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The severely impaired do profit most: short-term and long-term predictors of therapeutic change for a parent management training under routine care conditions for children with externalizing problem behavior

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Abstract Short-term and long-term predictors of therapeutic change due to parent management training were investigated. Therapeutic change was defined as the change in outcome measures [externalizing problem behavior and parenting self-efficacy (PSE)] from before treatment to afterward. Three different types of predictors were analyzed: child variables (gender, age, and initial externalizing and internalizing behavior), parent variables (age, initial PSE and parental psychopathology) and socioeconomic status and other sociodemographic characteristics of the family (parental school education, employment, family status, language). The parent management training was part of the Prevention Program for Externalizing Problem Behavior, which was evaluated as an effectiveness trial under routine care conditions using a within-subject control group design. Between 78 and 270 families were included

in the analysis, which investigated therapeutic change over two time intervals: (1) immediate change from the pre-treatment to the post-treatment assessments, and (2) long-term-change from pre-treatment to 1-year follow-up. Throughout several analyses, the only predictor of therapeutic change that was consistently significant over the two time periods for the externalizing problem behavior of the child was the initial externalizing problem behavior. More impaired children improved more. Similarly, the only predictor of therapeutic change for the two time periods in PSE was the initial level of PSE. Parents with less PSE gained more during the course of the training.

Keywords Externalizing · Therapeutic change · Predictor · Parent management training

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Introduction

The efficacy of behavior-based treatment of externalizing behavior problems has been well investigated [9, 13, 18, 20, 42]. However, determining the efficacy of a particular treatment is just one crucial step in psychotherapy research. At this research stage, the investigator is informed if the target group on average profits from the treatment. The research, however, does not answer the question “for whom does this intervention work?” In other words, it does not inform whether participants differentially profit from treatment and which factors are responsible for the diverse treatment response. Clarification of these issues would help to identify those families for whom the intervention would be useful and those for whom other or additional treatment modalities would be advisable.

A relatively broad array of predictors associated with treatment outcome for conduct problems was identified by

the Conduct Problems Prevention Research Group (CPPRG) [12]. These researchers remarked that assessment of the importance of a particular predictor is complicated by the fact that the results can vary for different outcome measures. That is, the significance of a predictor can vary according to the outcome measure used.

With respect to gender, Brestan and Eyberg [7] remarked that it was not known if boys and girls with externalizing behavior responded equally to behavior-based treatments. Empirical findings are ambiguous. Some studies found that treatment type was not related to treatment outcome and treatment response [4, 48]. Other studies found that girls had a better outcome than boys [12] and, conversely, further studies reported that boys had better outcomes than girls [25].

From a developmental psychopathology perspective, age may be a relevant predictor variable for treatment response [28]. Preventive efforts should start early before problems become consolidated and disturb subsequent developmental tasks. Thus, it is expected that interventions for younger children should be more effective than those for older children. Contrary to this hypothesis, in their meta-analysis, Serketich and Dumas [53] found that older children benefited most from intervention. Furthermore, in other studies, age was not related to outcome or treatment response [4, 19, 38].

For the initial severity of externalizing problem behavior as a predictor for treatment outcome, two mutually contradictory hypotheses can be proposed. The first proposes that children with severe externalizing problem behavior have the greatest scope for change. The opposing hypothesis states that more severe externalizing behavior shows higher stability over time [45] and, therefore, resistance to change may be higher in the more severely disturbed group. In empirical studies, children with higher levels of externalizing problems often demonstrated greater change in their behavior [26, 38, 50, 56, 60]. However, in some studies, children with less severe externalizing problems had greater change [33].

In general, only a few studies have investigated the influence of comorbidity on treatment outcome [3]. Therefore, the basis for firm conclusions is limited. Contrary to their own hypotheses, Kazdin and Whitley [34] found that comorbidity did not influence therapeutic change. However, Beauchaine et al. [4] found that comorbid anxiety and depression were positively related to treatment outcome. Thus, for externalizing problem behavior, certain comorbid disorders may promote favorable treatment effects.

Maternal age and maternal psychopathology, such as depression, have rarely been investigated as predictors of treatment outcome. One study showed that older mothers were more likely to attend the treatment and not to drop out

of the study [59]. On the other hand, children of younger mothers sometimes had better outcomes [4]. Lower parental psychopathology had predicted greater therapeutic change in some studies [33], but was not related to treatment outcome [48] or therapeutic change in other studies [41].

Studies with measures of socioeconomic status (SES) as predictors have provided conflicting results. Some studies showed that disadvantaged families profited less from treatment [38, 58], whereas other studies found that families with lower SES had greater therapeutic change [41] or no relationship was found [53]. Rieppi et al. [51] distinguished between composite SES measures (e.g., Hollingshead Four Factor Index of Social Status) [27] and individual SES measures and proposed the use of individual measures to maximize the explanation of SES effects. Thus, individual SES measures were chosen for the present study.

