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Chapter 6

Child Coping and Parental Involvement as Working Mechanisms of Intervention Effects on Behavior Problems in Children with Chronic Illness

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ABSTRACT

Objective: Changes in child use of disease related coping skills and quality of parent-child interactions were tested as mediating mechanisms through which a cognitive behavioral group intervention for children with chronic illness and their parents induced changes in child problem behaviors. In addition, it was tested whether parental involvement in the intervention strengthened the effects of mediators on outcomes.

Methods: Data from a randomized controlled trial were analyzed, including 194 children (8-18 years) who were assigned to a child-only intervention, a parent-child intervention or a waitlist control group. Mediator variables included self-reported use of information seeking, positive thinking, social competence, parent reported child use of coping skills, and observed quality of parent-child interaction. Longitudinal multilevel regression with a cross-lagged design tested mediating pathways between intervention conditions and change in parent and child reported internalizing and externalizing behavior problems on 6 and 12-months follow-up.

Results: Analyses revealed that parent-reported child coping skills and social competence mediated respectively the effect of the child-only intervention and the parent-child intervention compared to the waitlist. Involvement of parents in the intervention strengthened the effect of coping skills on behavioral outcomes.

Conclusion: Results emphasize that improvement in disease related coping skills are working mechanisms of a group-intervention for children with chronic illness. Parental involvement in the intervention seems a promising way to promote the use of coping skills in daily life, resulting in child adjustment on the long term.

INTRODUCTION

Children with chronic physical illnesses are at heightened risk for behavioral maladjustment, and are therefore in need of effective interventions (Barlow & Ellard, 2004; Beale, 2006; Pinquart & Shen, 2011). Given the nature of the risks for this population, approaches based on cognitive behavioral techniques as well as involving parents appear most promising (Thompson et al., 2011). A recently randomized controlled trial (RCT) of a standardized group intervention for children with various chronic illness, called 'Op Koers' (in English: 'On Track'), used cognitive behavioral techniques and showed reductions in internalizing and externalizing behavior problems. These effects were more persistent if the parents were given a parallel group program (Scholten et al., 2013). Confidence in a particular intervention approach not only derives from demonstrations of its effects on the target outcome, but also derives from demonstrations that specific elements of the intervention are responsible for the effects (Kraemer et al., 2008; La Greca et al., 2009). Studies that investigate mediators of change are scarce in pediatric literature, specifically studies that search for explanations of why and under what circumstances parent programs might be of added value.

Testing for mediation of intervention effects requires a number of conceptual and methodological considerations (Maric, Wiers, & Prins, 2012). With regard to the choice of mediator variables, it is recommended to study those concepts that are both theoretically and empirically relevant for intervention outcomes and targeted in the intervention. In the literature on adjustment to chronic illness, the role of coping has received ample empirical attention (Wallander & Varni, 1998; Compas, Jaser, Dunn, & Rodriguez, 2012). Based on a model of control-based coping, secondary control strategies (efforts to adapt to the source of stress) were shown to be effective in adapting to chronic illness, while disengagement coping (efforts to avoid or deny the stressor) appeared associated with poor adjustment (Compas et al., 2012). Children who coped with stressors by employing positive thoughts or activities had lower levels of internalizing problems than children who used disengaged coping strategies, such as self-criticism and social withdrawal (Compas et al., 2006; Spirito et al., 1994). To diminish or prevent behavior problems, programs might promote secondary control coping skills, such as information seeking, positive thinking and social competence. As yet, it is unclear to what extent the impact of interventions on these coping skills consequently leads to reduction of behavior problems.

In order to change coping strategies of children with chronic illnesses, interventions typically include cognitive behavioral based techniques such as cognitive restructuring and exposure (Thompson et al., 2011). Such interventions have shown reliable effects on outcomes, albeit with small effect sizes especially on the long term (Kibby et al., 1998; Plante et al., 2001). Interventions may be given at a time when maladaptive coping strategies have already developed and are integrated in children's emerging personality and social-emotional functioning. Unless the new coping strategies become



integrated as well, children may over time fall back on the strategies they were most familiar with. To continue practicing and internalizing newly learned skills, support from parents might be helpful. Indeed, the added parent group in 'Op Koers' contributed to the persistence of the effects (Scholten et al., 2013). An important question therefore is whether the additional value of the parent program can be explained by continued use of coping skills, especially after the end of the intervention.

Another mechanism through which parent intervention programs might produce effects is through improvements in parent-child interactions. Positive parent-child interactions have been associated with less internalizing and externalizing problems in children with chronic illness (McKernon et al., 2001; Lothman & Pianta, 1993). Intervention programs for parents frequently include various techniques to improve parenting behaviors, such as responsiveness and emotional communication (Kaminski, Valle, Filene, & Boyle, 2008). Positive interactions and emotional communication with children have shown to be important working mechanisms of parent interventions (Kaminski, et al., 2008), and relevant for children's coping with distress (Willemen, Schuengel, & Koot, 2009). Based on this, positive parent-child interactions might offer an alternative mechanism to explain the effects of intervening with parents of children with chronic illnesses.

