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Impact of comorbidity in prevention of adolescent depressive symptoms

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Abstract

Despite the well-known relevance of comorbidity, few studies have examined the impact of comorbid anxiety or externalizing symptoms on the prevention of depressive symptoms in adolescents. To replicate earlier positive effects of a cognitive-behavioral prevention program of depressive symptoms and to test the hypothesis that the prevention program would be less effective in adolescents with comorbid anxiety and externalizing symptoms, a study was conducted involving 301 8th-grade students, randomly divided into an intervention group and a non-intervention control group. The randomized design included baseline, post-intervention, and 6-month follow-up. The prevention program included 10 sessions held in a regular school setting. The prevention program showed positive effects on depressive symptoms, independent of comorbid symptoms. These effects were found mainly with girls independent of their depressive symptoms at baseline, and in part with boys with less severe depressive symptoms at baseline. Surprisingly, negative effects of the prevention program on depressive symptoms were found on the depression of boys with more severe depressive symptoms at baseline. The prevention program's low rate of attrition and high recruitment rate support the generalizability of the results.

Keywords: depressive symptoms; adolescents; comorbid symptoms; school-based universal prevention

According to epidemiological studies, 15% to 20% of children and adolescents experience at least one depressive episode before adulthood (Birmaher et al., 1996). The consequences of the early development of depressive disorders may persist for years after adolescence. Depressive symptoms at a young age also increase the probability of major depression (e.g., Weissman et al., 1999) and other psychopathologies later in life (Birmaher et al., 1996). Even so-called “subsyndromal depression” is a serious risk factor for depressive episodes in youth or later in life (Georgiades, Lewinsohn, Monroe, & Seeley, 2006; Lewinsohn, Solomon, Seeley, & Zeiss, 2000). In response to the high incidence and negative long-term effects of depressive symptoms and major depression in children and adolescents, different researchers have developed universal prevention programs that can be applied to a general population regardless of individual risk (for a review of the advantages and disadvantages of different types of prevention programs, see Offord, 2000; Pössel, 2005).

Four cognitive-behavioral, school-based universal prevention programs of depressive symptoms for adolescents have emerged from different labs. All but one have shown some positive effects by preventing the development of depressive symptoms or reducing the increase of an already existing depressive symptomatology (Merry, McDowell, Wild, Bir, & Cunliffe, 2004; Pössel, Horn, Groen, & Hautzinger, 2004; Shochet et al., 2001; Spence, Sheffield, & Donovan, 2003, 2005). Only one prevention program (Clarke, Hawkins, Murphy, & Sheeber, 1993) showed no effect at all on the depressive symptomatology of participating adolescents.

To the best of our knowledge, no study has focused on the impact of comorbid problems on the prevention of depressive symptoms in adolescents. This is surprising given that it has been estimated that 40% to 90% of depressed adolescents have at least one comorbid disorder (Angold, Costello, & Erkanli, 1999), the most frequent being anxiety, oppositional defiant

disorder, and conduct disorder (e.g., Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). Some studies, however, found that these disorders affected the impact of psychotherapy on depressive adolescents. Based on empirical findings, most psychopathologies can be seen as existing on a continuum from subthreshold symptoms to diagnosable mental disorders (e.g. depression; see Flett, Vredenburg & Krames, 1997). Drawing from these studies, we may develop hypotheses about how comorbid symptoms might influence the effects of prevention programs.

So far, four studies have focused on the impact of comorbid anxiety on cognitive-behavioral therapy with depressed adolescents. In one of these studies, Clarke et al. (1992) noted that a higher score in state anxiety was connected with higher depression scores in a post-intervention trial. In another study focusing on a post-intervention trial, Reinecke (2005) reported a similar effect of comorbid anxiety disorders on a clinician-rating of depressive symptoms. In a study performed by Brent and colleagues (Brent, Kolko, Birmaher, Baugher, & Bridge, 1999; Brent et al., 1998), however, comorbid anxiety disorders were correlated with lower rates of recovery; no influence of comorbid anxiety on required additional psychotherapy could be shown in a post-intervention measure. Moreover, Rohde, Clarke, Lewinsohn, Seeley, and Kaufman (2001) reported no influence of anxiety disorders on the recovery of major depression. Instead, their results showed a greater decrease of self-reported depression scores from baseline to post-intervention measurement in adolescents with lifetime anxiety disorders than in patients without lifetime anxiety. In later 24-month follow-ups, no connection between comorbid anxiety and depression was found, independent of the outcome variable (Brent et al., 1999; Rohde et al., 2001; Weersing & Weisz, 2002). Although the pattern of results is somewhat mixed, it suggests that while anxiety may reduce the short-term effect of psychotherapy for depressed adolescents, it has no influence on follow-up effects.