A parent management training within the Prevention Program for Externalizing Problem Behavior (PEP) [49] was investigated in the present study. PEP was conceived as an indicated prevention program. Indicated approaches address high-risk persons with initial signs of a disorder that do not meet the diagnostic criteria of a disorder [44]. Although the present trial had a preventive character, it went beyond a purely preventive approach. All families with children who had elevated symptoms were considered for this trial irrespective of whether diagnostic criteria were fulfilled or not. Previous analyses of this study revealed statistically significant short-term [21] and long-term (1-year follow-up) effects [22] of the parent management training. The trial was planned as a within-subject control group study where a waiting period prior to treatment served as the control condition. With respect to short-term effects, it was shown that changes during the treatment period were significantly stronger than during the waiting period [21]. Immediately after the training (post), the treatment effects for externalizing child behavior problems were in the medium range and parenting competencies were in the upper-small range. At 1-year follow-up, the treatment effects for externalizing problem behavior were maintained and, for parenting competencies, a further increase within the small-to-medium range was observed [22]. Clinical significance has also been addressed for the same study [24]. Clinical significance is an additional concept to those of statistical significance and effect size [36, 43, 47]. Measures of clinical significance provide information about the practical meaning of the results. To assess clinical significance, the method of Jacobson et al. [29, 30] was applied. Immediately before treatment, up to 50.7% of the children were classified as clinical cases (dysfunctional) on three measures of child behavior problems and, immediately after treatment (parent training), up to 61.6% of the clinical cases were judged to be improved

or recovered [24]. That is, a large proportion of children exhibited a clinically relevant change in their externalizing problem behavior.

The aim of the present study was to extend the above findings and identify predictors associated with therapeutic change due to parent management training (called “treatment” throughout this manuscript). Therapeutic change was defined as the difference in outcome measures from the pre-treatment to the post-treatment assessments and was essentially the same term as that defined and used by Kazdin et al. [33, 34].

All aforementioned studies on predictors or moderators for treatment outcome or therapeutic change used externalizing behavior problems as the outcome variable. In the present study, we also evaluated parenting self-efficacy (PSE) as an outcome measure for therapeutic change because this is a central mediator for parent management training. Much less is known of predictors of parenting behavior than of child externalizing behavior. This is one of the first studies to investigate both potential predictors.

Moreover, as little is known about the differential effectiveness of predictors for different follow-up periods, we analyzed two time periods for therapeutic change: (1) immediate therapeutic change, which comprised the change from the pre-treatment assessment to the assessment immediately after treatment (post); and (2) long-term-change, which was the change from pre-treatment to 1-year follow-up. We also investigated whether the importance of a predictor remained the same over time. The present study was exploratory. Many of the results were equivocal, which makes it difficult to develop precise hypotheses.

In this study, therapeutic change was the primary outcome measure. In subsequent analysis, we defined outcome at post and follow-up, respectively, as further criteria to predict success. Thus, the present study tried to answer two slightly different research questions: (1) what are the predictors for therapeutic change? and (2) what are the predictors of outcome?

Method

Evaluation procedure

In this study, the parent management training component of PEP was evaluated by a within-subject control group design. There were two assessment points before treatment: the first assessment (pre1) was 3 months before treatment, and the second assessment (pre2) occurred after a 3-month waiting period and immediately before treatment. There was an assessment immediately after treatment (post) and further follow-up assessments were conducted at 3 months (fu1) and 1 year (fu2) after the post-measurement. The

present analysis considered two time periods: the first time interval covered the treatment period (i.e., from pre2 to post), and the second time interval covered both the treatment period and the 1-year follow-up period (i.e., from pre2 to fu2). Information on all variables was gathered from mothers by questionnaire booklets.

Participants

Families who referred their child to 1 of 37 different local counseling services, pediatric primary care centers and psychotherapy practices located in North Rhine-Westphalia (Germany) were taken into consideration for the study. Children were usually referred to these institutions because their parents or teachers were concerned about the behavior problems of the child and, therefore, asked for assessment and counseling or more extended treatment. The only inclusion criterion was a 3- to 10-year-old child with externalizing problem behavior. No threshold with respect to symptom severity was defined. The ethics committee of the University Hospital Cologne approved the study. Families were informed by the trainer about the study design and informed consent was obtained prior to study participation. In particular, families were informed about the 3-month pre-treatment assessment period.