The objectives of the current study were to examine whether improvements in disease related coping skills and positive parent-child interactions were the mechanisms through which the 'Op Koers' intervention induced improvements in internalizing and externalizing behavior, and to test whether the additional program for parents of children with chronic illness strengthened this mediating effect. It might be hypothesized that parental involvement not only encourages learning of coping skills but also using the coping skills in child daily life, which in turn strengthened the effects of coping skills on behavioral outcomes. Parental involvement in the intervention might enhance the possibilities for parent-child dyads to discuss and co-regulate children's emotions, which may protect against the development of emotional and behavioral problems. Therefore, in the current study, we also tested whether parental involvement in the intervention moderated the link between coping skills and behavioral outcomes. To establish mediation of the intervention effect, assessments of changes in the mediators temporally preceded the measurement of changes in behavior (effect outcomes) and a waitlist control group was used as comparison group.

METHOD

Participants

Participants were 194 children with chronic illness recruited from outpatient clinics of three academic hospitals, four nonacademic hospitals, and two primary schools for

children with CI in the Netherlands. Children's ages ranged from 7.52 to 18.07 years (mean age = 12.03 years, $SD = 2.68$); 50% were girls. The majority of the children and their parents were born in the Netherlands ($n = 133$, 69%), had a medium to high income ($n = 137$, 70%), and lived in a two-parent household ($n = 155$, 80%). Children were under medical care for 45 different diagnoses. The five most common diagnoses were: type 1 diabetes ($n = 57$, 29%), auto-immune diseases ($n = 24$, 12%), kidney disease ($n = 24$, 12%), inflammatory bowel disease ($n = 19$, 10%), and asthma ($n = 18$, 9%). Excluding somatic complaints from the internalizing scale, 48% of parents and 15% of children reported internalizing baseline problems within the subclinical or clinical range. Percentages of externalizing baseline problems within subclinical or clinical range were 19% based on parental report, and 4% based on child-report.

Six months after the start of the intervention, families were asked to participate in the parent-child interaction task (see Measures below). Informed consent was given by 115 families (59%), including 58 boys and 57 girls with a mean age of 11.90 years ($SD = 2.95$; range 7.52-18.07 years). Nonparticipation was explained by lack of interest (26%), being unreachable by phone (29%), schedule problems (15%), or unknown reasons (30%). Compared to non-participating families, participants were significantly more frequently randomized to the parent-child intervention condition, originated from high SES and from two-parent families, and less frequently from the school setting ($p < .05$). Participants were equally spread across the conditions: child-only (38%), parent-child condition (31%), waitlist (30%). No differences between participants and non-participant were found on the outcome or coping skills variables ($p > .05$).

Design and procedures

A multicenter randomized controlled trial was designed in accordance with the Consolidated Standards of Reporting Trials statement (Schulz et al., 2010). Additional details of the study inclusion criteria, procedures, randomization and flow-chart were reported in Chapter 3 and 4. Participants were block randomized into either two or three of the following study-groups: 1) the 'Op Koers' child-only intervention, 2) 'Op Koers' with a parallel parent program, and 3) a waitlist control group. To allow statistical modeling of change in the mediators and outcomes, data were collected at four time points. We followed the recommendations of Maric and colleagues (2012) about temporal precedence. We used the mediator scores (disease related coping skills) at the first three measurement occasions: baseline, directly after the intervention, and at 6-month follow-up (Table 6.1). Parent-child interactions (mediators) were observed at 6 month follow-up. For the outcomes (internalizing and externalizing problems), the scores at baseline, 6 months follow-up, and 12 months follow-up were used. Subject retention to study completion was 82%.



Interventions

Children in both intervention groups received the same group course consisting of six weekly 90-minute sessions, and a booster session after 6 months, with four to eight participants per group ($M = 5.04$, $SD = 0.89$). Two qualified psychologists carried out the intervention, based on a detailed manual. All psychologists ($n = 35$) were extensively trained in the protocol. Five coping skills were taught: 1) seeking and giving information about the disease, 2) using relaxation techniques during stressful situations, 3) increasing knowledge of self-management and medical compliance, 4) improving social competence, and 5) positive thinking (Last et al., 2007; Scholten et al., 2011). Two slightly different versions of the protocol were developed, one for children at primary school age (8–12 years old) and another for adolescents (12–18 years old).

