The prevention program for externalizing problem behavior (PEP) improves child behavior by reducing negative parenting: analysis of mediating processes in a randomized controlled trial

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Background: Our indicated Prevention program for preschool children with Externalizing Problem behavior (PEP) demonstrated improved parenting and child problem behavior in a randomized controlled efficacy trial and in a study with an effectiveness design. The aim of the present analysis of data from the randomized controlled trial was to identify the mediating processes that account for these positive treatment effects. We hypothesized that a decrease in negative parenting and increases in positive parenting and parental warmth would mediate the relationship between treatment and child improvement. Method: Parents of 155 children were randomly assigned to the PEP intervention group (n = 91) or a nontreated control group (n = 64). Parents rated their child’s problem behavior and their own parenting practices before and after PEP training. Parental warmth was assessed during standardized play situations. Four mediation models were tested using structural equation modeling. Trial registration number ISRCTN12686222; http://www.controlled-trials.com/isrctn/pf/12686222. Results: Changes in child externalizing problem behavior were most strongly mediated by reductions of negative parenting in difficult parenting situations. Increases in positive parenting also served as a mediator. Changes in parental warmth, parents’ feeling of self-efficacy, and parental mental health did not play a mediating role in the association between PEP treatment and child behavior. Conclusions: In our program, the most important component was to teach parents how to reduce dysfunctional parenting strategies in conflict situations. Keywords: Parenting, conduct problems, randomized trial, mediator.

Introduction
Externalizing behavioral problems (oppositional, aggressive, hyperkinetic, impulsive, and inattentive behavior) often persist over the course of childhood and from adolescence into adulthood (Bongers, Koot, Van Der Ende, & Verhulst, 2004). Developmental models have identified that ineffective inconsistent parenting is a key factor contributing to child externalizing behavioral problems during the early years (Greenberg, Domitrovich, & Bumbarger, 2001; Mrug & Windle, 2009; Patterson, DeGarmo, & Forgatch, 2004). More specifically, parenting practices that contribute to externalizing problem behavior include a parent–child relationship characterized by hostility, disapproval, and harshness (Ge, Brody, Conger, Simons, & Murray, 2002; Tolan, Hanish, McKay, & Dickey, 2002), lack of rules (Bor, Sanders, & Markie-Dadds, 2002), failure to monitor the child, use of erratic and corporal punishment (Gershoff, 2002), and provision of positive consequences for problem behavior (Bor et al., 2002; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). These dysfunctional parental discipline techniques are often referred to as negative parenting, while positive parenting includes praise, positive and proactive discipline, and joint play (Gardner, Sonuga-Barke, & Sayal, 1999). Positive parenting improves the parent–child relationship and provides positive consequences for desirable behavior. It has been shown to be associated with fewer child conduct problems ( Dishion et al., 2008; Gardner, Shaw, Dishion, Burton, & Supplee, 2007).

As shown by various meta-analysis cognitive-behavioral parent management trainings (PMT) are effective in improving parent–child relationships and parenting skills, and are thus regarded the most suitable intervention for reducing child externalizing behavior problems (Dretzke et al., 2005; Eyberg, Nelson, & Boggs, 2008; de Graaf, Speetjens, Smit, de Wolff, & Tavecchio, 2008; Lundahl, Risser, & Lovejoy, 2006; Sandler, Schoenfelder, Wolchik, & MacKinnon, 2011). Most PMT include information on child development and care, instructions on how to build a positive parent–child relationship (e.g. by engaging in positive play activity), and behavior management skills to reduce negative parenting (e.g. reinforcement desirable behavior with attention, extinguish undesirable behavior). Some programs provide lessons on promoting child social or cognitive skills (Kaminski, Valle, Filene, & Boyle, 2008). Although the most prominent PMT (e.g. Eyberg,

In their meta-analysis, Kaminski et al. (2008) investigated which program contents of 77 evaluations of parenting trainings were associated with larger effect sizes (Kaminski et al., 2008). Here, programs were most effective when the training included in vivo practice with one’s own child and when parents were taught skills related to emotional communication (e.g. active listening, reduction of negative communication), to interact positively with their child (e.g. demonstrate positive attention for appropriate behavior, engage in positive play activity), and disciplinary consistency (e.g. using planned ignoring or time out). The authors conclude that two of four of the most robust predictors of program efficacy aim at enhancing the overall parent–child relationship, whereas one component relates to child discipline. PMT theory presumes that parents are the agents of change, so teaching parents how to respond differently to their child should decrease child problem behavior. However, it is not known whether a change in child behavior is caused by improvements of the parent–child relationship, changes in antecedents and consequences of child behavior, or by cognitive parental variables, such as knowledge of child development or learning principles, attitudes, or parental feelings of self-efficacy. Few mediation analyses have examined how PMT changes child behavior, with conflicting results. This might in part be caused by the high interrelation of parents’ cognition, various parenting behaviors (e.g. positive and negative parenting), or parents’ mental health, or by the variability in methods used in the mediation analyses (Sandler et al., 2011).