The number of families at each of the assessment points was as follows: pre1 $n = 328$, pre2 $n = 265$, post $n = 210$, fu1 $n = 171$ and fu2 $n = 101$. Families who never attended the training were excluded from the analysis. Thus, conclusions about the treatment were valid only for families who attended at least one unit of the parent management training. After this correction, the number of families analyzed at each assessment point was: pre1 $n = 270$, pre2 $n = 248$, post $n = 210$, fu1 $n = 171$ and fu2 $n = 101$.

Using the sample of 270 families at pre1, we conducted several comparisons to investigate missing data. We tested whether families who participated in the training, but who dropped out of the study either at post ($n = 60$) or at fu2 ($n = 169$) differed from those who attended the training and provided a complete set of data. Participants with missing data at post did not differ in any of the outcome measures at pre1 from those whose data were available at post. The same was true for those participants with missing data at fu2 ($n = 169$) and available data at fu2 ($n = 101$), respectively. Patients with missing data at fu2 did not differ from patients with full data sets at fu2 regarding their changes during treatment (pre2/post) on any of the outcome variables. Therefore, it was assumed that dropout was random.

PEP trainers

Prevention Program for Externalizing Problem Behavior trainers were experienced child psychotherapists and

employees of the 37 different institutions. Overall, 59 trainers were recruited to hold PEP courses. On average, there were 4.66 (SD = 1.36) families per trainer and 7.50 (SD = 5.13) families per institution. The schooling of the prospective PEP trainers was for 2 days and was held by project members. Of the 59 trainers, 37.3% were psychologists, 15.7% educationalists, 23.5% social or educational workers, 15.7% remedial teachers and 7.8% belonged to other professions.

PEP presentation format, content and intensity

Prevention Program for Externalizing Problem Behavior is presented in a group format. The program consists of two different components: a parent training and a training for kindergarten teachers of children with externalizing problem behavior aged 3–10 years. In the present study, only parents were trained. The parent component comprises 12 units: 6 basic units and 6 additional units. Each unit takes between 90 and 120 min to complete and is meant for between four and eight participants. Details about the program are presented elsewhere [21, 49].

In the present study, the trainers were obliged to deliver the six basic units, but the additional units were only given as required, based on the needs of the parent groups and available time as determined by the trainer. On average, the 59 trainers offered 7.88 units (SD = 1.43). Parents attended on average 4.63 lessons (SD = 1.56) of the six basic units.

Outcome measures

Outcome measures were the externalizing behavior problems of the child rated by the parents and the parent-rated self-efficacy of parenting. Single questionnaires were aggregated to two composite scores.

Externalizing behavior problems child

The *Child Behavior Checklist for ages 4–18* (CBCL/4–18) [1] is designed to assess a variety of child-specific behavior problems. Items are scored from 0 to 2 with higher scores indicating more severe problems. Various studies proved the German version to be a factorially valid, robust and highly reliable rating scale [16]. For this study, we used the Externalizing Syndrome Scale (CBCL-EXT) with 33 items and an internal consistency of Cronbach's $\alpha = 0.89$.

The *Symptom Checklist for Attention-Deficit and Hyperactivity Disorder* (SCL-ADHD) [17] assesses the diagnostic criteria of DSM-IV [2] and ICD-10 [61] for attention-deficit and hyperactivity disorder (ADHD). The instrument consists of 20 items assessing the 18-symptom criteria for ADHD according to DSM-IV and ICD-10.

Items are scored on a 0 to 3 severity scale; scores of 2 and above are considered clinically relevant. The instrument has been shown to be reliable [17]. In our sample, internal consistency for the total score was Cronbach's $\alpha = 0.92$.

The *Symptom Checklist for Oppositional Defiant Disorder* (SCL-ODD) [17] contains in nine items the diagnostic criteria of DSM-IV and ICD-10 for oppositional defiant disorder (ODD). This instrument has been shown to be reliable [17]. Items are scored on a 0–3 severity scale; scores of 2 and above are considered clinically relevant. Internal consistency was Cronbach's $\alpha = 0.91$.

Self-efficacy parenting

The *Self-Efficacy Scale* (SEFS) is the German adaptation of the Parenting Sense of Competence Scale developed by Johnston and Mash [31] and the Self Efficacy for Parenting Task Index by Coleman and Karraker [11]. The SEFS comprises 15 items measuring parents' perception of self-efficacy on a 0–3 scale with higher values indicating more competencies. In this sample, one item was deleted due to low item total correlation. Internal consistency of the remaining items was Cronbach's $\alpha = 0.85$.

The German adaptation of the *Problem Setting and Behavior Checklist* (PSBC) developed by Sanders et al. [52] measures the perceived ability to solve difficult parenting situations. Items are scored on a 0–3 scale. Higher scores reflect a stronger ability to deal with difficult parenting situations. Internal consistency for the overall score in our sample was Cronbach's $\alpha = 0.91$.

