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BRIEF REPORT

Parenting Programs to Improve Sibling Interactions: A Meta-Analysis

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Sibling relationships have a profound and lasting impact on children's development and parents often seek for ways to optimize them. Programs to guide parents in efforts to improve sibling interactions draw from different perspectives (mainly behavior management and mediation) and advise the use of different techniques (mainly direct children's behavior using reinforcement practices or maintain impartiality and facilitate communication). We systematically searched PsycINFO and MEDLINE for randomized evaluations of parenting programs to improve sibling interactions, to estimate their effects on sibling interactions, and identified eight studies (136 effect sizes): four evaluations of behavior management, three evaluations of mediation; and one evaluation of behavior management combined with mediation. The overall effect of the programs on sibling interactions was substantial ($d = 0.85$, 95% [CI 0.27, 1.43]). Subgroup analyses of more specific outcomes (i.e., positive versus negative interactions, and communication skills, problem-solving skills, and aggression) suggested substantial but imprecisely estimated and heterogeneous effects. Evidence for the superiority of either approach (behavior management or mediation) was unsystematic. Our findings indicate that the parenting program literature for sibling interactions is relatively immature in terms of the number, size, and robustness of studies—substantially lagging behind that of other family interventions. Available studies suggest promising effects, but their small numbers and ample heterogeneity result in imprecise estimations. We call for a more systematic body of evidence to understand the promise and boundary effects of the various parenting program approaches for improving sibling interactions.

Keywords: siblings, parenting program, meta-analysis, behavior management, mediation

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Sibling relationships have a profound and lasting impact on children's development, for better (Pike et al., 2005; Pike & Oliver, 2017) and for worse (Tucker et al., 2019; Wolke & Samara, 2004). Parents often find it difficult to guide the development of healthy sibling relationships (Pickering & Sanders, 2017). Sibling interactions typically shift frequently between positive and negative behaviors and affect (Kramer, 2004), and rivalry and conflict are common (Kramer et al., 1999). Several programs

have been developed to help parents improve siblings interactions. We synthesize the literature on different program types and estimate their effects on sibling interactions.

We explicitly examine program effects on various elements of sibling interactions, encompassing both negative (e.g., aggression) and positive (e.g., problem-solving) behaviors. It has been argued that the often dominant focus on sibling conflict is understandable—severe sibling aggression and bullying have detrimental consequences (Tucker et al., 2019)—but that a narrow focus on sibling conflict hinders a thorough understanding of the nature of sibling interactions (Kramer, 2004). By examining the elements of sibling interactions that parenting programs can more (or less) successfully change, we hope to shed light on the malleability of different elements of sibling interactions (i.e., those that are less or more impacted by parenting behavior) and to contribute to realistic expectations of the merit of parenting programs (i.e., what parents and service provides can and cannot expect from these programs).

Parenting programs for sibling interactions draw from different theoretical perspectives, leading to meaningfully different advice for parents on how to cultivate positive sibling interactions. For example, some programs are based on operant and social learning theory (Bandura 1977; Skinner 1965) and encourage parents to redirect children's behavior using differential attention (rewarding positive sibling interactions and providing negative consequences for negative interactions) and to model positive communication. These

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programs are similar to parenting programs designed to reduce disruptive behavior in individual children (Kaehler et al., 2016). Other programs are based on mediation strategies, with parents acting as an impartial third party facilitating communication and problem-solving (Bush & Folger, 2004; Kressel, 2006). These programs encourage parents not to act as a behavioral agent solving the conflict, but to facilitate children in solving the situation themselves. Parents are taught how to maintain impartiality and guide their children to problem solution. Such meaningfully different advice to parents in different programs raises the question whether one approach is superior to another in improving sibling interactions. In this meta-analysis, we therefore compare the effects of different program approaches on sibling interactions.