The results of several mediation analyses support the notion that changes in parents’ skills for handling difficult parenting situations and responses to child problem behavior can account for child behavior improvement (Beauchaine, Webster-Stratton, & Reid, 2005; Bernat, August, Hektner, & Bloomquist, 2007; Chronis-Tuscano et al., 2011; Eddy & Chambers, 2000; Hinshaw, 2007; Hinshaw et al., 2000; Reid, Webster-Stratton, & Baydar, 2004; Zhou, Sandler, Millsap, Wolchik, & Dawson-McClure, 2008). A change in positive parenting was found to mediate the change in observed child problem behavior in the Webster-Stratton ‘Incredible Years’ program (Gardner, Burton, & Klimes, 2006; Gardner, Hutchings, Bywater, & Whitaker, 2010), and it was suggested that skill change (including positive parenting) might be the most important ingredient of PMT (Hutchings, Lane, & Gardner, 2004). In a study where parent training targeted the parent–child interaction, a reduction of negative parental discipline behavior predicted lower relapse rates in families experiencing home violence (Chaffin et al., 2004). However, only one other study on mediating processes in PMT has identified improvements in the parent–child interaction as the cause of child behavior change (Zhou et al., 2008), which seems to contradict the meta-analytic findings of Kaminski et al. (2008).

Several studies have shown that parental feelings of self-efficacy mediate program efficacy in PMT. Parent training (Triple P) increased parental self-efficacy, which subsequently changed parenting strategies (Hartung & Hahlweg, 2011). Similarly, in the Home-Start Parenting Program, changes in parenting were predicted by changes in maternal sense of competence (Deković et al., 2010). Thus, parental self-efficacy can function as a predictor of parenting, but can also be decreased by child problem behavior, so may be a transactional variable in a feedback loop (Jones & Prinz, 2005). Other studies, however, have not confirmed a mediating role of parental self-efficacy in child behavior improvement (Gardner et al., 2006). Reduction of maternal depression served as a mediator for improvements of child problem behavior in a preventive family intervention, that promotes motivation for change in high-risk families (Shaw, Connell, Dishion, Wilson, & Gardner, 2009).

A recent review on the long-term impact of prevention programs promoting effective parenting found increases in parental warmth, authoritative parenting, functional discipline, parental monitoring, and family communication skills to mediate program effects on child outcome (Sandler et al., 2011). Methodological heterogeneity made the aggregation of findings between studies difficult, however. The authors conclude that future research on mediation processes of PMT should include multiple mediator models combining various parenting factors like cognition, behavior, or mental health, as well as models that investigate the specific impact of these factors separately (Sandler et al., 2011).

Our indicated prevention program for preschool children with Externalizing Problem behavior (PEP; Plück et al., 2006) involves parents and kindergarten teachers of children aged between 3 and 6 years showing externalizing problem behavior. PEP is administered in a group format with separate sessions for parents and teachers. The parent training aims to
Improvement of child behavior by reducing dysfunctional parenting

In a randomized controlled trial, PEP decreased disruptive child behavior, improved parenting strategies, and increased parental warmth (Hanisch et al., 2010). Similarly, when PEP was delivered in routine care in an effectiveness design study, parenting strategies and child outcome were improved (Hautmann, Hanisch, Mayer, Plück, & Döpfner, 2008); Hautmann et al., 2009, 2010. Parents in the PEP intervention group showed reduced negative parenting strategies and increased positive parenting (Hanisch et al., 2010; Hautmann et al., 2009). Increased parental warmth was observed in the interaction with the child, and parents had a greater increase in feelings of self-efficacy compared with the control group (Hanisch et al., 2010). As the PEP program focuses on improving parent–child interactions and on teaching parents how to handle difficult parenting situations, we hypothesize that reductions of dysfunctional parenting together with increases in positive parenting behavior and parental warmth will mediate positive treatment effects. Although PEP does not address parental attitudes and feelings of efficacy, improvements in parenting and child behavior do increase parental feelings of efficacy (DeGarmo, Patterson, & Forgatch, 2004). As parents’ feelings of self-efficacy were not increased right after participation in our training, we propose that they might change as a result of increased parenting competencies (Coleman & Karraker, 1998) and do not expect parental feelings of self-efficacy to play a mediating role in our analysis. Similarly, we proposed parents’ mental health to change in the long-term rather than immediately and thus do not expect it to mediate short-term program impact.

