is because discrepancy between child and parent report is common for psychosocial variables (De Los Reyes & Kazdin, 2005), and therefore these differences are important to examine to interpret group differences. Based on the existing discrepancy literature, we expected moderate overlap between informants.

Our second aim was to compare the prosocial behavior of siblings of children with ASD and siblings of children with physical disabilities, respectively, with siblings of children without disabilities. Our research question was whether there are differences between siblings of children with ASD, siblings of children with physical disabilities, and siblings of children without disabilities in their levels of prosocial behavior. Based on the literature summarized above, we hypothesized that siblings of children with physical disabilities will display more prosocial behavior compared with siblings of children without disabilities (e.g., Perenc et al., 2015). Based on the higher presence of the broader autism phenotype in particular, we hypothesized that siblings of children with ASD will display less prosocial behavior compared with siblings of children without disabilities (e.g., Griffith et al., 2014).

Our third aim was to examine correlates of prosocial behavior among siblings across both disability groups. Our research question was whether siblings' mental health difficulties, adaptation to their brother's or sister's disability, and communication with their parents associated with their prosocial behavior. We included siblings' internalizing and externalizing difficulties and siblings' adaptation to their brother's or sister's disability as child factors and parent–child communication quality as a parent factor, as these child and parent factors have been proposed to influence prosocial development (Eisenberg et al., 2015; Malti & Dys, 2018; Memmott-Elison et al., 2020). Research has also shown that these variables, which are malleable through interventions, are associated with siblings' psychosocial functioning (Haukeland et al., 2020; Incledon et al., 2015; Long et al., 2013; Murphy et al., 2017). Because research on correlates of siblings' prosocial behavior is scarce, we approached the second aim without a-priori hypotheses.

Method

Participants

The sample included three groups comprising a total of 123 children and their parents; (1) siblings of children with ASD ($n=47$), (2) siblings of children with physical disabilities ($n=42$), and (3) siblings of children without disabilities ($n=44$). Children had to be between 8 and 16 years of age to be included. This was because siblings of children with ASD or physical disabilities were included for an intervention adapted for children between 8 and 16 years (Fjermestad et al., 2020a, b; Haukeland et al., 2020). Exclusion criteria for siblings were diagnosed developmental, physical, or psychiatric disorder. The physical disabilities represented among the second group were rare genetic disorders involving physical impairments (e.g., Becker/Duchenne and other congenital muscular dystrophies, Friedreich's ataxia, spinal muscular atrophy; 61.9%); congenital heart disease (28.6%); and cerebral palsy (9.5%).

The three groups did not differ significantly by age or gender (see Table 1). The three groups differed significantly by parental educational level. The proportion of fathers and mothers with higher education were highest among siblings of children without disabilities ($\geq 88.6\%$) and lowest among fathers and mothers of siblings of children with physical disabilities ($\geq 53.7\%$). However, in all three groups most fathers and mothers had higher education.

Recruitment

Families of children with ASD or physical disabilities were recruited through national resource centers and user associations for developmental and physical disabilities and community and specialized health services for families of children with disabilities. The control group was recruited from two local elementary schools. The

Table 1 Demographic characteristics of the three groups of participants

	ASD siblings ($n=47$)	PD siblings ($n=42$)	TD siblings ($n=44$)	Group differences	
				F/χ^2	p
Mean age (SD)	11.0 (2.3)	11.5 (2.0)	11.4 (2.5)	0.561	0.572
Boys	61.7%	54.8%	38.6%	5.047	0.080
Girls	38.3%	45.2%	61.4%		
Fathers with higher education ^a	65.1%	53.7%	88.6%	12.852	0.002
Mothers with higher education ^a	79.1%	69.0%	90.9%	6.406	0.041

ASD Autism spectrum disorder, PD Physical disabilities, TD Typically developing; ^ahigher education was defined as completion of undergraduate studies and higher

exact response rate is not known, since the participants could self-refer (e.g., though the user associations).