Systematic literature reviews of parenting programs for siblings are rare and no statistical syntheses have been conducted to date. Kramer (2004) reviewed evaluations of parenting programs to enhance sibling interactions that were, at that time, mainly nonexperimental. Tucker and Finkelhor (2017) reviewed parent and child-focused interventions to reduce sibling conflict, with the most recent included study published in 2009. One of their key recommendations was to improve our understanding of the optimal content of these programs. With this systematic literature review and statistical synthesis, we strive to advance this understanding by statistically comparing the effects of different approaches. Specifically, we conducted a systematic literature review of parenting programs for sibling interactions to test (a) the overall effects of parenting programs on sibling interactions, (b) the elements of sibling interactions that are most affected by parenting programs, and (c) whether any approach more effectively improves siblings interactions than other approaches.

Methods

Protocol and Registration

We conducted our study in line with the PRISMA guidelines for systematic reviews and meta-analyses. We preregistered our protocol on PROSPERO prior to study coding (reference number CRD42020167776). We did not apply for research ethics committee approval because we used secondary data.

Information Sources, Search, and Eligibility Criteria

We searched PsycINFO and MEDLINE on March 1, 2020, using keywords relating to “sibling” and “parenting” (full search string included as Online [Supplemental Material](#)). We included studies that (a) tested the effects of a parenting program against a passive control condition (i.e., no treatment, wait-list, minimal interventions such as factsheets or non-manualized standard services); (b) adopted an experimental (i.e., randomized) design; and (c) include at least one outcome relating to positive (e.g., sharing, positive affect) or negative (e.g., conflict) sibling interactions. We placed no restrictions on publication date or children’s age, and included all indicators of sibling interaction quality (e.g., conflict, rivalry, positive affect, sharing) as reported by parents, caregivers or children, or as observed by researchers. We included dissertations, but not other gray literature, because conference abstracts and white papers generally do not give enough detailed statistical information to compute effect sizes. We excluded studies evaluating programs

targeting children (instead of parents), such as the More Fun with Sisters and Brothers Program (Kennedy & Kramer, 2008) and Siblings Are Special (Feinberg et al., 2013), because we aimed to examine specifically what parents can do to enhance sibling interactions.

Data Items

We coded several study characteristics (e.g., lead author, year of publication, and country where data were collected), program characteristics (e.g., number of sessions and individual or group format), and sample characteristics (e.g., child age and gender, average levels of socioeconomic disadvantage, and ethnicity). Studies were coded by the first author and double coded by two independent graduate level students. One change was made based on comparing the coding sheets (mean age of one of the study samples).

Regarding the different elements of sibling interactions, the first author listed all sibling interaction outcomes as reported in the individual studies. The first and last author then clustered outcomes into two general clusters: (a) indicators of positive interaction (e.g., sharing, talking calmly, suggesting solutions) and (b) indicators of negative interaction (e.g., aggression, blaming, shouting). For exploratory purposes, they also clustered outcomes into three more specific clusters: (a) communication skills (e.g., talking calmly, taking perspective); (b) problem-solving skills (e.g., suggesting solutions, brainstorming about solutions); and (c) verbal and physical aggression. Because the clusters were pragmatically drawn from the data, they were not double coded based on a priori criteria.

Regarding the different program approaches, the first author screened the studies on the approaches they evaluated to explore different ways to cluster them. There seemed to be a clear distinction between two approaches: behavior management (i.e., parents using technique to direct children’s behavior based on learning theory principles) and mediation (i.e., parents acting as an impartial third party facilitate problem-solving). After deciding to code studies as behavior management, mediation, or both, an independent graduate-level student (not involved in any earlier work on this study) coded the programs based on descriptions in the study reports. Because the approaches were so well-explained in the study reports (e.g., “randomly assigned to mediation and control conditions” and “a transtheoretical intervention that integrates family systems, social learning theory, and a conflict mediation perspective”), agreement with coding by the first author was perfect.