Composite scores outcome variables

Confirmatory factor analysis using structural equation modeling [5, 8, 35] was performed to test whether an aggregation of the single scales scores to composite scores describing externalizing problems of the child (EXP) and PSE was admissible. Models were computed with pre2 data by using LISREL [32].

In the model, two latent variables, EXP and PSE, were considered. CBCL-EXT, SCL-ADHD and SCL-ODD served as indicators for EXP, and SEFS and PSBC were the observed variables for PSE. The latent variables were allowed to covariate. The χ^2 test was significant [$\chi^2(4, n = 248) = 13.43, P = 0.009$]. As two other fit indices showed either a good fit (CFI = 0.98) or, according to MacCallum et al. [40], a mediocre fit (RMSEA = 0.098), the model was maintained. All factor loadings considered were significant on an alpha error level of 0.05.

To aggregate the single variables to the two composite scores (EXP and PSE), they were z-transformed, added up and averaged. For z-transformation, means and standard deviations of pre2 were used.

Operationalization therapeutic change

Therapeutic change was determined for two time intervals: (1) immediate change was from the pre-treatment to the post-treatment assessment; and (2) long-term-change was from pre-treatment to 1-year follow-up. For this, the pre2 score was subtracted from the post and fu2 scores, respectively, and divided by the standard deviation of the pre2 scores [33, 34]. Thus, the scores are equivalent to an effect size measure (e.g., pretreatment–posttreatment/standard deviation unit). Cohen's [10] classification of small (0.20), medium (0.50) and large (0.80) effect sizes can be used to evaluate difference scores. The average difference scores of EXP for the change from pre2 to post was -0.44 and from pre2 to fu2 was -0.50 , indicating a decrease in child problem behavior in the small-to-medium range. The average difference score of PSE for the change from pre2 to post was 0.42 , and from pre2 to fu2 was 0.71 , indicating an increase in parenting competencies in the small-to-medium range.

Predictor variables

Variables used to explain therapeutic change were assigned to the three dimensions of: (1) child, (2) parent and (3) SES and other sociodemographic characteristics of the family.

Child

The first child variable was *sex*. Boys were coded 0 and girls 1. At the beginning of the study, there were 214 (79.3%) boys. The second child variable was *age*. At pre1, children had an average age of 6.52 years ($SD = 2.02$) with a range of 3–10 years.

Further child predictor variables were the composite score *EXP* and *Internalizing Syndrome Scale (CBCL-INT)* assessed by CBCL/4–18 at pre2.

Parent

The first parent variable was *age* of the mothers. The mean age was 36.35 years ($SD = 5.18$) with a range from 22 to 49 years. A further parent variable was the composite score *PSE*. The total score of the Depression Anxiety Stress Scales (DASS) [37] was used to assess *parental psychopathology*. As much as 42 items are scored on a four-point scale with higher scores corresponding to greater psychopathology. This instrument has been shown to be reliable [14]. Internal consistency for this sample was Cronbach's $\alpha = 0.96$.

SES of the family

School education of the mothers and fathers was assessed using a four-point scale (0 = no school-leaving

qualification, 1 = secondary school basic qualification, 2 = secondary school intermediate qualification, 3 = secondary school high qualification). Four (1.5%) mothers and three (1.1%) fathers had a school-leaving qualification that was not classifiable (from other countries) and were, therefore, excluded from the analysis. Data were missing for 51 (18.9%) fathers.

Employment status was coded as unemployed (0) or employed (1). Of the 270 families, 148 (54.8%) mothers and 189 (70.0%) fathers were employed. Data were missing for 7 (2.6%) mothers and 49 (18.1%) fathers.

Family status was coded as single-parent families (0) or two-parent families (1); 68 (25.2%) children lived in single-parent families. Of the single-parent families, 67 children lived with their mother and 1 child with his or her father.

Language was dichotomized as families who spoke exclusively German at home (coded 1) and families who spoke exclusively or additionally a language other than German (coded 0); 227 (84.1%) families spoke exclusively German at home.

Statistical analysis

A per protocol approach was used for both the correlational and regression analyses. That is, all patients with missing data for the relevant analysis were excluded. Linear regression analyses were used to examine the relevance of the predictors for therapeutic change. First, predictors were entered separately into the model. Subsequently, predictor variables that were significant in isolation were entered in a hierarchical regression analysis. This is in line with the CPPRG study [12].

Results

Predictors of therapeutic change

Table 1 summarizes the correlation coefficients for the different predictor variables; the correlation coefficients ranged from $r = 0.00$ to 0.63 .

Linear regression analysis determined whether a single predictor variable significantly explained therapeutic change in one of the two composite outcome measures, EXP and PSE.