Procedure and Intervention

The data presented are drawn from a larger study of the SIBS intervention (short for *siblings*), targeting communication between siblings of children with developmental or physical disabilities and their parents (e.g., Fjermestad et al., 2020a, b; Haukeland et al., 2020). The SIBS intervention comprises five sessions delivered over two days with separate sessions for parents and siblings, as well as two joint parent-sibling sessions where parents and siblings talk about aspects of the diagnosis or emotional experiences related to the sibling experience (Fjermestad et al., 2020a, b). Preliminary data from two open studies in Norway and Cambodia, respectively, have suggested that the SIBS intervention has potential in reducing mental health difficulties among parents and siblings of children with developmental and physical disabilities (Fjermestad et al., 2020a, b; Haukeland et al., 2020).

For the current study, families of children with ASD or physical disabilities were drawn from a total sample comprising 126 families of children with chronic disorders participating in the Norwegian study. We used a convenience sample from an early stage of several ongoing SIBS intervention trials. Families of children with ASD or physical disability completed questionnaires about siblings' mental health, siblings' adjustment, and family communication prior to participating in the intervention. In the current study, we only use data from this baseline assessment.

Measures

Sibling Mental Health and Prosocial Behavior

We used the *Strengths and Difficulties Questionnaire* (SDQ; R. Goodman, 1997) to measure siblings' mental health and prosocial behavior. We used three subscales comprising all 25 items of the SDQ: (1) internalizing symptoms (10 items, e.g., *often unhappy, down-hearted or tearful*), (2) externalizing symptoms (10 items, e.g., *often fights with other children or bullies them*), and (3) prosocial behavior (5 items, e.g., *shares readily with other children*) (A. Goodman et al., 2010). Items are rated on a Likert-scale from not true (0) to certainly true (2). The internalizing and externalizing subscales concern mental health problems whereas the prosocial behavior subscale represents strengths. The SDQ has demonstrated adequate psychometric properties ($\alpha=0.66\text{--}0.76$; A. Goodman et al., 2010; Stone et al., 2010). In the current study, children and parents completed the SDQ. Internal consistency analyses showed adequate reliability across subscales and reports ($\alpha=0.63\text{--}0.82$).

Siblings' Adjustment to Their Brothers or Sister's Disability

We used the *Negative Adjustment Scale* (NAS; Lobato & Kao, 2002) to measure siblings' negative adjustment to their brother or sister's disability. The NAS comprises

16 items measuring adjustment in terms of interpersonal relationships, intrapersonal coping, and fear of the disability (e.g., *my brother or sisters problem changes what we can do as a family*) (Lobato & Kao, 2002; Orm et al., 2021; Sahler & Carpenter, 1989). Items are rated on a Likert-scale from never (1) to a lot (4). The NAS has demonstrated adequate psychometric properties ($\alpha=0.69\text{--}0.79$; Haukeland et al., 2020; Lobato & Kao, 2002; Orm et al., 2021). In the current study, siblings of children with ASD and siblings of children with physical disabilities completed the NAS. Internal consistency was acceptable ($\alpha=0.77$).

Communication with Parents

We used the *Parent–Child Communication Scale – Child report* (PCCS-C; Conduct Problems Prevention Research Group, 1994) to measure the degree of openness and emotional support in the parent–child communication. The PCCS-C comprises eight items (e.g., *can you let your father/mother know what is bothering you*). Items are rated on a Likert-scale from almost never (1) to almost always (5). The PCCS-C has demonstrated adequate psychometric properties ($\alpha=0.63\text{--}0.82$; Haukeland et al., 2020; McCarty & Doyle, 2001). In the current study, children from all three groups completed the PCCS-C. Internal consistency was good (about mother $\alpha=0.83$; about father $\alpha=0.82$).

