

Testing Links Between Childhood Positive Peer Relations and Externalizing Outcomes Through a Randomized Controlled Intervention Study

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In this study, the authors used a randomized controlled trial to explore the link between having positive peer relations and externalizing outcomes in 758 children followed from kindergarten to the end of 2nd grade. Children were randomly assigned to the Good Behavior Game (GBG), a universal classroom-based preventive intervention, or a control condition. Children's acceptance by peers, their number of mutual friends, and their proximity to others were assessed annually through peer ratings. Externalizing behavior was annually rated by teachers. Reductions in children's externalizing behavior and improvements in positive peer relations were found among GBG children, as compared with control-group children. Reductions in externalizing behavior appeared to be partly mediated by the improvements in peer acceptance. This mediating role of peer acceptance was found for boys only. The results suggest that positive peer relations are not just markers, but they are environmental mediators of boys' externalizing behavior development. Implications for research and prevention are discussed.

Keywords: externalizing behavior, peer relations, randomized controlled trial, children

Peer relations form an important context for children's behavioral development (for a review, see Rubin, Bukowski, & Parker, 2006). The association between problems in peer relations and antisocial behavior especially has been studied extensively (see overviews by Boivin, Vitaro, & Poulin, 2005; Deater-Deckard, 2001; Hay, Payne, & Chadwick, 2004; van Lier, Vitaro, & Eisner, 2007). Many of these studies on the link between peer relations and behavioral problems focus on two features of problematic peer relations—namely rejection by peers and affiliation with deviant friends (Boivin et al., 2005; Kupersmidt, Coie, & Dodge, 1990; van Lier et al., 2007; Vitaro, Tremblay, Kerr, Pagani, & Bukowski, 1997). However, besides functioning as risk factors, peer relations may also promote a more positive adjustment in childhood and may reduce externalizing behavior. In this study, we focus on this expected positive effect of peer relations in preventing externalizing behavior.

Positive peer relations are theorized to prevent externalizing problems because they provide children a social context in which they can practice social skills, learn social norms and rules, experience social support, and validate a sense of self-worth (Hartup,

1992; Rubin et al., 2006). Indeed, empirical evidence shows that positive peer relations promote children's behavioral adjustment. For instance, children who are highly accepted by their peers show less externalizing behavior and more prosocial behavior than their less accepted counterparts (Cillessen & Mayeux, 2004; Coie, Dodge, & Kupersmidt, 1990). Similarly, children who have friends have been found to be more cooperative and sociable than friendless children (Newcomb & Bagwell, 1998; Parker & Asher, 1993). In addition, aspects of children's involvement with their classmates have been found to protect children against externalizing problems. For instance, van den Oord and Rispens (1999) demonstrated that teacher-rated aggression is low among children who are in classrooms where children have a high proximity (i.e., social closeness) to each other and a large amount of contact with each other.

Positive Peer Relations as Environmental Mediators of Children's Development of Externalizing Behavior

Although the above mentioned studies support the idea that positive relations with peers may protect against externalizing problems in childhood, several issues concerning this relationship remain unclear. First, there is still controversy on the actual influence that peer relations exert on children's behavior (Parker & Asher, 1987). In fact, according to some researchers, peer relations in general are only *markers* of later externalizing outcomes. That is, peer relations are not assumed to influence externalizing behavior but rather serve as an index of behavioral problems (Bukowski & Adams, 2005). Support for this so-called incidental model (Elliott, Huizinga, & Ageton, 1985; Gottfredson & Hirschi, 1990) has been found in studies that showed that childhood peer rejection did not increase children's risk for (early) adolescent externalizing behavior beyond the predictive value of early externalizing behavior (Kupersmidt & Coie, 1990; Pedersen, Vitaro,

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This study was financially supported by ZonMW Grant 26200002. We would like to thank Alfons A. M. Crijnen for his contribution in the initial phase of this study. We would also like to thank the teachers, principals, staff, participating students, and parents for their cooperation during this project.

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Barker, & Borge, 2007). In contrast, others have regarded peer relations as necessary components for externalizing behavior because they mediate the development of behavioral problems (Patterson, DeBaryshe, & Ramsey, 1989). Several longitudinal studies have indeed shown that problems in peer relations, such as peer rejection and victimization, mediate the association between early problem behavior and later antisocial behavior (Ladd & Troop-Gordon, 2003; Snyder, Prichard, Schrepferman, Patrick, & Stoolmiller, 2004; Vitaro, Pedersen, & Brendgen, 2007). These studies indicate that there is some evidence for a true influence of peer relations on children's development of externalizing behavior. However, these studies focused on problematic peer relations. Studies on the role of positive peer relations in the pathway leading to externalizing behavior are very limited.

In addition to the above mentioned evidence from longitudinal studies on the role of peer relations in behavior development, randomized controlled trials (RCTs) provide a unique design to test the role of peer relations in children's behavior development (Howe, Reiss, & Yuh, 2002; Kellam & Rebok, 1992; Rutter, Pickles, Murray, & Eaves, 2001). That is, by trying to manipulate factors hypothesized to underlie externalizing problems, RCTs can test whether such changes—in this study positive peer interactions—mediate the effect of the intervention on the reductions in externalizing problems. Despite the suitability of this design to test developmental theory, there are few studies that used a RCT to test links between peer relations and externalizing behavior. What is more, those studies focused exclusively on problematic peer relations. For instance, Vitaro, Brendgen, Pagani, Tremblay, and McDuff (1999) found that the reduced levels of conduct problems among 13-year-old children who received a preventive intervention was mediated by associations with less deviant friends at ages 10–12 years. Furthermore, van Lier, Vuijk, and Crijnen (2005) showed that reductions in antisocial behavior from age 7 years to age 10 years among children who received a preventive intervention coincided with affiliations with nondeviant friends and a reduced probability of experiencing peer rejection. Thus, there is some evidence from RCTs that peer relations may actually be environmental mediators of change in externalizing behavior. However, as these studies only focused on problematic peer relations, they provided no evidence of positive peer relations protecting against externalizing problems. Therefore, in the present study, the first objective is to use a RCT design to study whether positive peer relations are merely markers or environmental mediators of children's externalizing behavior development.