Common basic maladjustments may explain this pattern of results. For example, depression and anxiety can be explained by dysfunctional emotional regulation and negative affectivity (Clark & Watson, 1991). These maladjustments can cause inadequate regulations of emotions and an inability to cope with negative events. Another risk factor of depression and anxiety is the so-called “behavioral inhibition” in social situations, which includes symptoms such as shyness, withdrawal behavior, inhibited communication, and anxiousness in unfamiliar and unpleasant situations (Muris, Merckelbach, Schmidt, Gadet, & Bogie, 2001). To reduce these symptoms of depression, effective cognitive-behavioral therapy addresses such maladjustments. Nevertheless, the existence of comorbidity may be the expression of a more generalized maladjustment compared to adolescents with only one disorder. If so, the ratio between maladjustment and intervention dose in adolescents with comorbidity at the end of psychotherapy might be less positive than in patients with only one disorder. This could explain the lower short-term effects in adolescents with comorbid depression and anxiety. In the long run, however, we expect adolescents participating in cognitive-behavioral therapy to be able to generalize the use of their new abilities to other situations. As such we believe that these adolescents will be more likely to address the common basic maladjustments of depression and anxiety. After the conclusion of cognitive-behavioral therapy, participants may experience a reduction of their depressive symptoms.

In addition to the studies previously mentioned six studies have focused on the impact of externalizing problems on cognitive-behavioral therapy and its subsequent influence on depression (Brent et al., 1999; Reinecke, 2005; Rohde et al., 2001; Rohde, Clarke, Mace, Jorgensen, & Seeley, 2004; Rohde, Jorgensen, Seeley, & Mace, 2004; Weersing & Weisz, 2002). None of these studies reported an effect of conduct disorder, oppositional deviant disorder, or a

combination of both on the outcome of therapy with depressed adolescents in pre-post comparisons. In the follow-ups, however, three studies showed that externalizing problems increase the recurrence of major depression (Rohde et al., 2001), reduce the likelihood of recovery from major depression (Rohde, Clarke et al., 2004), and increase the amount of required additional therapy (Brent et al., 1999) after a course of cognitive-behavioral psychotherapy. Two studies, on the other hand, reported no effect of externalizing problems on self-reported depressive symptoms (Weersing & Weisz, 2002) and recovery from major depression (Rohde et al., 2001) after therapy. In summary, while externalizing problems may have no short-term effects on the therapy outcomes of depressed adolescents, they may have a negative influence on depression in the follow-ups.

One explanation for this pattern of results could be that depression in adolescents experiencing both depressive symptoms and comorbid externalizing problems might be the direct consequence of the externalizing problems or of the lifestyle connected with externalizing problems, as predicted by the so-called “failure model” (Capaldi & Stoolmiller, 1999). This model suggests that externalizing problems can result in conflict with others, rejection, a lack of support, poor skill development, and being difficult to teach, which in turn leads to failure experiences in social interactions and academic achievement. Such stressful life experiences are known to increase the risk of depression (Patterson & Stoolmiller, 1991). Furthermore, Panak and Garber (1992) showed that peer rejection partially mediates the link between externalizing problems and depressive symptoms. If our hypothesis is correct, the prevention of depressive symptoms in adolescents with externalizing problems might reduce depressive symptoms on a short-term basis, but in the long run, it will have only a reduced influence if changes are not made in the externalizing behaviors that cause depressive symptoms in these adolescents.

In general, some variables have to be considered when focusing on the prevention of depressive symptoms in adolescents, beginning with gender. According to the literature, the prevalence of major depression for adolescent girls is twice as high as it is for boys (e.g., Hankin et al., 1998). Furthermore, concurrent and life-time comorbidity involving depression is higher in girls than in boys (Costello et al., 2003), causing differences in the effects of prevention of depressive symptoms based on the mechanisms proposed above.

Additionally, the so-called *prevention effect* and *therapy effect* have to be taken into account. The term prevention effect refers to the prevention of the expected increase of depressive symptoms in participating adolescents without symptoms or with less severe symptoms at baseline. This effect becomes apparent as no changes in depressive symptoms occur in the intervention group while depressive symptoms in the control group increase. Therapy effect, however, refers to a decrease of symptoms in adolescents with more severe depressive symptoms at baseline in the intervention group while the severity of depressive symptoms in the control group remains stable or increases further. This theoretical pattern of results is supported by empirical studies (e.g., Pössel, Horn, Hautzinger, & Groen, 2004).