Methods

Data from the randomized controlled trial of the efficacy of PEP (Hanisch et al., 2010) were used for this analysis of meditational models to identify mediators of the link between PEP treatment and child externalizing behavior. Details of the study design, methods and results have been reported previously (Hanisch et al., 2010) and are summarized briefly below. The study was approved by the Medical Ethical Committee of the University Hospital of Cologne, Germany, and participating parents provided informed consent. Following screening for externalizing problem behavior in 62 kindergartens in the urban area of Cologne, 243 children were defined as the indicated target sample and selected for further investigation (Figure 1). Of these, 155 children attending 54 kindergartens (1–6 children per kindergarten) comprised the study sample. Each kindergarten was randomly assigned to either the intervention or control group so that teachers did not simultaneously teach children in both groups. To account for selective drop out in the intervention group, 91 children (58.7%) were assigned to the intervention group, while the control group comprised 65 families. Nine families declined participation in the training, and 22 families attended less than six sessions. Treatment effects significantly differed between the ‘frequent attenders’, who attended an average of 8.38 (SD 1.58) sessions, and the ‘infrequent attenders’ with on average 0.67 (SD 1.07) parent training sessions (see Hanisch et al., 2010 for more details on this analysis). As we were interested in identifying mediating factors of treatment outcome we only included the ‘frequent attenders’ in the mediation analysis. As depicted in Figure 1 the mediation analysis is based on 65 control and 60 PEP group families.

Evaluation procedure

Home visits were conducted prior to group randomization and at approximately 8 weeks after treatment termination. They included structured interviews, academic tests, and parent behavior rating scales. The parent who generally spent more time with the child was video-taped during a standardized play situation with the child. Child behavior during the academic testing and play situation was rated by research assistants who were blind to treatment group membership. Parents were paid 25 Euros per home visit and 10 Euros per set of returned rating scales.

Intervention procedure

The PEP intervention has been described in detail elsewhere (Hanisch et al., 2010). Briefly, it comprised 10 weekly sessions each lasting 90–120 min, with 5–6 participants per group. Parents and teachers were trained separately and the trainings were held in the kindergarten by the same experienced child psychologist. Training material and procedures were standardized and provided as a manual (Plück...
et al., 2006). Only the parent training is discussed below. The first three sessions focus on defining individual problem situations and conveying basic strategies to strengthen parent–child interactions. The next three sessions teach parents the basic strategies of behavior modification using individually defined problem situations: defining rules, communicating commands effectively, and using positive reinforcement for appropriate child behavior and negative consequences for inappropriate child behavior. Sessions 7–10 consolidate these strategies by working on common difficult parenting situations, e.g. enduring conflicts among siblings or peers. Individual homework assignments and telephone supervision is provided. Parents are trained in self-monitoring and monitoring of the child’s behavior to enable further changes.

**Dependent measures**

Socio-demographic family data were gathered during the family background interview. Parents’, teachers’, and observers’ views on child symptoms, parents’ reports on their parenting skills, and parents’ quality of life were assessed using questionnaires, while parental warmth was rated by observer ratings during a structured play interaction.

For this analysis of meditational effects, only parent-reported data are of interest and no results from the teachers’ or observers’ questionnaires are presented.

**Child symptoms.** The Child Behavior Checklist (CBCL 1½–5; Achenbach & Rescorla, 2000; Arbeitsgruppe Deutsche Child Behavior Checklist, 2002) was used to assess parents’ reports of child-specific behavioral problems. The robustness and reliability of this rating scale has been demonstrated (Döpfnern, Berner, Schmeck, Lehmkuhl, & Poustka, 1995).

The Problem Checklist attention-deficit/hyperactivity disorder (PCL ADHD) and the Problem Checklist oppositional defiant disorder (PCL ODD) represent the diagnostic criteria (DSM-IV and ICD-10) for ADHD and ODD respectively (Döpfnern & Lehmkuhl, 2000). Because of the age range of our subjects, we only used a subscale of the Problem Checklist conduct disorder (PCL CD) for assessing oppositional defiant symptoms (PCL ODD, 11 items). Cronbach’s α indicated high internal consistencies for mothers’ reports (α = .91 for PCL ADHD and α = .88 for PCL ODD).