Different Aspects of Positive Peer Relations

Several indicators of positive peer relations can be identified. For instance, acceptance by peers, number of mutual friends, and proximity to other children have been recognized as conceptually distinct aspects of children's positive peer relations; furthermore, all are associated with low levels of behavior problems (Cillessen & Mayeux, 2004; Coie et al., 1990; Newcomb & Bagwell, 1998; Parker & Asher, 1993; van den Oord & Rispen, 1999). Peer acceptance reflects the judgment from classmates about how well children are liked in the group (Coie & Dodge, 1988), whereas the identification of children's friends reflects children's actual affiliations with peers (Cairns, Cairns, Neckerman, Gest, & Garipey, 1988). A high proximity to others indicates that a child is socially

close to other peers and is well capable of reaching others in a peer network. Each of these indicators of positive peer relations may have a unique link with externalizing behavior. For instance, Ennett et al. (2006) showed that popularity, dyadic friendships, and proximity each uniquely predicted adolescents' substance use. In the present study, we therefore focus on these three aspects of children's positive peer relations by studying whether each is uniquely associated with children's externalizing behavior.

The Child's Sex and the Link Between Peer Relations and Externalizing Behavior

It is well documented that boys show, on average, more externalizing behavior than girls (Moffitt, Caspi, Rutter, & Silva, 2001). Yet, it is still unclear whether the link between peer relations and externalizing behavior is different for boys and girls. Derosier, Kupersmidt, and Patterson (1994) did find that peer rejection was more associated with externalizing behavior for boys than for girls. However, others failed to find sex differences in the link between peer relations and externalizing behavior (van Lier et al., 2005; Vitaro et al., 2007). Therefore, in this study we examine possible sex differences in the link between positive peer relations and externalizing problems.

The Present Study

To summarize, in this article we aim to use a RCT design (a) to study whether positive peer relations are environmental mediators of children's externalizing behavior development; (b) to study whether peer acceptance, the number of mutual friends, and proximity to others each have a unique effect on externalizing behavior; and (c) to explore possible sex differences in the link between positive peer relations and externalizing behavior. These aims were studied in 758 children followed from late kindergarten to the end of second grade. Children were randomly assigned to the Good Behavior Game (GBG; Barrish, Saunders, & Wolfe, 1969; Dolan, Jaylan, Werthamer, & Kellam, 1989), a universal classroom-based preventive intervention, or a control condition. An important modus through which the GBG aims to reduce externalizing behavior and to promote prosocial behavior is by facilitating positive interactions between children through a team-based approach. In the GBG, children are assigned to teams. Team members are encouraged to actively support each other in behaving appropriately, and teams as a whole are systematically rewarded when complying with the explicitly formulated class rules. Because of the active facilitation and rewarding of positive interactions between team members, it is reasonable to assume that these changes in positive peer interactions underlie the effect of the program on externalizing problems. Previous research on the GBG found that the program was indeed effective in reducing externalizing behavior (Ialongo, Poduska, Werthamer, & Kellam, 2001; Kellam et al., 2008; Kellam, Rebok, Ialongo, & Mayer, 1994; Petras et al., 2008; van Lier, Muthén, van der Sar, & Crijnen, 2004). Given these findings, we hypothesize to find reductions in externalizing behavior after 2 years of intervention among GBG children in the present trial, as compared with control-group children. We also hypothesize to find improvements in children's levels of peer acceptance, numbers of mutual friends, and proximity to others among GBG children. Furthermore, we hypothesize to find that these improvements in positive peer relations mediate the reductions in externalizing behavior.

Method

Participants

In the early summer of 2004, 825 Kindergarten children from 47 classes in 30 elementary schools from two urban areas in the western part of the Netherlands and one rural area in the eastern part of the Netherlands were included in the study. All children who moved on to first grade ($n = 742$) and those who repeated first grade ($n = 100$) over the summer of 2004 were eligible for inclusion. Signed parental informed consent for children's participation in the study was obtained for 90% of the children, making the total sample 758 children (50% boys). The average age of participants at the end of kindergarten was 6.0 years ($SD = 0.46$). Of the children, 56% were from a Dutch/Caucasian background, 10% were Moroccan, 10% were Turkish, 6% were Surinam, 5% were from the Netherlands Antilles, and 13% were from other ethnical backgrounds. Furthermore, 38% of the children were from low socioeconomic status (SES) families, which is in accordance with the general Dutch population (36% low SES; Statistics Netherlands, 2007).

Children who moved into the sample between kindergarten and first grade because of grade retention in first grade were similar to study cohort members from kindergarten with respect to sex distribution; probability of being assigned into an intervention class; and their levels of externalizing behavior, peer acceptance scores, number of mutual friends, and proximity to peers in first grade. However, these children were more often of low SES, $\chi^2(1, N = 600) = 4.53, p < .05, \Phi = .09$, and less often of Dutch/Caucasian background, $\chi^2(1, N = 744) = 14.39, p < .05, \Phi = .14$.