The parent intervention consisted of six 90-minute sessions parallel to the child sessions, also led by two psychologists, and based on a detailed protocol. Parents were reinforced in sensitively attending to their children's needs, and in positive parent-child interactions (Scholten et al., 2011). All sessions took place in the hospital/school where the child was recruited.

Measures

Outcome variables

Behavior problems were assessed with the Parent Report Form (PRF; 4–18 years) of the Child Behavior Checklist, and the Youth Self Report (YSR; 11–18 years) (Verhulst, 1996; Verhulst, 1997). Questionnaires consisted of 120 (PRF) and 119 (YSR) problem items, and a three-point Likert scale (from 0 indicating “not true” to 2 indicating “very true or often true,” considering behavior during the past six months). We used the two broadband scales; “Internalizing Problems” and “Externalizing Problems”. The “Internalizing Problems” scale (range: 0–42) included the subscales “Anxious/depressed” and “Withdrawn/depressed”. Items from the subscale “Somatic Complaints” were disregarded (Perrin et al., 1991). The Externalizing Problems scale (PRF range: 0–70, YSR range: 0–64) included the subscales “Rule-breaking behavior” and “Aggressive behavior”. Higher scores indicated more problems. Cronbach's alphas for the PRF and YSR internalizing and externalizing scales ranged from .84–.91, which were satisfactory and comparable with those reported for the full version (Verhulst, 1996; Verhulst, 1997).

Mediator variables

Disease-related coping skills were assessed with the 26-item Questionnaire Op Koers for children (QOK-c) (Last et al., 2007; Scholten et al., 2011). On a four-point scale, children were asked if they agreed with statements concerning the five coping skills (e.g., “I know how to get answers to questions concerning my disease” or “When I am nervous to go to the hospital, I am able to relax myself”). Items were averaged

per skill. Higher scores reflected better use of skills. In the current study we used the subscales: information seeking (5 items: $\alpha = .69-.70$), social competence (5 items: $\alpha = .60-.73$), and positive thinking (3 items: $\alpha = .66-.72$). The skills relaxation and medical compliance were not used because of insufficient internal consistencies ($\alpha = .40-.64$). In addition we used a parent-reported scale to measure child coping skills (QOK-o). On a four-point scale, parents were asked if they agreed with five statements about their child concerning the five coping skills (e.g., “My child knows how to get answers to questions concerning his/her disease” or “If my child is not able to participate because of his/her illness, he/she explains that clearly to others”) (5 items: $\alpha = .62-.71$).

Parent-child interactions were measured with a 30-minute semi-structured observation paradigm in which parent and child collaborated on three structured tasks: (1) getting marbles into the holes of a labyrinth (the parent and the child each have one knob to control), (2) naming coping solutions for hypothetical situations using three different vignettes, and (3) talking about personal disease related emotions and solutions (child chooses a topic from a list, e.g., painful medical procedure, being victimized by classmates, missing school because of illness). These tasks were selected in line with the learning goals of the parent-child intervention. Parent, child, and the dyadic (reciprocal) interactions, to be allocated to eleven scales, were coded on 5-point rating scales, originating from the coding scheme of the Family Interaction Task (Weinfield, Ogawa, & Egeland, 2002; Willemsen et al., 2011). Exploratory factor analysis on the eleven scales supported four factors (77% explained variance). Two factors were chosen to reflect the two constructs with theoretical relevance for their contribution to child adjustment. The factors were: (1) positive parent-child interactions (35% explained variance), reflecting mutual eye contact and smiles, dyadic engagement and persistence, and teamwork (Cronbach’s alpha .86, four rating scales), and (2) parental support (14% explained variance), referring to parental listening and encouraging, quality of help and assistance, and emotional support (Cronbach’s alpha = .77, 3 rating scales).

All sessions were observed by four coders (Master students in psychology) who were naïve to information on study-group. All sessions were double coded. The interrater reliability was adequate ($N = 115$, ICC $M = .71$, range .62 – .78)

Data Analyses

Analyses were performed on an intention-to-treat basis, meaning that all data from the moment of randomization were used. Preliminary analyses examined participant baseline differences between groups on all study variables. The longitudinal design of this study, together with the nested data structure of children within intervention groups and centers (hospital/school), required multilevel analysis. Data were analyzed using a maximum-likelihood estimation procedure, which estimates all model parameters simultaneously to maximize the likelihood that the data were derived from the population. The mixed models procedure in SPSS20.0 was used. Intraclass correlations indicated dependency within measurement occasions ($ICC > .05$), but not within intervention



groups and centers. Therefore, it was only needed to account for dependency within children (assessment occasions) in the multilevel analyses.