The German version of the Home-Situation-Questionnaire (HSQ, Barkley, 1990; Breuer & Döpfnern, 1997) assesses 15 difficult parenting situations. In our sample, internal consistency was α = .80 (mothers’ reports).

**Parenting.** The German adaptation of the Parent Practices Scale (PPS; Strayhorn & Weidmann, 1988) comprises 13 items measuring positive, reinforcing and supportive parenting behavior on a 4-point rating scale. It was used to measure positive parenting behavior. Internal consistency was α = .84. The original Parent Practices Scale consists of 34 items with scales for warmth/positive parenting, consistency, and punitive discipline, we only used the positive parenting scale to reduce the length of the questionnaire, however.

Negative parenting was measured by the German adaptation of the Parenting Scale (PS) originally developed by Arnold, O’Leary, Wolff, and Acker (1993) and adapted by Naumann et al. (2010). This measure comprises 35 items and assesses lax and overreactive discipline (Reitman et al., 2001; Steele, Nesbitt-Daly, Daniel, & Forehand, 2005), and hostile parenting practices (Rhoades & O’Leary, 2007). Parents rate their response to child misbehavior on a 7-point scale, where higher scores indicate ineffective discipline strategies. Internal consistency in our sample was α = .76 for the overall score.

Parents’ perception of self-efficacy was measured using the Self-Efficacy Scale (SEFS), which is the German adaptation of the Parenting Sense of Competence Scale developed by Johnston and Mash (1989) and the Self Efficacy for Parenting Task Index by Coleman and Karraker (1998). Cronbach’s α was .80 for the overall score.

The German adaptation of the Problem Setting and Behavior Checklist (PSBC) developed by Sanders, Markie-Dadds, Tully, and Bor (2000) measures the perceived ability to solve difficult parenting situations. Internal consistency for the overall score in our sample was Cronbach’s α = .90.

**Parents’ psychopathology.** Parental symptoms of depression, anxiety, and stress were measured using the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995). Cronbach’s α was .96 for the overall score.

**Parent–child interaction during free play and task periods.** A 20-min parent–child interaction including 5 min each of free play, building a lego brick figure, independent play of the child, and clearing up. The interaction was scored by two research assistants using the German adaptation of the Coder Impressions Inventory (CII; McMahon & Langua, 1996), which comprises scales of parental warmth (12 items), appropriate discipline (13 items), harsh discipline (4 items), and physical discipline (2 items). In our sample, the parental warmth scale was the only scale with a satisfying internal consistency (Cronbach’s α = .82) and was used to measure parent–child interactions. Inter-rater reliabilities were r = .71 for parental warmth (p < 0.001).

Significant correlations were found for positive (PPS) and dysfunctional parenting (PS; r = 0.26, p < 0.004), for positive parenting (PPS) and parents’ feelings of self-efficacy (SEFS; r = 0.29, p < 0.001), and for dysfunctional parenting (PS) and parents’
feelings of self-efficacy (SEFS; \( r = 0.25, p < 0.005 \)). The perceived ability to solve difficult parenting situations as measured by the PSBC correlated significantly with all other questionnaire parenting measures (PS \( r = 0.32 \); PPS \( r = 0.47 \); SEFS \( r = 0.46 \)). The only significant correlation between parental warmth as measured by the CII and parents’ questionnaire measures was with negative parenting (PPS \( r = -0.18 \) \( p < 0.05 \); PS \( r = 0.13 \) \( p = 0.16 \); SEFS \( r = 0.017 \) \( p = 0.89 \); PSBC \( r = 0.04 \) \( p = 0.66 \)).

Data analysis

Missing data was handled using full information maximum likelihood estimation (FIML, Arbuckle, 1996; Raykov, 2005), which is recommended (Croy & Novins, 2005; Graham, 2009; Schafer & Graham, 2002) and is an improvement over ad hoc methods (for example, case wise deletion) even when the underlying assumptions are not met (Collins, 2006; Collins, Schafer, & Kam, 2001).

To be able to calculate composite scores for child externalizing and parenting all measures were \( z \)-standardized by pretest means and standard deviations (Hanisch et al., 2010). The pretest composite scores of child externalizing problem behavior for families that dropped out of the study between the pre- and post-tests did not differ from those that remained in the study. However, mothers who dropped out after the pretest assessment had a lower level of education than those who remained in the study (\( Z = -3.45, p < .001 \)).