A total of 113 children dropped out of the study cohort between first grade and second grade because of grade retention or because they moved to another school. Loss to follow-up was not related to sex, intervention status, number of mutual friends, or proximity to others. However, children who dropped out of the study were more often of low SES, $\chi^2(1, N = 600) = 4.89, p < .05, \Phi = .09$; were

less often of Dutch/Caucasian background, $\chi^2(1, N = 744) = 16.87, p < .05, \Phi = .15$; had higher levels of first-grade externalizing behavior, $F(1, 747) = 21.00, p < .05, d = 0.22$; and had lower peer acceptance, $F(1, 747) = 10.37, p < .05, d = 0.41$.

Design and Procedures

The study coordinator randomly assigned participating classes to one of three conditions: (1) a control condition, (2) a GBG-only condition, or (3) a GBG and parent intervention condition. Because the parenting intervention started after the 2 years of GBG intervention (timeframe of this study), effects of the parenting intervention are not analyzed in this study. The intervention condition therefore contains both conditions of children who received the GBG. Of the 47 classes included in the study, 16 classes ($n = 257$) were assigned to the control condition and 31 ($n = 501$) were assigned to the intervention condition. No differences were found between control and intervention children's sex, number of children who were lost to follow-up, and the area of the country they lived in. However, despite random assignment, control children had lower SES scores, $\chi^2(1, N = 600) = 10.77, p < .05, \Phi = .13$, and were less often of Dutch/Caucasian background, $\chi^2(1, N = 758) = 11.65, p < .05, \Phi = .12$, than GBG children. In Figure 1, we present a flowchart of participants in the RCT.

Teacher-rated data on children's behavior were collected in spring of kindergarten, in spring of first grade, and in fall and early summer of second grade through face-to-face interviews by trained graduate and undergraduate students. In the spring of first grade and in the winter of second grade, face-to-face interview were administered to all participating children by trained graduate and undergraduate students. The peer nominations were embedded in this larger interview on children's psychosocial functioning. All interviews were conducted in a quiet place in the school. Children were assured that their answers would be held confidential. Before

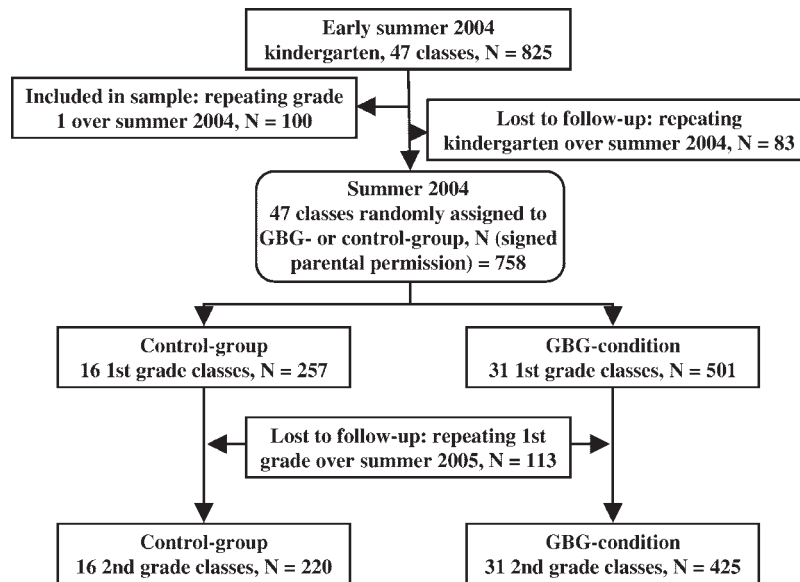


Figure 1. Flowchart of classes and participants in the randomized controlled trial. GBG = Good Behavior Game.

starting with the peer nominations, interviewers ascertained that children knew all the names on the peer nominations roster. Children were then directed to the first nomination, ascertained that they understood the description, and asked to nominate each child who was characterized by the description. Children received a small reward for completing the survey.

Preventive Intervention

The GBG (Dolan et al., 1989; van der Sar & Goudswaard, 2001) is a classroom-based and group-oriented preventive intervention aimed at reducing disruptive behavior and promoting prosocial behavior. Positive peer interactions are facilitated in the GBG by stimulating collaboration between children in teams and by systematically rewarding compliance to positively formulated class rules within teams. On the basis of behavioral observations, teachers assign children to teams with an equal number of disruptive and nondisruptive children. Teams contain of average 4–5 members, and team compositions may change throughout the year. Each team receives a number of cards, and teachers take a card from a team if a team member violates one of the predefined rules. Children in teams are encouraged to actively support each other in behaving appropriately. Teams as a whole are rewarded by receiving tangible rewards when at least one card is left at the end of a 15–60-min period. In addition, students and teams are always rewarded by compliments.

The GBG is implemented in three phases. In the introduction phase, children and teachers are familiarized with the GBG by playing it three times a week for 10 min. In the expansion phase, the duration of the GBG, the settings in which the GBG is played, and the behaviors targeted by the GBG are expanded. Rewards are delayed for a week and then a month. In the generalization phase, prosocial behavior outside GBG moments is promoted by explaining to children that the rules used during the GBG are also applicable, even when the game is not played. These three phases were implemented in both first and second grades. However, because children were already familiar with the GBG in second grade, classes swiftly moved onto the expansion and generalization phase. Teachers received three afternoons of training and 10 annual classroom supervisions by licensed GBG supervisors. After the classroom observations, the GBG supervisors gave feedback to the teachers. Plans for improvements were made if needed. The treatment integrity was checked through conducting these classroom observations of teachers by the licensed GBG supervisors.