For testing mediating effects, the approach of MacKinnon (2008) was followed. Mediation was ascertained by examining the joint significance of two paths: (1) the path from the intervention to the mediator (path *a*, see Figure 6.1), (2) the path from the mediator to the outcome (path *b*, see Figure 6.1) accounting for the direct effect of the intervention on the outcome. Path *a* and *b* were tested with separate models. Then, to establish mediation, if both paths appeared to be significant, significance of the indirect effect (the product of the coefficients of path *a* and path *b* was determined by Sobel test, following the recommendations for a multilevel framework (Krull & MacKinnon, 1999).

To test path *a*, a model was built with the mediator as dependent variable. A stepwise procedure was used to model individual growth curves following the recommendations of Singer and Willet (2003) (see also Chapter 4), and the same procedure was repeated for each mediator separately. In Step 1, an empty model with an autoregressive within-subjects (co)variance structure was fitted to the data. In Step 2, time (assessment occasion) was added as a random effect to model individual growth curves. We expected a stronger decrease in behavior problems during the intervention period than during the follow-up period; therefore, a quadratic effect of time was added to the linear effect of time. In Step 3, background variables were added as fixed effects, and were subsequently removed if found to be not significantly related to the mean level or change in the dependent variables (see Chapter 4). In Step 4, study-group and the interaction between group and time were entered into the model. Step 4 was carried out twice, to test whether the effect of study-group applied for (1) the effect of the child-only and the parent-child intervention groups compared to the wait list as a reference category, and (2) the parent-child intervention compared to the child-only intervention as a reference category. The parameter estimate and variance of the fixed effect of study-group were used as indices for path *a*.

To test path *b*, the same stepwise procedure (Step 1 to Step 4) was followed to build a model with behavior problems as dependent variable, and repeated for each outcome variable separately. In Step 5, the mediator was added to the model. The values on the mediating variable directly after the intervention and at six months follow up were lagged, indicating that they predicted the outcomes at the next time point. Each mediator was tested in a separate model. The parameter estimate and standard error of the mediator were used as indices for path *b*. In Step 6, the interaction between the mediator and study-group was added, to test whether parental involvement moderated the effect of coping skills on the outcomes.

At each step, differences in fit between nested models were evaluated using the χ^2 difference test for deviance values (-2 Log-Likelihood). Progression through the steps was based on the significance of the χ^2 difference test. If the model fit improved, the multivariate statistics of the predictors were interpreted. An alpha of .05 was used to test the statistical significance of the effects.

Explained variances of the mediators were computed by dividing the total variance of the step 5 models by the variance of the step 4 model (study-group), and subtracted from 1 (Snijders & Bosker, 2004). Given the value of R^2 , Cohen's f^2 was calculated to indicate the effect size. Effect sizes of ≤ 0.02 were considered small, effect sizes of approximately 0.15 were considered moderate, and effect sizes of approximately 0.35 were considered large (Cohen, 1988). Post hoc power calculations were adequate for the models that tested mediation for parent-reported internalizing problems (.76-.99), but somewhat lower for the model with information seeking on self-reported internalizing problems (.45) and parent reported coping skills on parent-reported externalizing (.25) and self-reported internalizing problems (.59). Post hoc power calculations for the significant moderation models were somewhat lower for the link between parent reported coping skills and parent reported externalizing (.60) and self-reported internalizing problems (.70), but adequate for the other models (.99).

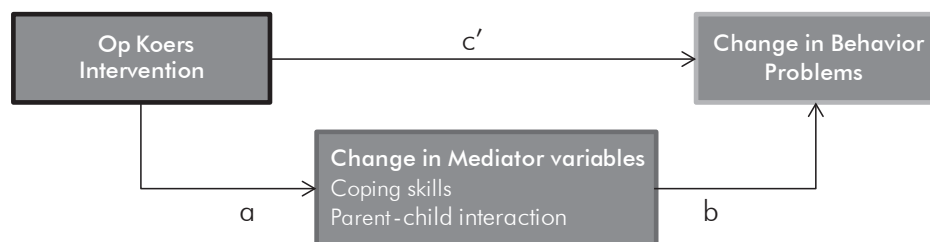


FIGURE 6.1 Conceptual Model of Mediation and Moderation Pathways of Treatment Effects on Child Outcomes. Path a represents the direct effect of the intervention on the mediator. Path b represents the direct effect of the mediator on the outcome, accounting for the direct effect of the intervention on the outcome. Path c' represents the direct effect of the intervention on the outcome, accounting for the direct effect of the mediator on the outcome.

RESULTS

Preliminary analyses

Means and standard deviations of the outcomes and mediators at the applicable measurement occasions are presented in Table 6.1. Despite randomization, there were significant differences between study-groups in age, illness severity and parent-reported internalizing scores at baseline, with participants in the parent-child intervention scoring higher than participants in the other groups ($p < .05$). In addition, parent-child intervention was more frequently performed in academic hospitals than in the nonacademic hospitals or school settings. Because setting (academic hospital vs non-academic hospital) and illness severity were also significantly positively associated with the level of parent-reported internalizing problems, and age and illness severity with the level of self-reported internalizing problem, we controlled for those variables in the multilevel analyses.