Standardized regression coefficients of the predictors for therapeutic change in EXP and PSE for the two time intervals pre2/post and pre2/fu2 are given in Table 2. EXP at pre2 and school education of the mother were significant predictors for therapeutic change of EXP at pre2/post and pre2/fu2. The higher the initial level of externalizing behavior, the more the children improved. The higher the

Table 1 Correlation coefficients of the predictor variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Child												
1. Gender												
2. Age	−0.12*											
3. EXP	−0.09	0.19**										
4. CBCL-INT	0.03	0.16*	0.55**									
Parent												
5. Age	0.04	0.25**	−0.10	−0.07								
6. PSE	−0.04	0.02	−0.40**	−0.20**	0.11							
7. DASS	0.08	−0.09	0.34**	−0.28**	0.13*	−0.63**						
SES family												
8. School educated mother	0.03	0.06	0.22**	−0.07	0.13	0.02	−0.04					
9. School educated father	0.01	−0.02	−0.09	0.03	0.14*	−0.13	0.05	0.55**				
10. Employed mother	0.00	0.12*	0.00	−0.09	0.15*	−0.08	−0.05	0.11	0.09			
11. Employed father	0.02	0.05	0.08	0.11	0.09	0.01	−0.11	0.25**	0.22**	0.16*		
12. Family status	−0.06	0.02	0.02	0.11	0.07	0.01	−0.11	0.03	0.11	−0.05	0.15*	
13. Language	0.07	0.04	−0.13*	−0.04	0.15	0.17**	−0.09	0.14*	0.19**	0.02	0.15*	−0.09

Sample size ranged from 205 to 270

EXP composite score externalizing problems of the child, *CBCL-INT* Child Behavior Checklist for ages 4–18 Internalizing Syndrome Scale, *PSE* composite score parenting self-efficacy, *DASS* Depression Anxiety Stress Scales, *SES* socioeconomic status

* $\alpha < 0.05$, ** $\alpha < 0.01$

Table 2 Results from separate regression analyses for prediction of therapeutic change in composite score externalizing problem behavior of the child (EXP) and composite score parenting self-efficacy (PSE)

	Therapeutic change EXP				Therapeutic change PSE			
	Pre/post		Pre/fu2		Pre/post		Pre/fu2	
	β	R^2	β	R^2	β	R^2	β	R^2
Child								
1. Gender	0.01	0.00	0.18	0.03	0.03	0.00	−0.01	0.00
2. Age	−0.03	0.00	−0.05	0.00	0.09	0.01	0.12	0.01
3. EXP	−0.35**	0.12	−0.55**	0.31	0.10	0.01	0.19	0.04
4. CBCL-INT	−0.06	0.00	−0.25*	0.07	0.01	0.00	0.16	0.02
Parent								
5. Age	0.00	0.00	0.11	0.01	−0.09	0.01	−0.10	0.01
6. PSE	0.05	0.00	0.33**	0.11	−0.33**	0.11	−0.47**	0.22
7. DASS	−0.04	0.00	−0.18	0.03	0.12	0.02	0.26**	0.07
SES family								
8. School educated mother	0.21**	0.04	0.23*	0.05	−0.07	0.01	−0.10	0.01
9. School educated father	0.09	0.01	0.22*	0.05	0.01	0.00	−0.15	0.02
10. Employed mother	0.13	0.02	0.15	0.02	−0.13	0.02	−0.13	0.02
11. Employed father	0.07	0.00	0.08	0.01	−0.15	0.02	−0.01	0.00
12. Family status	−0.09	0.01	0.09	0.01	0.00	0.00	−0.01	0.00
13. Language	0.13	0.02	0.23*	0.05	−0.09	0.01	−0.16	0.03

For pre2/post, sample size ranged from 167 to 198; For pre2/fu2, sample size ranged from 79 to 98

β Standardized regression coefficient, R^2 multiple correlation squared, *EXP* composite score externalizing problems of the child, *CBCL-INT* Child Behavior Checklist for ages 4–18 Internalizing Syndrome Scale, *PSE* composite score parenting self-efficacy, *DASS* Depression Anxiety Stress Scales, *SES* socioeconomic status

* $\alpha < 0.05$, ** $\alpha < 0.01$

Table 3 Results from hierarchical regression analysis for prediction of therapeutic change in composite score externalizing problems of the child (EXP)

Step	Therapeutic change EXP					
	Pre2/post (<i>n</i> = 196)			Pre2/fu2 (<i>n</i> = 78)		
	Variable	β	R^2 at step	Variable	β	R^2 at step
1. Child	EXP	−0.35**	0.12	EXP	−0.62**	0.31
2. Parent				CBCL-INT	0.13	
				EXP	−0.59**	0.31
				CBCL-INT	0.13	
3. SES				PSE	0.07	
	EXP	−0.32**	0.14	EXP	−0.56**	0.36
	School educated mother	0.13		CBCL-INT	0.16	
				PSE	0.04	
				School educated mother	−0.8	
				School educated father	0.04	
				Language	0.25*	