Measures

Teacher ratings of externalizing behavior were assessed with the Problem Behavior at School Interview (Erasmus, 2000). Teachers rated pupils' behavior on a 5-point Likert scale ranging from 0 (*never applicable*) to 4 (*often applicable*). Oppositional behavior was assessed by seven items (e.g., "Disobeys teachers' instructions"; "Is stubborn"; $\alpha = .91$). Conduct problems were assessed by 12 items (e.g., "Attacks other children physically"; "Steals"; $\alpha = .90$). Externalizing behavior was the sum of the oppositional and conduct problems scales.

Peer nominations of acceptance were obtained by asking children to nominate an unlimited number of children in their class that they liked most (Coie & Dodge, 1988). The sum of these peer

nominations was divided by the number of children in the class minus one (self-nomination was not allowed) to construct the Peer Acceptance score.

Number of mutual friends was assessed by asking children to nominate their best friends in the class. Unlimited nominations were used. The number of reciprocated friendship nominations of a child were identified and corrected for class size by dividing the number of reciprocated nominations by the class size minus one (self-nomination was not allowed).

Proximity to others was computed by using the network analysis software program UCINET (Version 6; Borgatti, Everett, & Freeman, 2002). We computed children's so-called reach centrality as a measure of their proximity to others. Children's reciprocated friendship nominations in the class were used as input. A graph of each classroom was made in which the points represent children, and the lines are defined as reciprocated friendships between children. The reach centrality of a child is then assessed by computing the distance to all other peers in the class. An infinite distance (i.e., a child is not connected to any other child) is defined to be 0. Reach centrality extends to the number of mutual friends in that it represents the peers that a particular child can reach directly and via his/her reciprocal friends. The maximum score is achieved when a child has reciprocated friendships with all classmates. The reach centrality becomes less when others are reached via two friends, three friends, and so forth. The scores are divided by the largest observed reach centrality value to correct for the size of the classroom.

Teacher ratings of prosocial behavior in kindergarten were assessed with the Problem Behavior at School Interview. Prosocial behavior ($\alpha = .80$) was assessed by four items, including "Helps other children" and "Comforts a child who cries or is sad."

Teacher ratings of social problems in kindergarten were assessed by the 11-item Social Problems scale of the Teacher's Report Form (Achenbach, 1991; Verhulst, van der Ende, & Koot, 1997). Teachers rated pupils' behavior on a 3-point scale (0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very true or often true*). Items include "Cannot get along with other pupils" and "Other pupils don't like him/her." Cronbach's α was .73.

Male sex and *intervention status* were dummy coded (0 = female, 1 = male; 0 = control group, 1 = GBG; respectively).

Results

Descriptive Statistics

The means and standard deviations of externalizing behavior and positive peer relations are in Table 1. Children in the GBG and control conditions showed no differences in externalizing behavior at baseline (i.e., before implementation of the GBG). Children in the GBG condition had significantly lower levels of externalizing behavior than children in the control group in first and second grades. GBG children had significantly higher scores on the indices of positive peer relations than control-group children in the winter of second grade (final assessment). The effect size of mean difference in externalizing behavior (Cohen's *d*) after 2 years of intervention between control-group and GBG children was 0.45 (Cohen, 1988). The effect sizes of mean difference in peer acceptance, having mutual friends, and proximity to other children in the winter of second grade were 0.34, 0.20, and 0.26 respectively. The

Table 1
Means and Standard Deviations of Teacher-Rated Externalizing Behavior and Peer-Nominated Peer Acceptance, Number of Friends, and Proximity to Others for Children in the Control Group and GBG Conditions

Variable	Condition								F test	Effect size	95% CI	Sex F test
	Control				GBG							
	Boys		Girls		Boys		Girls					
M	SD	M	SD	M	SD	M	SD					
Externalizing behavior												
Spring kindergarten (n = 655)	1.72	1.40	1.09	1.01	1.92	1.47	1.26	1.08	3.29	0.16	0.00, 0.31	39.99**
Spring 1st grade (n = 758)	2.01	1.46	1.28	1.17	1.76	1.46	1.09	1.07	4.84*	0.17	0.02, 0.32	45.89**
Fall 2nd grade (n = 645)	2.01	1.42	1.24	1.07	1.51	1.30	1.07	1.02	11.28**	0.28	0.13, 0.43	35.00**
Early summer 2nd grade (n = 645)	2.16	1.50	1.41	1.21	1.40	1.31	1.02	1.17	28.40**	0.45	0.30, 0.60	27.45**
Peer acceptance												
Spring 1st grade (n = 758)	0.21	0.15	0.25	0.15	0.23	0.15	0.27	0.17	3.09	0.13	0.00, 0.28	8.29**
Winter 2nd grade (n = 645)	0.24	0.15	0.32	0.18	0.31	0.18	0.37	0.17	19.24**	0.34	0.19, 0.49	20.22**
Number of friends												
Spring 1st grade (n = 758)	0.14	0.10	0.15	0.10	0.14	0.10	0.14	0.10	0.15	0.00	-0.25, 0.05	0.45
Winter 2nd grade (n = 645)	0.11	0.08	0.13	0.10	0.13	0.10	0.15	0.13	6.64**	0.20	0.05, 0.35	6.37**
Proximity to others												
Spring 1st grade (n = 758)	0.32	0.15	0.33	0.17	0.33	0.16	0.34	0.16	1.61	0.12	0.00, 0.28	1.61
Winter 2nd grade (n = 645)	0.27	0.14	0.28	0.15	0.29	0.16	0.33	0.17	8.43**	0.26	0.11, 0.41	8.43**

Note. GBG = Good Behavior Game; Effect size = Cohen's *d*; CI = confidence interval of effect size.
* *p* < .05. ** *p* < .01.

correlations between externalizing behavior and peer relations are in Table 2.