Risk of Bias

Regarding individual studies, we assessed risk of bias using the Cochrane Collaboration tool (Higgins et al., 2011). Based on this tool, we rated studies on: random sequence generation, allocation concealment, blinding of assessors, blinding of providers and families, incomplete outcome data, selective reporting, and other sources of bias. Clear descriptions of random sequences generation and allocation concealment were often not reported. Participant blinding is difficult to achieve in this field, because parents know they attend a program. There was little evidence of bias regarding blinding of assessors, addressing incomplete data and drop-outs (especially newer studies used Multiple Imputation to deal with incomplete data), and selective outcome reporting. We did not test for publication bias. A standard assumption of for example funnel

plots, Egger test, and trim-and-fill tests is the independence of effect sizes. Because it was key to our analysis strategy that we included all relevant effect sizes from each study, these standard tests were not applicable.

Effect Sizes

Effect sizes were expressed as Cohen’s *d* using post-intervention means and standard deviations. When means and standard deviations were not reported, we used proportions (e.g., proportion of conflicts that were resolved) to calculate odds ratios, which were converted to Cohen’s *d* using the logit transformation. We included multiple effect sizes per study if studies measured multiple indicators of sibling interactions.

Analytic Strategy

To test the overall effects, we used robust variance estimation meta-analysis with random effects (Tanner-Smith et al., 2016). This method allows for the inclusion of correlated effect sizes, for example because a study reports effect sizes corresponding to multiple measures of the same construct. We used an assumed intercorrelation of .8, which is standard. This method also corrects for any differences in homogeneity between subgroups by using a common tau squared parameter, averaging heterogeneity between subgroups. We estimated models hierarchically, first considering all effects in one model (Model 1); then considering only effects on improving positive interactions (Model 2a) or in reducing negative interactions (Model 2b); then considering only effects on sibling communication skills (Model 3a), problem-solving skills (Model 3b), or aggression (Model 3c). Finally, we re-estimated Model 1 as a meta-regression, splitting studies focusing on mediation from studies focusing on behavior management, and excluding one study that included both (Model 4), in order to understand whether approach impacts effectiveness.

Robust variance estimation is so named both because it accounts for correlation between effect sizes from the same study and because it is robust to violations of distributional properties. This was useful here because a characteristic of this body of evidence was a number of extreme effect sizes. However, we checked the robustness of our findings for Model 1 by re-estimating this using 1,000 bootstraps and calculating percentile-based confidence intervals.

Results

Our systematic search yielded 3,557 unique hits. After screening the titles and abstracts, 24 studies remained. A further 16 studies had to be excluded, mostly because they used a non-randomized design, or because the program did not primarily target parents. The remaining eight studies (Table 1) are included in our meta-analysis. Our supplemental material shows the PRISMA flow diagram of included studies.

Narrative Synthesis

The studies evaluated two approaches: behavior management (*k* = 4) and mediation (*k* = 3). One study (Linares et al., 2015) evaluated an integrative approach with elements of both behavior management (e.g., time-out for aggressive interactions) and mediation (e.g., identify the problem and try to find a solution for

Table 1
Included Studies and Their Main Characteristics

Author	Year	Approach	Program	#Sessions	Intervention level	Facilitators	N	Child age (M)	% girls	% ethnic minority	Family structure	Assessment	Outcome type
Adams	1992	BM	Time-out and overcorrection	4	Indicated	Unknown	30	1–12 (5.7)	55	0	Unknown	Obs	Aggression
Linares	2015	BM & Med	Promoting siblings bonds	8	Selective	MA level clinicians	22	5–11 (8.2)	48	69	100% foster	Obs and quest	Aggression; pos and neg interaction
Pickering	2016	BM	Triple P	1	Indicated	Researcher	66	3–10 (5.9)	46	30	8% step; 12% single	Quest	Relationship quality
Ross	2014	Med	Mediation	2	Universal	Unknown	58	5–10 (7.4)	54	17	17% divorced	Obs and quest	Conflict discussions
Siddiqui Smith	2004 2007	Med Med	Mediation Mediation	1 1	Universal Universal	Unknown Unknown	48 48	2–6 (4.3) 5–10 (7.8)	49 50	? 2	2% divorced 100% married	Obs Obs and quest	Conflict discussions Conflict behavior and resolutions
Tiedemann	1992	BM	Sharing program	5	Selective	Unknown	48	2–6 (4.3)	49	?	100% married	Obs and quest	Sharing
Vickerman	1997	BM	Reprimands	4	Indicated	Researcher	26	4–12 (8.7)	46	?	15% single	Obs	Coercion