Data Analytic Plan

All statistical analyses were conducted using IBM SPSS 26. Initially, the distribution of each variable was examined using skewness and kurtosis values and Q-Q plots. No variable had considerable deviations from normality (skewness ≥ -1.698 , kurtosis ≤ 2.882). Missing data were $\leq 12.8\%$ for all variables. When excluding participants with non-responding fathers ($n=8$), missing data did not exceed 7.8% for any variable. Thus, it was decided that imputation was not necessary and listwise deletion was used (Bennett, 2001). For the first aim, we used Pearson's correlation coefficient to examine informant agreement and paired *t*-tests to examine differences in means between informants. For the second aim, we performed analysis of variance (ANOVA) to test for group differences in prosocial behavior. Thereafter, we adjusted these analyses for the covariates gender of siblings and parental education in analysis of covariance (ANCOVA). For the third aim, we used linear regression to examine the impact of child-reported internalizing and externalizing difficulties, parent–child communication, and negative adjustment on prosocial behavior among siblings of children with a disability (ASD or physical disability) only. We also performed a post-hoc regression analyses to examine group differences in prosocial behavior. Power analysis using G*Power (Faul et al., 2009) showed that for the ANOVAs, our sample had statistical power of 0.73 for detection of a medium effect size (partial $\eta^2=0.06$) and 0.99 for a large effect size (partial $\eta^2=0.14$). Correspondingly, for the linear regression analyses with four independent variables, our sample (only siblings of children with disabilities) had a power of 0.82 for detection of a medium effect size ($f^2=0.15$) and 0.99 for a large effect size ($f^2=0.35$).

Results

Between Informant's Agreement

Mother- and father-report of children's prosocial behavior correlated significantly ($r(108)=0.57, p<0.001$). Mother-report correlated significantly with child-report ($r(115)=0.23, p=0.013$) whereas father-report and child-report did not correlate significantly ($r(109)=0.12, p=0.224$). Fathers rated their children as significantly less prosocial compared with mothers ($t(109)=1.986, p=0.050$, Cohens $d=-0.19$). There was no significant difference between child-report and parent-reports.

Group Differences in Prosocial Behavior

Table 2 depicts the means and standard deviations for each variable across groups. No significant differences in prosocial behavior were found. Adjusting for the covariates sibling gender and parental educational level confirmed these results.

Correlates of Prosocial Behavior

Regression analyses including sibling internalizing and externalizing difficulties (SDQ), negative adjustment (NAS), and parent-child communication (PCCS) as independent variables showed significant models for father ($F(4,49)=4.041, p=0.007, R^2=0.248, f^2=0.33$) and mother reported ($F(4,55)=4.684, p=0.003, R^2=0.254, f^2=0.34$) prosocial behavior. More child-reported internalizing difficulties and externalizing difficulties associated with less father-reported prosocial behavior (see Table 3). For mother-report, more child-reported internalizing difficulties were associated with less prosocial behavior, whereas higher child-reported communication quality with mother was associated with more prosocial behavior. No significant correlates of child-reported prosocial behavior were found.

Table 2 Descriptive statistics for study variables

Informant	ASD siblings (<i>n</i> =47)		PD siblings (<i>n</i> =42)		TD siblings (<i>n</i> =44)		Scale range
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Father SDQ prosocial	7.63	2.14	8.30	2.37	8.23	1.80	0–10
Mother SDQ prosocial	8.63	1.92	8.70	1.68	8.34	1.83	0–10
Self SDQ prosocial	8.07	1.72	8.39	1.55	8.73	1.11	0–10
Self SDQ internalizing	5.10	3.46	5.07	3.75	3.05	2.78	0–20
Self SDQ externalizing	5.11	3.54	6.31	3.30	3.09	2.50	0–20
NAS	34.42	6.47	32.06	7.85	–	–	16–64
PCCS-C on father	27.89	6.24	28.54	6.50	32.83	4.41	8–40
PCCS-C on mother	31.49	5.11	29.92	6.12	34.27	4.72	8–40

ASD Autism spectrum disorder, PD Physical disorder, TD Without a disability/typically developing

Table 3 Correlates of prosocial behavior among siblings of children with a disability