The Effect of the GBG on Externalizing Behavior

We first tested for GBG effects on growth in externalizing behavior through latent growth modeling using Mplus 4.21 (L. K. Muthén & Muthén, 1998–2007). A growth model with an intercept and linear slope was specified. The intercept of externalizing behavior was parameterized at the last assessment of externalizing behavior (early summer of second grade). In this way, the intercept represents the outcome estimate of externalizing behavior. To test for differences in outcome level of externalizing behavior between

control-group and GBG children, we regressed the intercept on the dummy coded intervention status variable. The slope parameter (i.e., growth in externalizing behavior from kindergarten to second grade) was correlated with the intercept (i.e., outcome level of externalizing behavior). Also, the slope was regressed on all covariates and hypothesized mediating variables. To test whether the models represented the associations in the observed data well, we used the comparative fit index (CFI; critical value > .95), the Tucker–Lewis index (TLI; critical value > .95), and the root-mean-square error of approximation (RMSEA; critical value ≤ .06) (see Hu & Bentler, 1998). Because assignment to intervention was done at the classroom level, we adjusted standard errors for

Table 2
Bivariate Correlations Among Teacher-Rated Externalizing Behavior and Peer-Nominated Peer Acceptance, Number of Friends, and Proximity

Variable	Teacher ratings				Peer nominations					
	1	2	3	4	5	6	7	8	9	10
Teacher ratings										
1. Spring kindergarten externalizing	—									
2. Spring 1st-grade externalizing	.56**	—								
3. Fall 2nd-grade externalizing	.56**	.56**	—							
4. Early summer 2nd-grade externalizing	.52**	.56**	.78**	—						
Peer nominations										
5. Spring 1st-grade peer acceptance	-.29**	-.27**	-.18**	-.22**	—					
6. Winter 2nd-grade peer acceptance	-.32**	-.37**	-.28**	-.28**	.53**	—				
7. Spring 1st-grade number of friends	-.20**	-.16**	-.09*	-.08	.56**	.37**	—			
8. Winter 2nd-grade number of friends	-.19**	-.15**	-.11**	-.12**	.38**	.60**	.35**	—		
9. Spring 1st-grade proximity to others	-.18**	-.16**	-.11**	-.11**	.57**	.44**	.72**	.35**	—	
10. Winter 2nd-grade proximity to others	-.19**	-.14**	-.10*	-.14**	.38**	.57**	.33**	.74**	.41**	—

* *p* < .05. ** *p* < .01.

nesting of the conditions in classrooms by using a sandwich estimator (Williams, 2000).

The growth model of externalizing behavior fit the data well (CFI = .97, TLI = .96, RMSEA = .04). A significant positive estimate of the slope parameter for children in the control group indicated that children who did not receive the GBG showed an increase in externalizing behavior from kindergarten to second grade ($B_{\text{slope}} = 0.21, SE = 0.11$). In accordance with the findings on mean differences in observed scores between GBG and control-group children, a significant negative estimate of intervention status on the growth parameters of externalizing behavior was found ($B_{\text{intercept}} = -0.65, SE = 0.25, \beta_{\text{intercept}} = -.25, p < .05$; $B_{\text{slope}} = -0.35, SE = 0.13, \beta_{\text{slope}} = -.35, p < .01$). These estimates indicate that compared with the controls, GBG children had a reduced growth in externalizing behavior (GBG effect on slope), which resulted in a significant reduction of externalizing problems at the end of second grade (GBG effect on intercept).

Positive Peer Relations as Mediators of the Effect of the GBG on Externalizing Behavior

We then tested for positive peer relations as mediators of the GBG effects on externalizing behavior. We first specified three separate mediation models. In these models, the effect of GBG on peer relations in second grade was estimated by regressing the indices of peer relations on the dummy coded intervention status. The second-grade peer relations scores were also regressed on their first-grade values to control for stability in peer relations. To test whether reductions in externalizing behavior were mediated by increases in positive peer relations, we regressed the growth parameters of externalizing behavior on the second-grade positive peer relations score. We tested the significance of the indirect effect of the GBG on externalizing behavior via peer relation indicators using Sobel’s test (Sobel, 1982). All paths were controlled for male sex and low SES.

Table 3 shows the estimates of the separate mediation models. The model on peer acceptance (CFI = .97, TLI = .95, RMSEA = .06) showed significant improvements in peer acceptance for GBG children ($\beta = .13, p < .01$; see Table 3, GBG → mediator) and a significant path from (improved) peer acceptance to (reduced) rates of externalizing behavior in early summer of second grade ($\beta = -.26, p < .01$; see Table 3, mediator → I_{ext}). There was still a significant path from the GBG to the intercept of externalizing behavior ($\beta = -.14, p < .01$; see Table 3, GBG → I_{ext}), suggest-

ing partial mediation (Baron & Kenny, 1986). We therefore tested for the significance of the indirect path (Sobel, 1982). Results show a significant indirect effect of GBG via peer acceptance ($\beta = -.03, p < .01$; see Table 3).