Note. BM = behavior management; Med = mediation; universal = general population; selective = at risk for sibling interaction problems; indicated = mild to severe levels of sibling interaction problems; Obs = observational assessment; Quest = questionnaire assessment.

nonaggressive interactions). Studies evaluating mediation came from the same research group (Ross & Lazinski, 2014; Siddiqui & Ross, 2004; Smith & Ross, 2007) and were more similar in terms of intervention characteristics (one or two individual sessions with instructions and role-play) and outcomes (mainly sibling communication techniques), as well as being more prevention oriented, targeting the general population. Studies evaluating behavior management came from different research groups (Adams & Kelley, 1992; Pickering, 2016; Tiedemann & Johnston, 1992; Vickerman et al., 1997), varied more in terms of intervention characteristics (one to five sessions, group discussions versus individual sessions with instructions) and outcomes (e.g., sharing versus aggression), and were more treatment oriented, targeting parents concerned about children's interactions (Tiedemann & Johnston, 1992) or with identified interaction problems (Vickerman et al., 1997). The study integrating the two approaches (Linares et al., 2015) adopted yet another approach, with a more intensive intervention in foster families.

Studies mainly focused on primary school children, but some were narrower in age range (2–6 years; Tiedemann & Johnston, 1992) than others (1–12 years; Adams & Kelley, 1992). Five studies (63%) reported on families' ethnic background or race, ranging from a few (Smith & Ross, 2007) to over half of the families (Linares et al., 2015) being from a minority. Where percentages of single or divorced parents were reported, the majority of parents was married (e.g., Ross & Lazinski, 2014; Smith & Ross, 2007). One study (Pickering, 2016) reported 8% were stepfamilies. In other words, diversity in family forms was limited, both between and within studies. In line with this, few studies seemed to target specific challenges faced in managing sibling interactions (e.g., for stepfamilies or families dealing with racism), again with the exception of foster families (Linares et al., 2015).

In terms of intervention effects, all studies reported at least some changes in sibling interactions, but most studies (all but one) including multiple outcomes showed a mixture of effects, with some outcomes being affected and others not. Most studies exclusively assessed immediate intervention effects, one study included 6-month (Tiedemann & Johnston, 1992), and one study 2-year, follow-up assessments (Pickering, 2016).

Overall Effects on Sibling Interactions

Drawing on 136 effect sizes reported in eight studies, we found that programs had a substantial beneficial impact on sibling interactions overall ($d = 0.85$, 95% CI [0.27, 1.43], $p < .0107$). Unsurprisingly, this effect was highly heterogeneous ($I^2 = 93%$). We conducted a robustness check using bootstrapped confidence

intervals, to exclude the possibility that the overall effect size was driven by extreme effects sizes. Results stayed the same.

Differential Effects by Sibling Outcome

The overall effect in improving sibling positive interactions (Model 2a), which drew on 79 effect sizes reported in seven studies, was large, but not significant ($d = 1.08$, 95% CI [−0.41, 2.56]) and highly heterogeneous ($I^2 = 95%$). The effect on reduced negative interactions (Model 2b) was substantial, but only of marginal significance ($d = -0.54$, 95% CI [−1.09, 0.01]) and highly heterogeneous ($I^2 = 90%$), drawing on 57 effect sizes reported in seven studies. Findings for sibling communication (Model 3a), problem-solving skills (Model 3b), and aggression (Model 3c) each suggested substantial but imprecisely estimated and heterogeneous effects, drawing on few studies each (Table 2).