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>P</i>	95% CI
Father SDQ prosocial					
Self SDQ internalizing	−0.204	0.087	−2.340	0.023*	[−0.379, −0.029]
Self SDQ externalizing	−0.241	0.097	−2.496	0.016*	[−0.436, −0.047]
NAS	0.091	0.054	1.671	0.101	[−0.018, 0.199]
PCCS-C on father	0.037	0.051	0.716	0.477	[−0.066, 0.139]
Mother SDQ prosocial					
Self SDQ internalizing	−0.138	0.057	−2.430	0.018*	[−0.252, −0.024]
Self SDQ externalizing	−0.072	0.059	−1.219	0.228	[−0.190, 0.046]
NAS	0.022	0.031	0.726	0.471	[−0.039, 0.084]
PCCS-C on mother	0.077	0.035	2.186	0.033*	[0.006, 0.147]
Self SDQ prosocial					
Self SDQ internalizing	0.151	0.075	2.001	0.051	[0.000, 0.301]
Self SDQ externalizing	−0.093	0.070	−1.325	0.191	[−0.234, 0.048]
NAS	−0.049	0.042	−1.181	0.243	[−0.133, 0.034]
PCCS-C on father	0.047	0.039	1.187	0.241	[−0.032, 0.126]
Self SDQ prosocial					
Self SDQ internalizing	0.126	0.067	1.879	0.065	[−0.008, 0.260]
Self SDQ externalizing	−0.125	0.069	−1.827	0.073	[−0.263, 0.012]
NAS	−0.036	0.037	−0.960	0.341	[−0.110, 0.039]
PCCS-C on mother	0.018	0.040	0.454	0.651	[−0.063, 0.100]

CI Confidence interval

p*-value ≤ 0.05, *p*-value ≤ 0.01

Post-hoc Regression Analyses of Group Differences in Prosocial Behavior

Since siblings of children with ASD and siblings of children with physical disabilities display more internalizing and externalizing difficulties and poorer quality mother–child communication compared with siblings of children without disabilities (see Table 2), and these variables were related to their prosocial behavior, we conducted two *post-hoc* regression analyses to examine the effect of group when controlling for internalizing difficulties, externalizing difficulties, and mother–child communication. Father- or mother-reported prosocial behavior, respectively, were the dependent variables and parental educational level and sibling gender were included as covariates. Results showed significant models for both father ($F(6, 107) = 3.012$, $p = 0.009$, $R^2 = 0.152$, $f^2 = 0.18$) and mother report ($F(6, 103) = 4.131$, $p = 0.001$, $R^2 = 0.194$, $f^2 = 0.24$). Siblings of children with physical disabilities display significantly more prosocial behavior compared with siblings of children without disabilities according to both father and mother report, whereas siblings of children with ASD displayed more prosocial behavior compared with siblings of children without disabilities according to mother report (see Table 4).

Table 4 Group comparison of prosocial behavior adjusting for correlates and covariates

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI
Father SDQ prosocial					
ASD siblings	0.110	0.513	0.214	0.831	[−0.907, 1.126]
PD siblings	1.108	0.510	2.175	0.032*	[0.097, 2.119]
Self SDQ internalizing	−0.078	0.060	−1.292	0.199	[−0.198, 0.042]
Self SDQ externalizing	−0.147	0.065	−2.160	0.026*	[−0.276, −0.018]
Sibling gender	0.535	0.380	1.410	0.162	[−0.218, 1.289]
Fathers educational level	0.301	0.219	1.371	0.173	[−0.134, 0.736]
Mother SDQ prosocial					
ASD siblings	0.969	0.402	2.410	0.018*	[0.172, 1.766]
PD siblings	0.811	0.393	2.065	0.041*	[0.032, 1.590]
Self SDQ internalizing	−0.057	0.046	−1.243	0.217	[−0.148, 0.034]
PCCS-C on mother	0.103	0.029	3.499	0.001**	[0.044, 0.161]
Sibling gender	0.230	0.310	0.741	0.460	[−0.385, 0.844]
Mothers educational level	−0.008	0.211	−0.036	0.971	[−0.425, 0.410]

CI Confidence interval, ASD Autism spectrum disorder, PD Physical disabilities

p*-value ≤ 0.05, *p*-value ≤ 0.01

Discussion

Our aims were to describe and compare prosocial behavior among siblings of children with ASD and physical disabilities with siblings of children without disabilities, and to examine possible correlates of prosocial behavior among siblings. Few previous studies have examined correlates of prosocial behavior among siblings of children with developmental and physical disabilities, and even fewer have provided the field with comparative data across siblings of children with different developmental and physical disabilities. Thus, our study is an important contribution to the current literature by finding no differences between siblings of children with ASD and siblings of children with physical disabilities and by identifying correlates of siblings' prosocial behavior that can be targeted in interventions.