A higher number of mutual friends (CFI = .97, TLI = .95, RMSEA = .06) was found for GBG children, as compared with controls ($\beta = .11, p < .01$). A direct path of number of mutual friends to externalizing behavior was also found ($\beta = -.11, p < .01$). Still, the effect of the GBG on the intercept of externalizing was significant ($\beta = -.17, p < .01$). We therefore estimated the significance of the indirect path, which was confirmed ($\beta = -.02, p < .05$).

The third mediation model tested the potential mediating effect of proximity to others on externalizing behavior (CFI = .98, TLI = .96, RMSEA = .05). More proximity to others among GBG children was found ($\beta = .11, p < .01$), as well as a direct effect of proximity to externalizing behavior ($\beta = -.12, p < .01$). Again, the direct effect of the GBG on externalizing behavior remained significant ($\beta = -.17, p < .01$). The indirect path of GBG via proximity to the intercept of externalizing problems was, though, significant ($\beta = -.02, p < .05$).

The Unique Effect of Indicators of Positive Peer Relations on Reductions in Externalizing Behavior

After ascertaining that the indicators of positive peer relations were related to change in externalizing behavior when considered separately, we moved on to the multiple mediation model (see Figure 2). Parameter estimates were controlled for male sex, low SES, prosocial behavior, and social problems in kindergarten. Standard errors were adjusted for the nested data. The model had a good fit to the data (CFI = .98, TLI = .96, RMSEA = .03). The standardized regression coefficients of the model are in Figure 3. We found that when the three indicators of positive peer relations were entered simultaneously, only the indirect path from the GBG to externalizing behavior via peer acceptance remained significant (Sobel test: $\beta = -.03, p < .05$). The direct path from GBG to the intercept of externalizing behavior also remained significant, suggesting partial mediation (Baron & Kenny, 1986).

As loss to follow-up was related to externalizing behavior and peer acceptance, we tested whether this nonrandom missing influenced the results. We fitted the mediation model including only children who remained in the study until second grade ($N = 645$). The results of this model were similar to the model on the full sample ($N = 758$). For instance, the indirect path from the GBG

Table 3
Estimates From Separate Mediation Models for Externalizing Behavior

Mediator	Direct effects									Indirect effect		
	GBG → I_{ext}			GBG → Mediator			Mediator → I_{ext}			GBG → Mediator → I_{ext}		
	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
1. Peer acceptance	-0.39	0.10	-.14**	0.05	0.01	.13**	-1.79	0.27	-.26**	-0.09	0.03	-.03**
2. Number of friends	-0.46	0.10	-.17**	0.03	0.01	.11**	-1.19	0.47	-.11**	-0.04	0.02	-.02*
3. Proximity to others	-0.46	0.10	-.17**	0.03	0.01	.11**	-0.87	0.32	-.12**	-0.04	0.02	-.02*

Note. GBG = Good Behavior Game; I_{ext} = intercept of externalizing behavior.
* $p < .05$. ** $p < .01$.

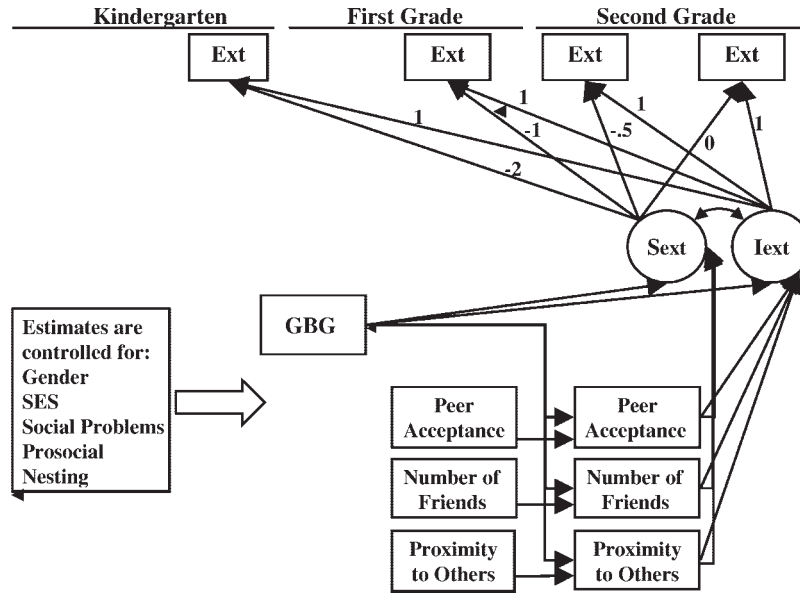


Figure 2. Graphical representation of the multiple mediation model testing the possible associations between the Good Behavior Game (GBG), externalizing behavior (Ext), and positive peer relations. S_{ext} = slope of externalizing behavior; I_{ext} = intercept of externalizing behavior; SES = socioeconomic status.

via improvements in peer acceptance was significant ($\beta = -.03, p < .05$).

A concern of mediation analyses is the interchangeability of mediator and outcome. That is, reductions in externalizing behavior may cause improved peer relations. We tested for this possibility by specifying a model in which externalizing problems in the fall of second grade served as the mediator of improved second-grade peer acceptance. The indirect path from the GBG to peer acceptance via externalizing behavior was indeed significant (Sobel test: $\beta = .04, p < .05$). Thus, the alternative pathway of reductions in externalizing problems causing improvements in peer acceptance cannot be ruled out on the basis of the data.