β standardized regression coefficient, R^2 multiple correlation squared, *EXP* composite score externalizing problems of the child, *CBCL-INT* Child Behavior Checklist for ages 4–18 Internalizing Syndrome Scale, *PSE* composite score parenting self-efficacy, *SES* socioeconomic status

* $\alpha < 0.05$, ** $\alpha < 0.01$

CBCL-INT at the beginning of the study, the more the children improved. The lower the initial parenting competencies in the beginning, the more the parents improved. The lower the school education of the mothers, the more the children improved. Additionally, CBCL-INT, PSE, school education of the father and language were significant predictors for therapeutic change of EXP at pre2/fu2. The higher the CBCL-INT at the beginning of the study, the more the children improved. The lower the school education of the father, the more the children improved. If the families exclusively or additionally spoke a language other than German, then the families profited more. PSE at pre2 was a significant predictor for therapeutic change of PSE for both time intervals. The lower the initial parenting competencies in the beginning, the more the parents improved. Additionally, DASS became significant at pre2/fu2. The more parents were impaired by psychopathology, the more they improved their PSE.

Hierarchical regression analyses were used in the second step to analyze the combined effects of the different predictors that were significant in the first step. Variables were entered in an ordered fashion. Child proximal variables were entered into the model first, followed by child distal variables. That is, for therapeutic change of EXP, child variables were considered first, followed by parent variables, and then SES measures were entered into the model. Results of the hierarchical regression analysis for EXP are reported in Table 3. For the hierarchical regression analysis of the therapeutic change of EXP at pre2/post, EXP and school education of the mother were considered. However, in the final step, only EXP remained relevant; school

Table 4 Results from hierarchical regression analysis for prediction of therapeutic change in composite score parenting self-efficacy (PSE)

Step	Therapeutic change PSE					
	Pre2/post (<i>n</i> = 198)			Pre2/fu2 (<i>n</i> = 98)		
	Variable	β	R^2 at step	Variable	β	R^2 at step
1. Parent	PSE	−0.33***	0.11	PSE	−0.51**	0.22
				DASS	−0.7	
2. Child						
3. SES						

β Standardized regression coefficient, R^2 multiple correlation squared, *PSE* composite score parenting self-efficacy, *DASS* Depression Anxiety Stress Scales, *SES* socioeconomic status

* $\alpha < 0.05$, ** $\alpha < 0.01$

education just missed significance. In the final step, R^2 was 0.14. In the next hierarchical regression analysis for therapeutic change of EXP at pre2/fu2, EXP, CBCL-INT, PSE, school education of the mother, school education of the father and language were considered. In the last step, EXP at pre2 and language remained as significant predictors; all others did not reach significance. The higher the initial level of externalizing behavior, the more the children improved. If the families exclusively or additionally spoke a language other than German, they profited more. In the last step, R^2 was 0.36.

Results of the hierarchical regression analyses for PSE are reported in Table 4. Variables were again entered in an ordered fashion: parent variables, followed by child

variables and then SES variables. For therapeutic change of PSE at pre2/post, only PSE at pre2 was considered as a predictor. That is, the same result as for the single regression analysis was obtained. In the hierarchical regression analysis for therapeutic change of PSE at pre2/fu2, both PSE and DASS were considered. Only PSE remained as a significant predictor. The lower the initial parenting competencies, the more the parents improved. R^2 was 0.22.

Predictors of outcome

Among other things, the results of the main analysis on therapeutic change showed that patients with the most severe externalizing behavior problems and the most impaired parenting behavior had the largest improvement in these outcome variables. The subsequent analysis on immediate and long-term outcome investigated whether the patients with more severe externalizing behavior problems and more impaired parenting behavior at the beginning of the study were still the most severely disturbed patients at the end of the study.

In the first analysis on externalizing behavior at post as the criterion, the regression coefficient for EXP at pre2 was positive ($\beta = 0.79$, $P < 0.001$). The same was true when EXP at pre2 was the predictor for externalizing behavior at fu2 ($\beta = 0.63$, $P < 0.001$). That is, the higher the initial externalizing problem behavior, the higher the externalizing behavior was at the end.

In the second set of analyses, we used parenting behavior at post and fu2, respectively, as criteria. Here, the only predictor tested was initial parenting behavior at pre2. For parenting behavior at post as the criterion, the regression coefficient for PSE at pre2 was also positive ($\beta = 0.66$, $P < 0.001$). The same was true when parenting behavior at fu2 was the criterion ($\beta = 0.57$, $P < 0.001$). That is, the higher the initial PSE before treatment, the higher was the PSE at the end of treatment.