Individual difference scores (posttest-pretest score) were calculated for the following potential mediators: positive parenting (measured using the PPS), dysfunctional parenting in conflict situations (measured using the PS), parental feelings of self-efficacy (measured using the SEFS), parents’ perceived ability to solve difficult parenting situations (measured by the PSBC), and parent-child interaction (measured using the CII parental warmth scale), and parents’ psychopathology (measured using the DASS). Group means of the difference scores were compared using two-sample \( t \) tests.

Figure 2 describes the proposed mediation model. To be regarded a mediator, the variable in question meets the following four criteria: (a) a significant association between the predictor variable and the presumed mediator (path a in Figure 2); (b) the predictor generally is - but does not have to be - significantly associated with the outcome variable (total or direct effect); (c) the mediator must be significantly associated with the outcome variable (path b in Figure 2); (d) the indirect effect must significantly differ from zero (path a multiplied by path b in Figure 2; MacKinnon, 2008).

The proposed mediation model was tested by structural equation modeling in Mplus (Muthén, 2004; Muthén & Muthén, 2007). Child externalizing behavior was measured by a latent variable with the indicators CBCL, PCL ADHD, PCL ODD and HSQ. Factor loadings of all indicators were significant (see Figure 3). Bias-corrected bootstrap confidence intervals (90%) were used to determine whether the indirect effect was significantly different from zero (MacKinnon & Fairchild, 2009; MacKinnon, Lockwood, & Williams, 2004). A mediating effect was established when the confidence interval did not include the value zero.

To test for meditational processes several constructs were considered (dysfunctional parenting, positive parenting, parental warmth, parental feelings of self-efficacy and parents’ psychopathology) were tested as mediators). They were regarded either as indicators of a common latent variable measuring parenting or were analyzed as single constructs.

Model fit was tested using established criteria: (a) the chi-square value had to be nonsignificant; (b) a comparative fit index (CFI) above .90 was considered adequate; and (c) a root mean square error approximation (RMSEA) value below .05 indicated a good fit and a value below .08 indicated an adequate fit.


Results

The characteristics of the children in the PEP intervention and nontreated control groups were similar for age, gender, and symptom severity on the CBCL total, PCL ADHD, or PCL ODD (see Hanisch et al., 2010 for details). Mothers and fathers of both groups reported similar levels of school education and vocational training. There was a between-group difference in the pretest mothers’ composite score of child symptoms; children in the intervention group were rated as more severely impaired than children in the control group (\( t(87) = -1.94, p < .05 \)).

Table 1 summarizes group means of the individual difference scores (change from pretest to posttest) for child externalizing behavior and the parenting measures and parental psychopathology tested in the mediator analyses. The PEP intervention group showed greater pretest to posttest differences indicating that (a) externalizing behavior problems decreased more in children of PEP trained families.
intervention group, whereas there was a slight warmth did not change from pre- to post-test in the parenting (t(123) = 1.94, p = .055) or psychopathology (t(123) = -2.69, p = .002).

Results for main analysis are reported in Figure 3. As mediators were investigated general parenting measured by multiple indicators (Figure 3A), dysfunctional parenting (Figure 3B), positive parenting (Figure 3C), parental warmth (Figure 3D), and parents’ feelings of self-efficacy (Figure 3E).

Changes in general parenting were associated with treatment (β = .28, p < .001) and outcome (β = 1.01, p < .001) (Figure 3A). Total effect and indirect effect (p < .02) approximately have the same size suggesting that treatment effects on externalizing are in most part mediated by general parenting. Model fit parameters suggest a good model fit (χ² (25, N = 123) = 24.77, p = .48, CFI = 1.00, RMSEA = .00).

Changes in dysfunctional parenting were significantly associated with treatment (β = .54, p < .001) and outcome (β = .29, p < .001) (Figure 3B). The indirect effect was significant (p < .028). Model fit parameters suggest a good model fit (χ² (8, N = 123) = 8.75, p = .36, CFI = .995, RMSEA = .03). These results support the hypothesis that reduction of dysfunctional parenting accounts for the treatment-related change in child externalizing behavior.

Figure 3C shows that changes in positive parenting were significantly associated with treatment (β = .35, p < .02) and outcome (β = .21, p < .001). The indirect effect was significant (p < .044). Model fit parameters suggest a good model fit (χ² (8, N = 123) = 2.6, p = .96, CFI = 1.00, RMSEA = .00). Changes in positive parenting thus also contribute to the relationship between treatment and changes in child externalizing behavior.