Hypotheses

Based on the literature, it can be expected that universal prevention of depressive symptoms will have positive effects on the depressive symptoms of participating adolescents (e.g., Merry et al., 2004; Pössel, 2005; Shochet et al., 2001). In order to give further support to this assumption, one aim of this study is to replicate these findings of universal prevention of depressive symptoms. For adolescents without and with less severe depressive symptoms at baseline, we expect to see a prevention effect with an increase in depressive symptoms in the control group, but no changes in the depressive symptoms of the intervention group. This should lead to

significant differences between both groups over time. In adolescents with elevated depressive symptoms at baseline, a decrease in symptoms can be expected in the intervention group (therapy effect). As with adolescents with few depressive symptoms at baseline, this should lead to significant differences between the intervention and control groups over time. Nevertheless, prevention is expected to be less effective in adolescents with comorbid anxiety symptoms immediately after the program, and in adolescents who display comorbid externalizing problems in follow-up assessments, than in adolescents without such symptoms.

Methods

Participants

Letters were sent to the principals of six middle schools in the area of Tuebingen (southwest Germany), asking for their school's participation in this project. The principals of two schools refused participation, expressing concerns for the potential loss of lessons for their normal school curriculum. A written description of the study was sent to the parents of the eighth graders at the four participating schools. Additionally, the study was described in detail to the adolescents and their parents in a parent-teacher conference by the authors. In these conferences the adolescents, parents, and their class teachers discussed the participation of the class and decided together if the class as a whole should participate in the study. As result of this procedure, all classes invited to participate in the study decided to give consent. Furthermore, all parents and adolescents, not participating on the parent-teacher conferences gave consent, too. This very high participation rate is typical for universal prevention in a school system like the one in Germany (Pössel, Baldus, Horn, Groen, & Hautzinger, 2005; Pössel, Horn, Hautzinger, & Groen, 2004), where classes of up to 30 students are taking all of their school courses together, for all high-school

years. Therefore, it is common that students have most of their friends in this one class, and they are highly motivated to participate in the same activities as their classmates, like in the prevention program.

Within the schools, the classes were randomly assigned to the intervention and control group. Both intervention and control conditions were recruited in each school, so that one class was randomly assigned to one condition and the other class was automatically assigned to the other. As result of the randomization procedure, 163 students (72 girls) in six school classes participated in the prevention program, and 138 students (68 girls) in six other classes received school lessons as usual (non-intervention control group). Based on this sample size of 301 adolescents and the calculated effect sizes for the impact of comorbid symptoms reported in the literature, this study design was adequate (>0.80) to detect medium or larger effect sizes ($f^2 = 0.07$; Cohen, 1988) with 4-way interactions.

The mean age of the participants in the intervention condition was 13.73 years ($SD = 0.63$). In the control condition the mean age was 13.63 years ($SD = 0.58$). Hereby, the age of the sample is within the range of earlier studies with school-based prevention programs (e.g., Petersen, Leffert, Graham, Alwin, & Ding, 1997; Clarke et al., 1993). During the course of the study 17/163 students of the intervention condition and 13/138 of the control condition dropped out because they changed schools. There were no differences between the drop-outs and remaining students in condition, (intervention vs. control), $\chi^2(1) = -0.47, p = .642$, gender, $\chi^2(1) = -1.58, p = .115$, age, $t(49.25) = 0.17, p = .867$, and anxiety symptoms, $t(299) = -0.82, p = .412$. But drop-outs showed more severe depressive symptoms, $t(299) = -2.14, p = .033$, and had higher composite scores of externalizing problems, $t(47.18) = -2.52, p = .015$, than remaining students.

Although data on socioeconomic status of the students are not available, a wide range of social classes is likely to be represented because students from schools in economically different regions of the area are represented.

Measures

The *Self-report Questionnaire – Depression* (Selbstbeurteilungsbogen-Depressive Störungen; SBB-DES) is an instrument developed for children and adolescents. It measures the severity of major depression and dysthymia symptoms outlined by the DSM-IV and ICD-10 (Döpfner & Lehmkuhl, 2000). The SBB-DES consists of 26 items (e.g., “I am sad most of the time.”). Each item has to be answered on a 4-point Likert scale, with higher numbers indicating more accordance with the item (on a scale ranging from 0 = “Not at all” to 3 = “A lot”). The test score is determined as the mean of the items, creating a range of scores from 0 to 3. Following Döpfner and Lehmkuhl (2000) a value of > 1 represents relevant depressive symptoms. In our sample, Cronbach’s Alpha = .92 and the 6 month test-retest stability, $r(301) = .56$, of this measure reached adequate levels.