Both sibling groups displayed similar levels of prosocial behavior as siblings of children without disabilities. However, we found that child-reported mental health (internalizing and externalizing difficulties) and mother–child communication significantly correlated with siblings' prosocial behavior. Importantly, when we adjusted for these variables in the group comparisons, siblings of children with ASD or physical disabilities displayed significantly more prosocial behavior than siblings of children without disabilities. This was according to mother-report, and for siblings of children with PD also according to father-report. These findings underscore the importance of sibling mental health and communication with mothers for siblings' overall psychosocial adjustment, and of considering additional factors when investigating sibling prosocial behavior.

Our hypothesis that siblings of children with physical disabilities would display more prosocial behavior compared with siblings of children without disabilities, was

partially supported. Across informants, no significant difference was found between siblings of children with physical disability and the two other groups without considering mental health and mother–child communication. However, these findings must be considered in light of the fact that siblings of children with physical disabilities have reported higher levels of internalizing and externalizing difficulties and poorer mother–child communication in other studies (Murphy et al., 2017; Vermaes et al., 2012). When adjusting for these variables, we found that siblings of children with physical disabilities displayed more prosocial behavior compared with siblings of children without disabilities according to both father- and mother-report. Thus, our findings suggest that prosocial behavior may be a relative strength in siblings of children with physical disabilities. That is, despite their emotional difficulties and poor parent–child communication, these siblings remain as prosocial as their peers. Our study is thus in line with previous findings, which have suggested that prosocial behavior is a strength in siblings of children with physical disabilities (Perenc & Pęczkowski, 2018; Perenc et al., 2015).

Our second hypothesis, that siblings of children with ASD would display less prosocial behavior compared with siblings of children without disabilities, was not supported. For siblings of children with ASD, this can be considered a positive finding. Siblings of children with ASD represents with elevated levels of autism characteristics (i.e., the broader autism phenotype) compared with the general population, which could hamper their prosocial development (Petalas et al., 2012). In addition, several studies have suggested less prosocial interactions between children with ASD and their siblings compared with other sibling relationships (Kaminsky & Dewey, 2001; Knott et al., 2007). In the current study, when adjusting for higher levels of mental health difficulties and poorer mother–child communication in siblings of children with ASD compared with siblings of children without disabilities, mothers reported more prosocial behavior amongst siblings of children with ASD compared with siblings of children without disabilities. Previous studies comparing siblings of children with ASD with siblings of children without disabilities have found mixed results, and these may be because they have failed to consider additional factors like sibling mental health and communication. Our findings underscore the importance of considering siblings mental health and mother–child communication when investigating prosocial behavior in siblings of children with ASD. Siblings of children with ASD display similar levels of prosocial behavior compared with siblings of children without disabilities, despite displaying higher levels of mental health difficulties and poorer mother–child communication. Siblings' prosocial behavior may thus be a relative strength also among siblings of children with ASD.

We also examined correlates of prosocial behavior. Together, siblings' mental health, adaptation to their brother's or sister's disability, and parent–child communication explained medium to large proportions of the variance in both father- and mother-reported prosocial behavior. Child-reported externalizing and internalizing difficulties and mother–child communication were significant correlates. These variables may be key to identify how prosocial behavior can be further strengthened among siblings of children with developmental or physical disabilities. The associations between externalizing and internalizing difficulties and prosocial behavior is well established (Memmott-Elison et al., 2020). However, it is noteworthy that

child-reported externalizing and internalizing difficulties correlated with mother and father reported prosocial behavior, but not child report. Given that within-informant correlations usually are higher than between-informant correlations (Achenbach et al., 1987; DeYoung, 2006), this was surprising and underscores the importance of including multiple informants in sibling research. Our findings suggest that siblings perceive their prosocial behavior independently of their externalizing and internalizing difficulties, whereas parents perceive siblings as less prosocial with more externalizing and internalizing difficulties present. It could be that siblings rate their general tendency or intention to be prosocial whereas parents rate siblings actual and recently displayed prosocial behavior. Informant discrepancies due to actor/observer differences and differences in rating observable behaviors versus intentions are common (De Los Reyes & Kazdin, 2005).