In Figure 3D, changes in parental warmth were significantly associated with treatment (β = .16, p < .01), but there was no significant association with outcome (β = .21, p = .33); and no significant mediating effect on outcome (p = .40).

Changes in parents’ feelings of self-efficacy (Figure 3E) were associated with treatment (β = .47, p < .001) and outcome (β = .13, p < .001). The small indirect effect suggests no significant mediation (p = .83) of changes in child problem behavior by changes in parents’ feelings of self-efficacy, however.

Neither changes in parental psychopathology nor in parents’ perception of handling difficult parenting situations were significantly associated with treatment and, thus, did not meet the first criterion for mediation described above. The regression coefficient for the association between treatment and parental psychopathology was .12 (p = .49) and between treatment and perceived ability to solve difficult parenting situations was .04 (p = .82).

Table 2 summarizes results of all mediation analysis including a, b, c’ paths, the mediating effect, decrease in the control group; the difference between groups was significant (t(123) = -2.44, p < .015). No between-group differences were found for the changes in parental feelings of self-efficacy (t(123) = -1.94, p = .055) or psychopathology (t(123) = -2.69, p = .002).

Table 1: Group means for individual difference scores (change from pre- to post-test) for child externalizing behavior and the five presumed mediators in the PEP intervention and control groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-PEP M (SD)</th>
<th>Post-PEP M (SD)</th>
<th>Pre Control M (SD)</th>
<th>Post Control M (SD)</th>
<th>Individual Difference Score PEP M (SD)</th>
<th>Individual Difference Score Control M (SD)</th>
<th>t</th>
<th>p value</th>
<th>Effect size d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child externalizing behavior</td>
<td>0.08 (0.89)</td>
<td>−0.48 (0.84)</td>
<td>−0.08 (0.85)</td>
<td>−0.33 (0.79)</td>
<td>0.57 (0.61) a</td>
<td>0.25 (0.62) a</td>
<td>2.44</td>
<td>0.015</td>
<td>0.44</td>
</tr>
<tr>
<td>Negative parenting*</td>
<td>0.10 (1.02)</td>
<td>−0.66 (1.19)</td>
<td>−0.07 (0.98)</td>
<td>−0.24 (0.99)</td>
<td>0.75 (1.00) a</td>
<td>0.17 (0.50) a</td>
<td>4.09</td>
<td>0.000</td>
<td>0.73</td>
</tr>
<tr>
<td>Positive parenting</td>
<td>−0.06 (0.96)</td>
<td>0.37 (1.01)</td>
<td>0.03 (1.03)</td>
<td>0.15 (1.01)</td>
<td>0.44 (0.89) b</td>
<td>0.11 (0.69) b</td>
<td>−2.26</td>
<td>0.026</td>
<td>0.75</td>
</tr>
<tr>
<td>Parental self-efficacy</td>
<td>−0.05 (1.00)</td>
<td>1.10 (1.32)</td>
<td>0.78 (1.22)</td>
<td>0.78 (1.22)</td>
<td>1.15 (1.47) b</td>
<td>0.72 (0.91) b</td>
<td>−1.94</td>
<td>0.055</td>
<td>0.35</td>
</tr>
<tr>
<td>Solving difficult parenting sit</td>
<td>−0.08 (1.11)</td>
<td>0.47 (0.98)</td>
<td>0.05 (0.88)</td>
<td>0.44 (0.99)</td>
<td>0.39 (0.84) b</td>
<td>0.55 (1.16) b</td>
<td>−0.91</td>
<td>0.367</td>
<td>−0.16</td>
</tr>
<tr>
<td>Parental psychopathology</td>
<td>0.01 (1.00)</td>
<td>3.94 (1.12)</td>
<td>0.32 (1.06)</td>
<td>4.13 (0.88)</td>
<td>3.93 (1.13) b</td>
<td>3.81 (0.65) b</td>
<td>−0.69</td>
<td>0.492</td>
<td>0.13</td>
</tr>
<tr>
<td>Parental warmth</td>
<td>0.13 (1.11)</td>
<td>0.22 (0.89)</td>
<td>−0.12 (0.88)</td>
<td>−0.47 (1.08)</td>
<td>0.03 (0.42) b</td>
<td>−0.13 (0.28) b</td>
<td>−2.44</td>
<td>0.015</td>
<td>0.44</td>
</tr>
</tbody>
</table>

*Difference score calculated as pre-test–post-test.