TABLE 6.1 Means and Standard Deviations of Child Psychosocial Outcomes and Mediators.

Measures	Baseline			Direct after intervention		
	N	Range	M (SD)	N	Range	M (SD)
Outcomes						
PRF internalizing ¹	178	0-27	8.65 (5.95)	-	-	-
PRF externalizing	178	0-35	8.42 (7.21)	-	-	-
YSR internalizing ¹	110	1-33	9.91 (6.77)	-	-	-
YSR externalizing	110	0-27	8.28 (5.88)	-	-	-
Mediators						
Coping skills						
Information seeking SR	184	1.50-4.00	3.05 (0.64)	169	1.83-4.00	3.25 (0.54)
Social competence SR	184	1.17-4.00	2.90 (0.61)	169	1.33-4.00	3.05 (0.55)
Positive thinking SR	184	1.00-4.00	2.82 (0.76)	169	1.00-4.00	3.03 (0.73)
Total coping skills PR	176	1.00-4.00	2.63 (0.67)	161	1.50-4.00	2.82 (0.59)
Parent-child interaction						
Positive interactions O	-	-	-	-	-	-
Emotional communication O	-	-	-	-	-	-

PRF = Parent Report Form, YSR = Youth Self Report, CR = Child report, PR = Parent Report, O = Observation ¹Excluding the "somatic complaints" scale.

Effects of Intervention on changes in Mediators (path a)

Regardless of study-group, all disease-related coping skills improved significantly over time [information seeking ($B = .17, p < .001$), social competence ($B = .09, p < .001$), positive thinking ($B = .19, p < .001$)]. The parent-child intervention predicted stronger increases in information seeking, social competence, and positive thinking, compared to the wait-list group (Table 6.2). The child-only intervention predicted stronger increases in parent reported coping skills compared to the waitlist. Comparisons between the parent-child and the child-only intervention were marginally significant ($.051 \leq p \leq .083$). Increases in information seeking and social competence were non-significantly stronger in the parent-child intervention, while effects on parent-reported total coping skills tended to be in favor of the child-only intervention.

The effect of study-group on positive parent-child interactions was not significant, neither the effect on parental support (Table 6.2).

Effects of mediators on changes in outcomes over time (path b)

Regardless of the study-group, parent and child reported internalizing and externalizing problems decreased significantly over time (Chapter 4). As shown in Table 6.3, increases in coping skills were significantly associated with decreases in the outcome variables, independent of the direct effect of study-group. Improvements in information seeking, social competence, and positive thinking were associated with stronger decreases in parent reported internalizing and externalizing problems, and child-reported

6 months follow-up			12 months follow-up		
<i>N</i>	Range	<i>M</i> (<i>SD</i>)	<i>N</i>	Range	<i>M</i> (<i>SD</i>)
167	0-25	7.09 (5.42)	149	0-23	6.71 (5.49)
167	0-33	7.28 (6.89)	149	0-32	6.46 (6.36)
122	0-28	8.26 (6.75)	116	0-33	7.02 (6.40)
122	0-33	8.00 (7.08)	116	0-37	7.24 (7.21)
170	1.67-4.00	3.38 (0.53)	-	-	-
170	1.50-4.00	3.06 (0.55)	-	-	-
170	1.00-4.00	3.17 (0.77)	-	-	-
165	1.75-4.00	2.92 (0.55)	-	-	-
115	1.75-5.00	3.64 (.62)	-	-	-
115	2.00-5.00	3.45 (.66)	-	-	-

internalizing problems. Improvements in parent reported total coping skills were associated with stronger decreases in parent reported internalizing and externalizing problems. None of the coping skills were associated with changes in self-reported externalizing problems.

Positive parent-child interactions were significantly associated with a stronger decrease in parent reported internalizing problems, but a weaker decrease in parent reported externalizing problems. Parental support was not significantly related to change in the outcomes.

Testing Mediation of Intervention Effects on Outcomes

Table 6.4 shows the joint significance, that is the models with significant effects for path a as well as path b. Sobel-Z tests were performed when joint significance was achieved (Table 6.4). Results indicated that improvements in social competence significantly mediated the effect of the parent-child intervention (versus the waitlist) on parent reported internalizing and externalizing problems, and on self-reported internalizing problems. Mediating effects of improvements in information seeking and positive thinking were marginally significant ($.053 \leq p \leq .113$) for the effect of the parent-child intervention (versus the waitlist) on behavioral outcomes (Table 6.4). Parent reported total coping skills significantly mediated the effect of child-only (versus waitlist) on parent reported internalizing problems. Explained variances and effect sizes of the mediators were shown in Table 6.4.