Our results suggest that emotionally supportive and open mother–child communication is associated with more prosocial behavior (mother report) but that father–child communication has no impact on prosocial behavior (father report). This could be because mothers usually take greater responsibility for child care and are more sensitive to their children’s emotional needs (Hallers-Haalboom et al., 2017; Rankin et al., 2019). When comparing the contribution of the mother–child relationship and the father–child relationship on prosocial development in children, studies have suggested that the mother–child relationship is more important (see Eisenberg et al., 2015 for review).

Generally, we identified few differences between siblings of children with ASD and siblings of children with physical disabilities. Both groups displayed similar levels of prosocial behavior as siblings of children without disabilities before considering their mental health and mother–child communication. However, when considering these variables, siblings of children with physical disabilities showed a more consistent pattern of higher prosocial behavior across both father and mother report, whereas siblings of children with ASD displayed this strength based on mother-report only. This could be because of more autism characteristics amongst siblings of children with ASD and/or due to less prosocial interactions with their brother or sister with ASD (Kaminsky & Dewey, 2001; Knott et al., 1995, 2007; Rum et al., 2020). Moreover, mothers of children with ASD may implicitly compare siblings prosocial behavior with the prosocial behavior of the child with ASD, and this can result in inflated mother-ratings of siblings prosocial behavior (McDonald et al., 2017). Our analyses of informant agreement showed that mothers rated their children as more prosocial than fathers. Thus, it could be that mothers are more inclined to notice and report prosocial behavior compared with fathers.

Limitations and Directions for Future Research

It is important to note that all children in the current study were above 8 years of age. From this age and onwards, children have developed the perspective-taking abilities necessary to empathize with other people’s chronic life conditions (Eisenberg et al., 2015), such as a developmental or physical disability. This ability can prompt prosocial behavior specifically towards the brother or sister with

a disorder, based on his or her disability. In future studies it would be interesting to include a measure specifically assessing prosocial behavior in the sibling relationship, in addition to a general measure of prosocial behavior like the SDQ.

Some limitations of our study are worth noting. First, we lacked data on siblings' levels of autism characteristics and the intrusiveness of the disability of siblings' brother or sister. These variables have been shown to correlate with siblings' psychosocial adjustment in previous studies. Siblings of children with ASD have been found to display different levels of autistic traits (e.g., Ruzich et al., 2016) and knowledge about the levels of autistic traits in our sample would ease the interpretation of the results, particularly regarding the (lack of) group differences. In future studies it would be interesting to include measurement of autistic traits and polygenic risk of ASD to more closely examine how traits and genes influence prosocial behavior (Torske et al., 2020). Second, we relied on child- and parent-reported prosocial behavior. In future studies it would be interesting to include a measure of observer-rated prosocial behavior. Our results show considerable discrepancies between child- and parent-report(s), and an observer-rated measure could provide a more objective measurement of siblings' prosocial behavior. Prosocial behavior probably fluctuates over time and longitudinal studies of the development of prosocial behavior among siblings and associated factors is warranted. Few longitudinal studies of siblings psychosocial adjustment have been conducted (see Fisman et al., 2000 for an exception). Finally, as we recruited participants through various information channels across multiple sites, we could not calculate a response rate, and the representativeness of our sample cannot easily be determined.

Implications for Practice

Our study contributes to a more coherent story about the risks facing siblings of children with developmental and physical disabilities. Whereas there were no differences in prosocial behavior between siblings of children with ASD and physical disabilities, we found that siblings' mental health and family communication are important for siblings' prosocial development. These factors can thus be targeted to enhance strengths in siblings. The relationship between prosocial behavior and mental health difficulties can indicate that prosocial behavior is a protective factor which can be targeted in order to prevent mental health difficulties in siblings. Further, the relationship between mother-child communication and siblings' prosocial behavior can indicate that interventions targeting family communication (e.g., SIBS; Hauke-land et al., 2020) can be beneficial for siblings' social and emotional competencies. Further, our findings underscore the importance of considering siblings psychosocial functioning from a multi-informant perspective, utilizing between-informant rather than within-informant correlations, which may be more robust and provide important knowledge to the field (Kraemer et al., 2003).

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Declarations

Ethical Approval This study was prospectively reviewed and approved by a Regional Committee for medical and health research ethics and all procedures were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all parents of children below 16 years of age and from all participants ≥ 16 years of age.

Conflict of Interest We have no conflict of interest.

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