**Difference score calculated as post-test–pre-test. PEP, Prevention program for Externalizing problem Behavior.

*Negative parenting measured by the Parenting Scale (Naumann et al., 2010), positive parenting measured by the Parent Practices Scale (Strayhorn & Weidmann, 1988), parental self-efficacy measured by Self-Efficacy Scale (Coleman & Karraker, 1998), handling difficult parenting situations measured by the Problem Setting and Behaviour Checklist (Sanders et al., 2000), parental psychopathology measured by the Depression Anxiety Stress Scale (Lovibond & Lovibind, 1995), and parental warmth measured by the Coder Impressions Inventory (McMahon & Langua, 1996).

Discussion

The results of this study show that PEP training decreased negative parenting and increased positive parenting, parental warmth and parental feelings of self-efficacy. Positive effects on child outcome were mediated by improvements in parenting. This is consistent with the theoretical background of parent management trainings, which aim to reduce child problem behavior by improving parent–child interactions and enhancing parenting skills (e.g. Hinshaw et al., 2000; Reid et al., 2004).

The aim of the mediation model was to identify which aspects of parenting might be responsible for the positive treatment effects in our prevention program. We examined increases in positive parenting, parental warmth, parents’ perceived ability to solve difficult parenting situations and parental feelings of self-efficacy, and decreases in negative parenting and in parents’ psychopathology as possible mediators of the link between PEP treatment and child externalizing behavior.

The strongest mediator in our model was the decrease in negative parenting. Training content related as well as measuring methodology might account for this finding. Previous researchers have reported that a change in dysfunctional discipline strategies is essential for explaining changes in child behavior after parent interventions (Beaucahine et al., 2005; Chronis-Tuscano et al., 2011; Hinshaw, 2007; Hinshaw et al., 2000; Zhou et al., 2008). PEP includes active role playing by parents on how to behave in difficult parenting situations using real life situations. This active involvement of parents has previously been found to be important (Kaminski et al., 2008) and might have contributed to the mediation process of this component. One has to take into consideration however, that with questionnaire data we measured parents’ reports on how they cope with difficult situations, which might differ from their actual parenting behavior. One might speculate that parents’ paid special attention to this aspect of parenting as it was discussed most extensively and more toward the end than to positive parenting practices (e.g. engage in positive play activity), which were subject of the training at the beginning. A timeline with multiple assessments would have been useful (Kazdin, 2007).

Changes in positive parenting were identified to mediate training related improvements in child outcome as well. The mediated effect was smaller than for reductions of dysfunctional parenting, however. Consistent with the presumed importance of a good parent–child relationship for prevention of child conduct problems, PEP training taught parents how to deal with positive child behavior and how to engage in positive play activity. Others have reported that increases in positive parenting mediate the change in child behavior after parent training (Gardner et al., 2006, 2010). Moreover, positive parenting has been identified as one key program component related to larger effect sizes (Kaminski et al., 2008). It must be taken into account, however, that we assessed positive parenting using parents’ reports, while Gardner et al. (2006) used an observational measure where raters coded single observed parent behaviors. Thus, our measure of positive parenting
might have been less sensitive to change. Based on social learning theory, one would expect an increase in positive consequences for goal behavior to be an important factor in fostering new child behavior or in motivating the child to show goal behavior. Kaminski et al. (2008) identified that positive reinforcement by parents was one program component that was necessary, but not enough, to change child outcome. In line with this, we assume that an increase in positive parenting is necessary (but insufficient) to improve child behavior. A reduction in negative parenting in difficult parenting situations seems to have been likewise important in our PMT. As we only analyzed pre-post data we cannot assess whether increases in positive parenting might have been the necessary basis that enabled changes in negative parenting. If this was the case, changes in positive parenting – although less evident as a mediator in our model – may remain essential. Mediators could thus not change at once but rather operate in sequence. Changes in one mediator might then determine changes in another, which can only be examined by repeated assessments.

In our analyses, parental warmth changed as a result of training participation but it did not explain the changes in child behavior as would be expected from developmental theory or theories on maintenance of child disruptive behavior (Ge et al., 2002; Tolan et al., 2002). To our knowledge, no other study on cognitive-behavioral PMT has so far identified changes in parental warmth as a mediator of changes in child outcome. Measuring methodology might be one possible reason for the absence of parental warmth as a mediator as parental warmth is usually assessed by behavior observation. It cannot be ruled out that parents questionnaire reports of their parenting behavior measures cognitive variables, such as knowledge on how they should respond or perception bias. That is, they perceive a change in their responses after training that cannot easily be observed. These cognitive, more proximal, variables change more easily than more distal measures, such as behavior as assessed by behavior observation. This again stresses the importance to include more than two time points.