TABLE 6.2 Effects of Intervention Programs on Changes in Child Coping Skills and Parent-child Interaction (Path a)

Mediators	Child-only vs Waitlist			Parent-child vs Waitlist			Parent-child vs Child-only		
	B	S.E.	p	B	S.E.	p	B	S.E.	p
Information seeking	0.17	0.28	.551	0.78	0.31	.013	0.61	0.31	.051
Social competence	0.48	0.26	.064	0.98	0.28	.001	0.50	0.28	.083
Positive thinking	0.52	0.43	.222	1.00	0.48	.036	0.48	0.48	.315
Total coping skills	0.14	0.06	.013	0.03	0.06	.658	-0.11	0.06	.058
Positive parent-child interaction	-0.16	0.13	.213	-0.26	0.14	.065	0.10	0.13	.449
Parental support	-0.15	0.14	.295	-0.30	0.16	.062	0.14	0.15	.333

B's are the unstandardized estimates from the multilevel model and represent the association between intervention programs and changes in mediators (study-group*time). Differences between intervention programs were tested in the same model. All effects were controlled for the main effect of time and study-group.

TABLE 6.3 Effects of Changes in Child Coping Skills and Parent-child Interaction as Mediators of Intervention Effects on Change in Child Outcomes (Path b)

Mediators	PRF INT ¹			PRF EXT			YSR INT ¹			YSR EXT		
	B	S.E.	p	B	S.E.	p	B	S.E.	p	B	S.E.	p
Information seeking	-1.05	0.43	0.015	-1.06	0.43	0.013	-1.53	0.52	0.003	-.38	.52	.472
Social competence	-1.47	0.44	0.001	-1.17	0.45	0.010	-2.61	0.57	0.000	-.58	.58	.317
Positive thinking	-1.63	0.31	0.000	-0.78	0.32	0.014	-1.86	0.38	0.000	-.28	.38	.458
Total coping skills	-2.62	0.56	0.000	-0.75	0.37	0.043	-0.74	0.44	0.091	.30	.45	.502
Positive parent-Child interaction	-3.75	1.56	0.017	0.41	0.20	0.048	0.42	0.36	0.250	.50	.27	.064
Parental support	-1.04	1.42	0.466	0.28	0.19	0.151	0.50	0.33	0.137	.38	.25	.128

B's are the unstandardized estimates from the multilevel model and represent the association between changes in mediators and outcomes. All mediators were tested in separate models. All effects were controlled for the direct effect of time, study-group, and study-group*time.

¹Excluding the "somatic complaints" scale.

Impact of parental involvement in intervention on the link between mediators and outcomes (path b)

Study-group moderated the link between improvements in parent-reported coping skills and decreases in behavioral outcomes. For children in the parent-child intervention, increases in parent-reported coping skills predicted stronger decreases in parent reported internalizing ($B = -2.08$, $SE = .94$, $p = .002$, $R^2 = 9.1\%$, $f^2 = .10$) and externalizing ($B = -2.54$, $SE = .93$, $p = .007$, $R^2 = 3.0\%$, $f^2 = .03$) and self-reported internalizing problems ($B = -2.70$, $SE = 1.14$, $p = .019$, $R^2 = 5.4\%$, $f^2 = .06$) compared to children in the waitlist, and predicted stronger decreases in parent reported externalizing problems ($B = -1.93$, $SE = .91$, $p = .035$, $R^2 = 53.0\%$, $f^2 = .03$) compared to the child-only intervention.

Study-group also amplified the association between improvements in positive thinking and parent reported internalizing problems. For children in the parent-child intervention, increases in positive thinking predicted stronger decreases in parent reported internalizing problems, compared to the waitlist ($B = -2.56$, $SE = .84$, $p = .002$, $R^2 = 14.6\%$ $f^2 = .16$) and the child-only intervention ($B = -1.71$, $SE = .76$, $p = .025$, $R^2 = 14.6\%$ $f^2 = .16$).

Study-group also amplified the association between improvements in social competence and self-reported internalizing problems. For children in the parent-child intervention, increases in social competence predicted stronger decreases in self-reported internalizing problems, compared to the waitlist ($B = -3.46$, $SE = 1.47$, $p = .019$, $R^2 = 18.6\%$ $f^2 = .21$).