In summary, these analyses showed that the more severely impaired children and parents exhibited the greatest therapeutic change, but were still the most affected at the end of treatment.

Discussion

In this study of the predictors for therapeutic change of externalizing behavior of the child and PSE during a parent management training, therapeutic change was defined as the change in outcome measures from pre- to post-treatment (immediate change) and from pre-treatment to 1-year follow-up (long-term change). We also investigated whether some significant predictors of therapeutic change were

also predictors of therapeutic outcome (i.e., the severity of externalizing behavior and the impairment of parenting at the end of treatment and at follow-up).

In the multivariate regression analysis, the variable that was relevant for both time intervals of therapeutic change in externalizing behavior of the child was externalizing behavior at the beginning of the treatment. The higher the externalizing behavior of the child prior to treatment, the greater was the reduction after treatment. That is, children with severe externalizing behavior improved more. Up to about 30% of the variance of therapeutic change in externalizing behavior of the child could be predicted by the initial level of externalizing behavior. Language was also a predictor for the second time interval. That is, children from families who spoke another language besides German at home profited more from treatment. This factor only explained about 5% of the variance of therapeutic change. In the separate regression analyses, internalizing behavior of the child, initial level of PSE and education of the mothers and the fathers were significant for at least one time period. However, these variables did not additionally explain variance in the criterion in the multivariate analysis. Other potential predictor variables such as gender and age of the child, age and psychopathology of the mothers, employment of the mothers and the fathers and family status did not predict therapeutic change in any of the analyses.

For PSE, the only significant variable for therapeutic change was the initial level of PSE. This was the case for both time intervals of therapeutic change. The lower the initial self-efficacy, the higher was the subsequent gain. Up to about 20% of the variance in the criterion was explained by the initial level of PSE. Psychopathology of the mothers was significant in the bivariate analyses. However, this variable did not additionally explain variance in the criterion in the multivariate analysis. Other potential predictor variables such as gender, age, initial externalizing behavior, initial internalizing behavior of the child, age of the mothers, school education, employment of the mothers and fathers, family status and language did not predict therapeutic change. Thus, the predictors that were relevant for short-term effects were also important for long-term effects.

Our finding that children with higher scores for externalizing behavior at the beginning improved more than those with lower scores corresponds with results from meta-analyses [38, 60] and other studies [26, 50, 56]. Children with high levels of externalizing behavior have the greatest potential for change. On the other hand, experience from clinical practice shows that children with more severe externalizing behavior are especially difficult to treat. The fact that the children in our study were young and less chronically ill may explain the greater therapeutic change in the more disturbed groups.

However, our supplementary analysis found that those children with more severe externalizing behavior in the beginning were on average still the most affected children at the end of the treatment. That is, although children with high levels of externalizing behavior profited most from treatment, they were still the ones with the most severe behavior problems at the end of treatment and follow-up. For clinical practice, these results imply that a stepped care approach is useful [6, 15]. Thus, parent management training in a group format is a cost-effective intervention that can be applied as a first step. It is likely that those children who are more severely disturbed at the beginning of treatment will profit most. However, it is equally likely that they will be in need of more intensive support.

Owens et al. [48] investigated moderators of treatment response for the NIMH Collaborative Multisite Multimodal Treatment Study of Children With Attention-Deficit/Hyperactivity Disorder (MTA). They found that, for medication management and combined treatment, greater initial severity of the child predicted an inferior treatment response [57]. Despite a somewhat different statistical approach, our results confirm their findings. Additionally, our findings complete the picture by showing that the most impaired also improve the most.

By showing that the severely impaired do profit most, this study indirectly supports the indicated preventive approaches that target high-risk persons who already show initial symptoms of a disorder, but who do not yet meet the diagnostic criteria. In contrast to this approach, universal preventive interventions address the whole population irrespective of risk for developing a disorder.

Similarly, Sonuga-Barke et al. [54] also investigated a parent management training under routine care conditions where the treatment was offered by non-specialist nurses in primary care settings [55]. The parent management training had previously been shown to be effective when applied in specialized settings [54]. Yet, when applied under routine care conditions, no relevant treatment effects could be demonstrated. The authors concluded that the benefits reported earlier did not generalize to the routine primary care setting and hypothesized that the routine care therapists might not have been sufficiently able to support families through the process of change or might have been less involved in the program. The results of the present study give a somewhat different answer. Although the program was offered under routine care conditions and the trainers were also not explicitly specialized in the treatment of externalizing problem behavior, the effectiveness and clinical significance of the program was demonstrated, as reported in previous publications [21, 22, 24]. From this, it can be concluded that there is no need for a specialized setting and, therefore, the intervention can also be effective under a broad range of routine care conditions. One reason

for this result might be the different interventions offered. The parent management training investigated in this trial is highly structured and, therefore, easy to apply. Another reason for the different results between studies might be the higher level of education of the trainers in the current study (all had a university degree), whereas the training was offered by nurses in the study of Sonuga-Barke et al. [54].