Parental feelings of self-efficacy have previously been reported to be a mediator of PMT. One study documenting changes in parenting after a work-place parent training that addressed general parenting problems (rather than specific problems of children with externalizing problem behavior) found that increased parental self-efficacy was responsible for reduced stress (Hartung & Hahlweg, 2011). Participating parents most likely differed from our parent population in employment, education, and general feelings of competence. Moreover, Hartung and Hahlweg (2011) studied a universal sample that exhibited less problem behavior than our indicated sample. It has previously been reported that child problem behavior decreases parents’ feelings of self-efficacy

| Table 2 Unstandardized coefficients (standardized coefficients in parenthesis) of paths a, b, c', and ab indirect effect with standard errors and confidence intervals |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Mediator                        | a (std. coeff.)                 | SE (std. error)                 | CI lower 5%                     | CI upper 5%                     |
| General parenting               | 0.38 (0.36)                     | 0.18                            | 0.63                            | 0.11                            |
| Negative parenting              | 0.27 (0.21)                     | 0.17                            | 0.61                            | 0.11                            |
| Self-efficacy                   | 0.47 (0.32)                     | 0.24                            | 0.89                            | 0.17                            |
| Solving difficult               | 0.24 (0.19)                     | 0.15                            | 0.61                            | 0.11                            |
| Psychopathology                 | 0.04 (0.03)                     | 0.02                            | 0.11                            | 0.06                            |

(Jones & Prinz, 2005), suggesting that self-efficacy in our sample might have been lower than in previous studies. Another study reporting parental self-efficacy as a mediator evaluated effects of a Home-Start Parenting Program that targets parents feeling of self-efficacy more directly than usual cognitive-based parent management trainings generally do (Dekovic et al., 2011). These differences in program content might account for different findings.

To summarize, our findings suggest that teaching parents how to respond to child behavior in difficult parenting situations is the most important ingredient in our parent training program. Further studies need to be done to clarify the importance of other components (e.g. teaching parents how to increase positive parenting). One could speculate that a positive parental response might follow more functional discipline strategies and this could cause changes in child behavior problems. In other words, we need to test whether reducing the program components might yield the same results. This has direct practical implications. PEP training can be delivered in specialized clinic settings and in voluntary settings. Time restrictions are often present in the latter setting, so it would be useful to know where to reduce training time. One key question of prevention research is how to reach more families with evidence-based treatments and, more specifically, how to reach those families at risk but who not yet fulfill diagnostic criteria and, thus, do not attend clinic services.

Aside from a rather small sample size that might question the validity of the mediation model (Fritz & MacKinnon, 2007) the study has several limitations that must be taken into account. First, many of the variables were measured using self-report because observational measures were not available. Parental warmth is difficult to assess using parental report. The same is true for negative parenting in standardized situations. We used the CII to code parents’ responses during standard play activities. Aside from parental warmth, this includes appropriate discipline, harsh discipline, and physical discipline. As children showed only little problem behavior and parents showed even less discipline behavior, internal consistencies were low for these scales and we could not further consider them. Presumably, one needs to observe discipline in more naturalistic parenting situations. Second, we considered only two time points, suggesting a linear relationship between the measures. Since the variables of interest have a reciprocal relationship, presuming a linear influence of parenting on child behavior might lead to overrating the effects of parenting (Beauchaine et al., 2005).

Despite its limitations, the present analysis adds to the existing body of literature on mediation processes in PMT, which has yielded inconsistent results. Moreover, cross-cultural factors might affect mediating processes. Most important, however, the implementation of interventions in real-world settings might be easier if it becomes clearer which ingredients of a complex intervention predict outcome.

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### Key points

- Cognitive-behavioral parent management training programs are effective in improving parent–child relationships and parenting skills, and are suitable for reducing child externalizing behavior problems.
- The Prevention program for preschool children with Externalizing Problem behavior (PEP) improves parenting and child problem behavior.
- This study aimed to identify mediators of the positive treatment effects of PEP parent training.
- Reductions of negative parenting in difficult parenting situations and increase in positive parenting mediated the changes in child externalizing problem behavior associated with PEP parent training.
References


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