DISCUSSION

The present study provides first evidence of mechanisms that explained the effectiveness of a cognitive behavioral group intervention for children with chronic illness and their parents. Findings revealed that the positive effects of the intervention on behavioral outcomes were mediated by improvements in disease related coping skills. In families where children and parents both participated in the intervention, social competence skills improved more, which in turn predicted stronger decreases in internalizing and externalizing problems. The effect of the intervention was not mediated by parent-child interactions. Parent-child interactions were associated with behavioral outcomes but were not improved by the intervention. Involving the parents did increase the impact of improved coping skills on improved behavioral adjustment over time.

As expected, improvements in parent reported disease-related coping skills mediated the effect of the 'Op Koers' intervention on parent reported internalizing problems. This indicates that when children participated in the 'Op Koers' intervention, parents notice considerable improvements in children's use of coping skills, such as information seeking, positive thinking, and social competence, and consequently reported less internalizing problems. This is congruent with studies that indicated that secondary control coping strategies are supportive for adapting to the consequences of chronic diseases (Compas et al., 2012), and with studies that showed that engaged coping skills are important working mechanisms in interventions for children with chronic illness (Christian & D'Auria, 2006; Grey et al., 1999). Furthermore, the findings provide experimental evidence for a causal relationship between coping skills and internalizing behavior problems.

Parental involvement in the 'Op Koers' intervention was related to stronger improvements in disease related coping skills, such as information seeking, positive thinking and social competence compared to children in the waitlist group, while the child-only intervention did not differ from the waitlist group. In the intervention with



TABLE 6.4 Summary of Mediation: Joint Significance and Sobel Z-statistic

Mediator	Significant effect of intervention on mediator (path a)	Significant effect of mediator on outcome (path b)	Criteria for joint significance met?	Mediated effect a*b
Information seeking	Yes: Parent-child > waitlist	PRFint: Yes	Yes	0.82
		PRFext: Yes	Yes	0.83
		YSRint: Yes	Yes	1.19
		YSRext: No		
Social competence	Yes: Parent-child > waitlist	PRFint: Yes	Yes	1.43
		PRFext: Yes	Yes	1.14
		YSRint: Yes	Yes	2.55
		YSRext: No		
Positive thinking	Yes: Parent-child > waitlist	PRFint: Yes	Yes	1.62
		PRFext: Yes	Yes	0.78
		YSRint: Yes	Yes	1.86
		YSRext: No		
Total skills	Yes: Child-only > waitlist	PRFint: Yes	Yes	1.13
		PRFext: Yes	Yes	0.57
		YSRint: No		
		YSRext: No		
Positive interactions	No	PRFint: Yes	No	
		PRFext: Yes		
		YSRint: No		
		YSRext: No		
Parental support	No	PRFint: No	No	
		PRFext: No		
		YSRint: No		
		YSRext: No		

PRF = Parent Report Form, YSR = Youth Self Report, int = internalizing, ext = externalizing

¹ B's are the unstandardized estimates from the multilevel model and represent the association between intervention programs and changes in outcomes (study-group*time). All effects were controlled for the direct effect of time, study-group, and mediator.

² Excluding the "somatic complaints" items.

parental involvement a mediation effect could be established for social competence, however mediation effects of information seeking and positive thinking were marginally significant. Children's use of social competence skills – i.e., talking about the disease with others, explaining the consequences, informing them about capacities and limitations – was improved when parents were involved in the intervention, and in turn predicted decreases in internalizing and externalizing problems. Parental involvement in the intervention may enable children to practice these social skills with their parents or stimulate parents to provide more effective suggestions when their children experience problems, which in turn encourages children to communicate openly about their disease

Effect of intervention on change in outcome ¹ +(path c') (mediated model)			Sobel Z-statistic				Explained variance and effect size of mediator models	
B	SE	p	Outcome	Z	S.E.	p	R ²	f ²
0.48	2.06	.815	PFRint ²	-1.75	.47	.08	3.71%	.04
-0.21	0.27	.440	PRFext	-1.76	.47	.078	3.03%	.03
-0.02	0.42	.971	YSRint ²	-1.91	.62	.056	6.86%	.07
0.81	2.06	.694	PFRint ²	-2.42	.60	.016	4.58%	.05
-0.19	0.28	.486	PRFext	-2.02	.52	.044	3.22%	.03
0.00	0.42	.991	YSRint ²	-2.78	.92	.005	15.97%	.19
0.63	2.06	.761	PFRint ²	-1.94	.84	.053	11.70%	.13
-0.23	0.27	.411	PRFext	-1.58	.49	.113	3.31%	.03
0.03	0.42	.937	YSRint ²	-1.91	.97	.055	17.61%	.21
-4.86	1.96	.014	PFRint ²	-2.46	.46	.014	6.36%	.07
-0.26	0.26	.314	PRFext	-1.70	.33	.088	0.88%	.01



in daily life. This enables others to understand and support the child, which may result in decreases in social withdrawal, feelings of isolation and frustration.