Differential Effects by Program Approach

Differences between behavior management programs ($k = 4$) and mediation programs ($k = 3$) were imprecisely estimated and did not give a clear signal of superiority of mediation as compared to behavior management, despite the large regression coefficient suggesting effect sizes tended to be higher for mediation programs ($\beta = 0.56$, 95% CI [−1.06, 2.19]).

Discussion

Parents often seek advice on how to manage sibling interactions. We aimed to advance our understanding of the effects of parenting programs to support parents in this endeavor. We systematically searched for randomized trials of parenting programs to improve sibling interactions and meta-analyzed their overall effect, their effect on different elements of sibling interactions, and the effect of different program approaches.

We found a sizeable effect of parenting programs on improved sibling interactions. While this may not seem surprising—this is what the programs are designed to do—it is encouraging to see this overall effect, because most studies assessed sibling interactions in multiple ways and/or at different time points. The overall effect takes all reported outcomes pertaining to sibling interactions into account, both primary and secondary outcomes, based on observations of sibling interactions (40% of effect sizes), parent report (36%), child report (18%), and other caregiver report (6%). Studies contributed on average 17 effect sizes. Our finding suggests that the techniques advised in these programs (e.g., behavior management

Table 2
Program Effects on Different Elements of Sibling Interactions

Model	Outcome	Pooled effect (95% CI)	I^2 (%)	k (n)
Model 1	All elements of sibling interactions	0.85* (0.27, 1.43)	93	8 (136)
Model 2a	Positive sibling interactions	1.08 (−0.41, 2.56)	95	7 (79)
Model 2b	Negative sibling interactions	−0.54 (−1.09, 0.01)	90	7 (57)
Model 3a	Sibling communication skills	2.83 (−4.33, 10.00)	98	3 (32)
Model 3b	Sibling problem-solving skills	1.37 (−2.75, 5.49)	98	3 (36)
Model 3c	Sibling aggression	−0.27 (−1.57, 1.02)	72	3 (12)

Note. k = number of studies, n = number of effect sizes. I^2 reflects heterogeneity in effect sizes (25% = small, 50% = moderate, 75% = large).

* $p < .05$.

techniques such as praise and time-out, and mediation techniques such as step-wise facilitation of sibling problem-solving) can successfully change sibling interactions, at least in the short run (i.e., most studies measured only immediate program effects).

We could not precisely estimate program effects on specific elements of sibling interactions, due to the large heterogeneity in effect sizes and the often small number of studies and effect sizes for each element. At this stage, the literature is thus inconclusive about the elements of sibling interactions that are less or more affected by parenting programs.

There was no evidence to suggest that either parenting program approach (behavior management or mediation) was more effective than the other. There could be several explanations for this. First, it might be that one approach is superior to the other, but that the number of studies is currently too small, and the level of heterogeneity in effect sizes too large, to identify this. Second, it might be that one approach is superior to the other, but only for certain families or under certain circumstances. In mediation, for example, there must be a basic level of trust to negotiate a solution that maximizes the well-being of the relationship as a whole instead of their own personal preference (Rusbult & Van Lange, 2003). In cases where sibling conflict is more intense, it may be more difficult for parents to act as an impartial mediator. Third, it might be that both approaches work equally well. Different intervention programs often yield similar outcomes (i.e., the “dodo bird verdict”; Elliott et al., 2015). There could be multiple ways to achieve the same change, and despite meaningful differences in the techniques taught, programs may share common elements that contribute to program effects (e.g., empowering parents, strengthening feelings of self-efficacy, and placebo effects; Cuijpers et al., 2019).