The parent management training of PEP has a cognitive-behavioral basis. Principles and techniques that are considered in the program are common with other programs that also have a behavior-based foundation. Correspondingly, the results concerning the magnitude of the treatment effects are comparable to those found in other trials [13, 18, 20, 42, 46]. PEP was originally conceived as an indicated prevention program. The pure preventive context was left in this study, as children with severe problem behavior were also included. It is worth mentioning that a preventive orientated program can also be effective for children with symptoms in the clinical range.

One methodological explanation for strongest therapeutic change in the most impaired could be a regression to the mean effect; that is, children with higher ratings at the first measurement have a higher chance per se for reduced ratings at the second assessment. In such cases, we would expect to see greater changes in the outcome variables for the more impaired also during the waiting period. This was tested in a separate study using growth mixture analysis [23], and the variables did not change significantly during the waiting period. Thus, the results found here cannot simply be explained by a regression to the mean effect.

While several studies have investigated predictors for externalizing behaviors, we found no previous study on predictors of therapeutic change in parenting behavior. Our analysis of predictors for parenting behavior replicated the results for externalizing problems. That is, the parents with more impaired parenting behavior at the beginning had the largest changes and were the most impaired at the end of treatment and follow-up.

A relevant finding was that, in the longer term, more variance in therapeutic change could be explained. For EXP for the short time period of therapeutic change, about 12% could be explained by the initial level of problem behavior; the corresponding value for the longer time period was about 31%. A similar picture emerged for the therapeutic change of parenting competencies. Here, about 11% could be explained by initial PSE for the short time period of therapeutic change, and about 22% for the longer time period. That is, immediately after treatment, the advantages for the more impaired are not that obvious; the benefit only becomes more apparent in the long term. It might be that the more impaired families need time to implement the treatment techniques in their daily routine. Or, it may take more time to alter the behavior of the more

disturbed children. To our knowledge, this is the first study that documents this treatment effect. We are not suggesting that families with severely impaired children should get no further support after the parent management training until their advantage becomes apparent in the long run. These families are on average the most impaired in the end and, therefore, should be offered further interventions when needed.

This study has several limitations. First, there were considerable dropouts during the course of the study. However, analyses showed that it was likely that drop-out was random and did not depend on therapeutic change. Furthermore, because of the general paucity of long-term data, these results are valuable. Second, data were gathered exclusively from questionnaires given to mothers and a third-person rating would have been useful. Thus, the results primarily reflect the perception of the mothers who also participated in the treatment. Third, conclusions of this analysis are only valid for the child, parent and SES variables considered. By including other important domains (e.g., help seeking, initial burden), a different picture about the relevance of predictors might have been obtained. Fourth, there was a high correlation between the initially reported PSE and parental psychopathology. That is, parent reports might be biased through negative cognitions. Yet, even if such a bias did exist, the results suggest that treatment effects were not hindered, as the most impaired parents improved the most. Fifth, as there was some variance in the units the trainers offered. We decided to give the trainers the choice of how many units they offered because this corresponds to the real-world settings under which parent trainings are given. Under routine care conditions, the duration of a treatment is only partially influenced by the recommendations of experts and is primarily determined by organizational circumstances. That is, in this trial, the numbers of units held were based on the needs of the parent groups and the available time as determined by the trainers. However, the variance in the offered treatment units was small. In general, the data analyzed had a multilevel structure (families nested in trainers nested in institutions) and, therefore, from a statistical perspective, random effect models are relevant. We refrained from using this approach, as we were at the lower recommended threshold of trainers and institutions needed for this analysis [39].

From a practical point of view, these results are promising because the greatest treatment effects were observed for the parents and children with more severe problems. For the trainers and therapists, the findings also clarify who will profit from treatment. When the initial levels of externalizing problem behavior of the child and parenting competency are considered, many other domains (e.g.,

gender, age and internalizing problems of the child, age of the parent, parental psychopathology, school education and employment status of the parent, family background) do not additionally explain therapeutic change. That is, many domains do not have to be kept in mind by the trainer as relevant for therapeutic change. Nevertheless, the severely impaired children and their parents remained the most impaired at the end of treatment and might need further help. For institutions offering parent management training under routine care conditions, the findings of this study show that it is likely that children with severe externalizing behavior need continued special attention even if they exhibit strong treatment responses.

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