A novel finding was that parental involvement not only improved the use of coping skills, but also strengthened the effects of improved coping skills on behavioral outcomes. Effects of improvements in positive thinking and social competence resulted in stronger decreases in behavior problems when parents were involved in the intervention. This might be explained by the fact that parental involvement encourages children to effectively use the skills in daily life, rather than only report that they knew how to use the skills. For example, in the parent program, home assignments urged parents to perform role playing games with their children, which might have encouraged children to practice newly learned skills and gradually internalize these strategies. Children who practice these skills within a secure relationship might become more confident

to effectively apply these skills in daily life, which might result in stronger decreases in internalizing and externalizing problems.

Contrary to expectations, parental involvement in the intervention did not lead to more positive parent-child interactions or better parental support during a parent-child interaction task. Possibly, a six session program for parents is insufficient for improving positive interactions and parental support. Because interactions were observed at one time point, the alternative hypothesis might be that baseline differences masked possible improvements in parent-child interactions in families involved in the parent-child intervention. Baseline differences were also found on illness severity and internalizing problems, with higher scores for children in the parent-child condition. Nevertheless, improvements in children's use of coping skills might reflect improvements in dyadic co-regulation when parents were involved in the intervention. Future research might examine a sequential mediation model with two mediators, in which the parent program affects positive parent-child interactions and behavioral outcomes via coping.

The effects we found of study-group on child reported disease-related coping skills were limited to the parent-child and child only intervention compared to the waitlist. The parent-child and the child-only intervention did not differ in their effects on disease related coping skills, although differences were marginally significant. A possible explanation might be that additional effects of parental involvement to the child intervention mainly arise over the long term, while in this study mediators scores at short term follow-up were used.

None of the mediators were related to self-reported externalizing problems, while the positive effect of the parent-child intervention was established in Chapter 4. Other mechanisms may explain the effect of parental involvement on self-reported externalizing problems. Firstly, self-perception and positive self-worth might be possible mechanisms that explain why children reported themselves lower on externalizing problems (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005). Secondly, parents may have adopted parenting strategies from other parents involved in the parent program to correct child rude or oppositional behaviour (such as responding consistently and using time out), which are important ingredients of parent intervention programs to diminish externalizing problems (Kaminski et al., 2008). It should be noted that this population of children with chronic illness was characterized more with internalizing than externalizing problems.

Results should be interpreted in light of several limitations. Firstly, mediating effect sizes were small and, although we used multilevel modeling, a number of models lacked sufficient power. These problems are reported in many mediation studies (MacKinnon, 2008). Secondly, with the many analyses performed, false positives are a possibility when statistical power limits the room for correcting against. Thirdly, measures for disease related coping skills relaxation and medical compliance were not used in the present study because of low internal consistency, despite being intervention goals and

therefore possible mediators. It would therefore be recommended to study these and other relevant concepts as working mechanism of the intervention.

Notwithstanding these limitations, the current study has a number of significant implications. For future intervention studies it is recommended to focus not just on efficacy of interventions, but to include mechanisms that are amenable to intervention as potential mediators. Because the current study indeed showed mediating effects, an important task for future research will be to replicate and extend these findings, contributing to our insight in what makes interventions effective. Further research is needed to investigate multiple mediators at the same time, and test sequential models to examine whether mediators affect changes in other, more proximal, outcomes, such as parental encouragement in daily life and self-perception. In the end, results of studies on mediation lead to optimal psychosocial care by underlining specific parts of interventions that can be held responsible for change on the outcomes, and monitoring children on changes on these coping skills.

For psychologists, findings from studies on mediation can provide information needed for adapting or extending interventions to the principles that are responsible for the intervention effects. This study indicates that social competence, and to a lesser extent positive thinking and information seeking are important ingredients of an intervention for children with chronic illness. In addition, involvement of parents in the intervention and stimulating them to support and encourage their child to use their new skills in daily life, could result in stronger improvements in the use of the new skills and in stronger effects of the intervention. To ensure that children actually understand and use the skills and parents know how to encourage their children, it is beneficial to use protocolized interventions, such as elaborated in Op Koers.

CONCLUSION

This study indicated that the effect on behavioral problems of a cognitive behavioral group intervention for children with pediatric chronic illness and their parents could be partly explained by increases in disease related coping skills, in particular coping skills that are related to social competence. In addition, improvements in coping skills were even more beneficial if parents were involved in the intervention. Altogether, parental involvement in child interventions supports children in practicing coping skills in daily life and strengthens the effect on decreases in behavioral problems. Future research should include a larger sample and focus on mechanisms that possibly explain effects on self-reported externalizing problems. The current findings and future efforts have the potential to accomplish the ultimate goal of delivering evidence-based, targeted care for children with chronic illness and their families.