If we want to understand the best way to support parents in managing sibling interactions, we need a more systematic literature—a shift from relatively standalone research projects to a coherent science of parenting programs that consistently includes measures of sibling interactions. Especially because many general parenting programs targeting parenting and child development include elements to promote positive sibling engagement. In other words, we need less program-specific and more theoretically interconnected evaluations of parenting strategies that improve sibling interactions, following the lead from the closely related field of parenting programs for children’s conduct problems (e.g., Leijten et al., 2019). In addition, we need to invest in understanding the specific conditions under which different parenting program approaches are most likely to be successful. From parenting programs for children’s conduct problems, we know that problem severity influences what program approaches benefit families most (Leijten et al., 2018). Importantly, such an evidence base can consist of more than traditional randomized trials of complete intervention protocols only. Focused experimental studies evaluating single parenting techniques (e.g., Leijten et al., 2016), or contrasting different techniques (e.g., Adams & Kelley, 1992, included in this meta-analysis), can be an efficient way to improve our understanding of the most effective ways to support parents’ management of sibling interactions.

Other recommendations for the field are (a) consistency in program outcome constructs, to ease comparing findings across trials; (b) addressing the role of parents motivation to change their own behavior in order to help their children navigate their interactions, and how this may relate to different circumstances (e.g., divorce or intense sibling conflict); (c) research on programs

addressing the challenges of different family structures with different siblings relationships (e.g., foster, adoption, and stepfamilies); (d) more longer-term assessments; and (e) evaluations of field-based program deliveries.

Study strengths include the use meta-analytic techniques that allow for statistical integration of all relevant evidence, despite the small numbers of studies. In addition, we tried to explain the identified heterogeneity in effect sizes by examining differential effect by outcomes and by program approach, but at this stage the number of studies is too small, and the evidence too inconclusive, to know whether such differential effects exist.

Some study limitations are driven by limitations of the field itself. First, the number of randomized evaluations of parenting programs for sibling interactions is limited, and the types of outcome measures included are diverse. This makes it difficult to draw more final conclusions about the promise (and limitations) of these programs. Second, we distinguished between behavior management and mediation approach because these approaches came up in the literature. However, other approaches exist, such as parents’ future orientation (e.g., referring to what children can do next time a conflict arises; Recchia & Howe, 2009) and a thorough examination of parenting programs for sibling interactions requires taking all relevant approaches into account. Third, we adopted an “adevelopmental” approach—we did not consider children’s age as a potential moderator, while it might well be that different approaches are more effective at different developmental stages (Kramer, 2004). For example, behavior management techniques such as praise and time-out may work better for younger children who rely more on their parents to direct their behavior, and mediation techniques may work better for older children who have developed the cognitive and language abilities needed for this, and who have a stronger need for autonomy and solving disputes themselves (Wray-Lake et al., 2010). Again, the field currently does not allow for such nuanced analyses, but these are important for the future.

Other study limitations pertain to the choices we made in balancing the pros and cons of different meta-analytic approaches. For example, we included all reported outcomes reflecting the quality of how siblings interact with each other. Yet, some outcomes are arguably more important than others (e.g., the ultimate goal of parental mediation may not be that children are able to generate solutions specifically, but that they are able to communicate in constructive ways more generally). In addition, we chose to only include randomized evaluations of parenting programs. The advantage of this is that we can draw causal conclusions about program effects, but this comes at the cost of including other evaluations (e.g., pre–post or qualitative designs). Similarly, we chose to only include programs that specifically focus on parents (not on children themselves). The advantage of this is that the included studies are more homogeneous, but it does not allow for comparing the additional benefit of parenting programs to child-focused interventions and vice versa.

In sum, parenting programs can successfully change sibling interactions, but the evidence for program effects on specific elements of sibling interactions, and for specific parenting programs approaches, is of yet inconclusive. To advise parents and other stakeholders on the use of parenting programs to improve sibling interactions, we need more systematic lines of research to build an evidence base of how parenting programs to improve sibling interactions can be used to optimize children’s development and family well-being.

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