Sex Differences

To test for possible sex differences in the links found in the multiple mediation model, we specified a multiple-group model in which boys were compared with girls. A significant effect of the GBG on the intercept of externalizing behavior was found for boys ($B_{intercept} = -0.83, SE = 0.26, \beta_{intercept} = -.30, p < .01$) but not for girls ($B_{intercept} = -0.32, SE = 0.24, \beta_{intercept} = -.13, p > .05$). To ascertain that this nonsignificant path was not due to limited power provided by the smaller samples, we tested for the significance of the difference in the parameter estimates using the Wald test. This confirmed the sex difference: $F(2, 1) = 9.33, p < .01$. No sex differences were found in the effect of the GBG on peer acceptance, $F(2, 1) = 0.84, p > .05$, and also not in the effect of positive peer relations on externalizing behavior, $F(2, 1) = 0.27, p > .05$. However, because of lack of GBG effects on externalizing problems among girls, the indirect path of GBG via peer acceptance was only significant for boys ($\beta = -.06, p < .05$).

Discussion

In this study, we examined (a) the role of positive peer relations in children's development of externalizing behavior; (b) whether

peer acceptance, the number of mutual friends, and proximity to others each has a unique effect on externalizing behavior; and (c) whether these results are similar for boys and girls. The results show reduced rates of externalizing behavior among GBG children, as compared with children in the control group. The medium size of effect of the reductions in externalizing behavior after 2 years of intervention ($d = 0.45$) can be regarded as substantial considering that the GBG is a universal preventive intervention. This significant reduction in externalizing behavior adds to previous findings on the effectiveness of the GBG in reducing externalizing behavior (Embry, 2002; Jalongo et al., 2001; Kellam et al., 2008, 1994; Petras et al., 2008; van Lier et al., 2004). We found that reductions in externalizing behavior were specific for boys. This finding is in line with previous GBG studies that showed that reductions in externalizing behavior were primarily observed among boys (Kellam et al., 1994; B. O. Muthén et al., 2002; van Lier et al., 2005). However, this study also found that boys as well as girls in the GBG condition were more accepted by peers ($d = 0.34$), had more mutual friends ($d = 0.20$), and showed more proximity to others ($d = 0.26$) than controls. These results have not been reported previously for the GBG. This study, therefore, confirms and extends results from former GBG studies.

This study also showed that, when considered separately, peer acceptance, number of mutual friends, and proximity to others partially mediated the reductions in externalizing behavior induced by the GBG. However, if all the indicators of peer relations were considered simultaneously, only increases in peer acceptance significantly mediated the impact of the GBG on externalizing behavior. As this role of positive peer relations in the reduction of externalizing problems was studied in a RCT intervention study that aimed to facilitate positive peer interactions (Hinshaw, 2002; Kraemer, Wilson, Fairburn, & Agras, 2002), these findings have several implications.

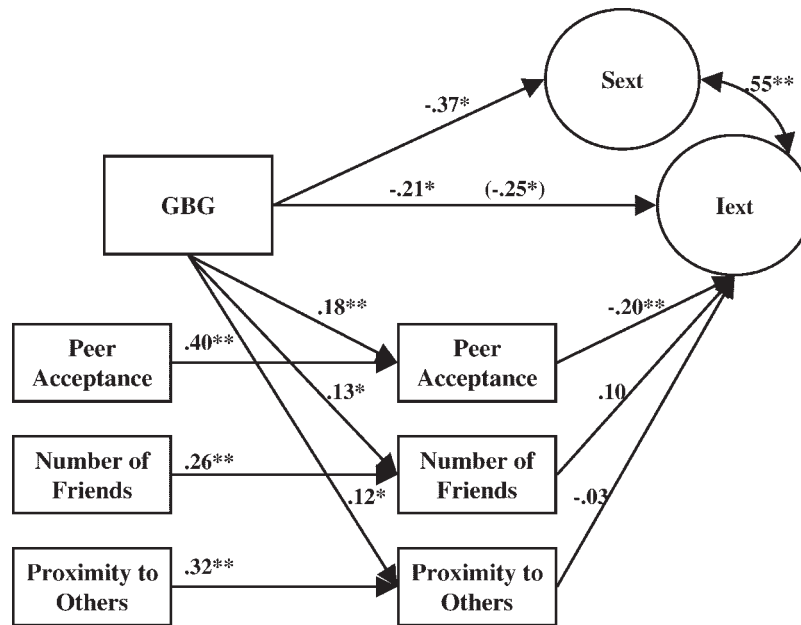


Figure 3. Outcome of the multiple mediation model. All estimates were controlled for male sex, socioeconomic status, social problems in kindergarten, and prosocial behavior in kindergarten. The indicators of positive peer relations in second grade were controlled for their values in first grade. Standard errors were adjusted for nested data within classrooms. The value enclosed in parentheses represents the standardized regression coefficient indicating the effect of the Good Behavior Game (GBG) on the intercept of externalizing behavior in the nonmediation model. S_{ext} = slope of externalizing behavior; I_{ext} = intercept of externalizing behavior. * $p < .05$. ** $p < .01$.

First, our findings are supportive of positive peer relations as environmental mediators of children's externalizing behavior development. This study is thereby consistent with previous research on adverse peer relations as environmental mediators of children's externalizing behavior (Bierman et al., 2002; van Lier et al., 2005; Vitaro et al., 1999). Together with the earlier studies, our findings suggest that indicators of both positive and adverse peer relations should be considered not just as markers, but as environmental mediators of the development of externalizing behavior. However, it must be noted that we found only proof for partial mediation (Baron & Kenny, 1986). Thus, nonincluded variables, potentially influenced by the GBG, should therefore also be considered to fully understand the influence of the program on the development of externalizing problems. For instance, improved classroom structure due to the program may result in reductions in impulsive, attention-deficit/hyperactivity disorder like symptoms, which may also reduce externalizing problems (van Lier et al., 2004). In addition, as the indirect path from the GBG to peer acceptance via externalizing behavior was also significant in the model, the alternative pathway of reductions in externalizing problems causing improvements in peer acceptance cannot be ruled out on the basis of the data. Rather, this could suggest a transactional relation between the development of positive peer relations and externalizing problems, which are both influenced by the intervention.

A second implication regards the notion that number of friends and proximity to other children may not impact externalizing behavior as much as being accepted by peers. It may be that friendships and proximity to others are improved following from

peer acceptance. That is, being accepted by peers can shape conditions under which dyadic friendships and proximity to other children become important for children's behavioral development (Bukowski, Pizzamiglio, Newcomb, & Hoza, 1996). We have to consider, though, that this study focused on the period from kindergarten to second grade. The finding that only peer acceptance mediated the intervention effects when all mediators were considered simultaneously may, as a result, be explained by age differences in the importance of these aspects of peer relations. That is, being accepted by peers may be important especially during the first years of elementary school. In contrast, although close and intimate friendships already emerge in early childhood, they may become more significant for children's development during late childhood and adolescence (Sullivan, 1953; Vitaro et al., 2007).

Finally, we found only significant mediation by peer acceptance for boys. This may imply that especially for boys, having positive relations with peers is of importance when trying to prevent externalizing problems. It is, however, important to note that sex only moderated the effect of the GBG on externalizing behavior problems, not on peer relations. In line with previous research on sex differences in externalizing behavior (Moffitt et al., 2001), girls in this study were found to have a low base rate of externalizing behavior, making reductions in these already low levels unlikely. As boys had higher levels of externalizing problems than girls, they had more opportunities to reduce their externalizing problems. Because we found the effect of the GBG on peer relations to be sex invariant, future research should further test

whether peer relations are sex-invariant environmental mediators of problem behaviors.

This study is not without limitations. First, our results do not imply causal links between children's positive peer relations and externalizing behavior. As we described, although the GBG focuses on peer dynamics in targeting externalizing problems, it cannot be ruled out that other processes account for the found associations. Also, as described in the Results section, the possibility exists that change in children's positive peer relations did not *cause* change in externalizing behavior, but rather, that change in positive peer relations was the *result* of reduced externalizing problems. The interchangeability of mediator and outcome is a well-known problem of mediation analyses. This can be ruled out, for instance, by theory or by using an experimental design (MacKinnon, Fairchild, & Fritz, 2007; Spencer, Zanna, & Fong, 2005). As mentioned, the GBG does not directly target externalizing problems, but rather hypothesized underlying mechanisms, such as the facilitation of positive peer interactions. Children are assigned to teams, and teams as a whole are systematically rewarded for their appropriate behavior. Consequently, it is likely that because peer interactions are manipulated, the change in positive peer relations mediated the reduction in externalizing behavior. Our results thus underscore the importance of peer relations in externalizing behavior development. However, because we did not directly manipulate positive peer relations and because we found support for the alternative mediation model, conclusions on peer relations as the cause of externalizing behavior cannot be made from the present findings.

A second limitation regards the relative short time frame from kindergarten to second grade. A longer follow-up would be needed to test whether the GBG and positive peer relations have long-term effects on children's externalizing behavior. A longer follow-up period is also needed to study whether the findings of this study also apply to later age periods, such as late childhood and adolescence.

A third limitation involves the fact that externalizing problems were rated by the same teachers who implemented the GBG. Consequently, we cannot rule out that teachers in the GBG condition rated the behavior of children different than control-group teachers. However, our results coincide with previous findings of the program on reductions in externalizing behavior and related problems using different informants (peers, self-reports, rater independent measures) up to 13 years of follow-up (Kellam et al., 2008; Petras et al., 2008; Poduska et al., 2008; van Lier et al., 2005).

Despite these and possible other limitations, the present results provide new and valuable insights on the link between childhood positive peer relations and externalizing outcomes and have implications for future research and preventive effort. As we already mentioned, longitudinal studies—spanning childhood and possibly even adolescence—are needed to test whether the results found in this study also apply to later age periods. Longitudinal studies are also needed to test whether initial acceptance by peers remains a unique predictor of externalizing behavior across development, and whether it offsets other processes (such as having more friends and being close to other peers) as important mediators of future externalizing problems. Also, our results imply that future studies should, besides including indices of poor peer relations as risk factors, also include indicators of positive peer relations as pro-

motive factors for children's adequate behavioral development. Finally, our results underscore the importance of enhancing positive relations between children in early elementary school. Positive effects of the GBG on reductions in externalizing behavior have been found in a number of rigorously executed RCTs on different samples (e.g., inner city population, general population sample) and in different countries (e.g., the United States, the Netherlands). Given the focus of the GBG, this implies that, indeed, creating a classroom environment that facilitates children's positive interactions with each other is an important component in preventing externalizing problems in early elementary schoolchildren.

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Received March 28, 2008

Revision received October 23, 2008

Accepted November 5, 2008 ■

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