The *Self-report Questionnaire – Anxiety* (Selbstbeurteilungsbogen-Angststörungen; SBB-ANG) is an instrument developed for children and adolescents to measure severity of anxious symptoms of GAD (e.g., “I am fearful of different events or have frequent worries (e.g., that I do anything wrong or that something bad happens to me or someone else).”), social anxiety (e.g., “I worry a lot about my behavior towards strangers.”), specific phobias (e.g., “I am very fearful of animals like dogs, spiders, or mice although I know this anxiety is excessive and unreasonable.”), and separation anxiety (e.g., “I am fearful of being separated from my parents.”) outlined by the DSM-IV and ICD-10 (Döpfner & Lehmkuhl, 2000). The SBB-ANG consists of 26 items. Each item has to be answered on a 4-point Likert scale, with higher numbers indicating

more accordance with the item (on a scale ranging from 0 = “Not at all” to 3 = “A lot”). The test score is determined as the mean of all SBB-ANG items, creating a range of scores from 0 to 3. Following Döpfner and Lehmkuhl (2000) a value of > 1 represents relevant anxious symptoms. In our sample, Cronbach’s Alpha = .90 and the 6 month test-retest stability, $r(301) = .62$, of this measure reached adequate levels.

The *Strengths and Difficulties Questionnaire* (SDQ, Woerner et al., 2002) is a brief questionnaire to measure the psychological adjustment of 11 to 16 year-olds and may be completed as a teacher or self-report measure. The SDQ consists of 25 positive and negative attributes. Participants rated each item on a 3-point Likert scale describing their personal strengths and difficulties (on a scale ranging from 0 = Not true to 2 = Certainly true). The items are divided into 5 scales (emotional symptoms, conduct problems, hyperactivity, peer problems, prosocial behavior) of 5 items each (e.g., “I get very angry and often lose my temper.”). Sum score of each scale range from 0 to 10. The SDQ is translated into more than 40 languages and can differentiate between normal adolescents and those with pathological symptoms, as well as between different disorders just as well as the YSR with just a fifth of the items (e. g., Klasen et al., 2000). In our sample, internal consistencies for the self-report scales of the SDQ were between .63 and .80 (Cronbach’s α), and the internal consistencies for the teacher-reports were between .73 and .85 (Cronbach’s α) which are comparable to internal consistencies of normative data for a representative German population (Woerner et al., 2002). In our sample, the 6 month test-retest stabilities of self- and teacher-reports are $r(301) = .50$ and $r(293) = .73$, respectively. Finally, the correlations between self- and teacher-reports range between $r(296) = .25$ and $r(296) = .34$, which is similar to correlations reported by Achenbach, McConaughy, and Howell (1987) in their meta-analysis of cross-informant correlations. The SDQ conduct problems scores of

adolescents and teachers were added to calculate a composite score for externalizing problems. Based on the representative field study of Woerner et al. (2002) a value in this composite score < 8 represents no or minimal symptoms, a value of 8 represents threshold problems and values > 8 represent relevant externalizing problems.

The school-based prevention program

Our manualised school-based universal primary prevention program LARS&LISA (Pössel, Horn, Seemann, & Hautzinger, 2004) is based on the social information processing model of social competence as described by Dodge (1993). Methods used are taken from cognitive-behavioral therapy. Based on Dodge's (1993) model, our prevention program targets on cognitive and social aspects, which can be further differentiate as follows: a) Two sessions about the relationship between cognition, emotion, and behavior; b) three sessions about exploration and changing dysfunctional cognitions; c) two sessions of assertiveness training; and d) two sessions of social competence training. The *cognitive part* of the program is based on the cognitive therapy approach of Beck, Rush, Shaw, and Emery (1979). First, the trainers explain the relationship between cognition, emotion, and behavior to the adolescents. Students then acknowledge their own automatic thoughts, confront them with the reality, and finally substitute them by functional, i.e., more realistic and helpful, thoughts. This part is designed to decrease underlying dysfunctional cognitions and to increase functional cognitions. By doing so, adolescents are expected to show less sadness, less anger, and more pleasure even with stressful experiences like school and social rejection. Furthermore, it can be posited that students' self-efficacy in social interactions increases as they develop functional cognitions. They frequent social interactions and come to see them as a possible alternative against withdrawal.

The *social part* of the program includes trainings for assertiveness and social competence. In the assertiveness training, adolescents practice confident, assured behavior in various situations. The social competence training targets the students' abilities to develop and maintain social contacts and networks. The training of new or unfamiliar functional behaviors in role plays leads to increased recognition about their possible value as alternative behaviors. Positive reinforcement during the program encourages adolescents' positive evaluation of the adaptive behavior beyond the program. Increasingly adaptive social behavior is expected as results of the role plays enabling participating adolescents to develop their individual social network, to enlarge it, and to improve using it.

Additionally, LARS&LISA includes a motivation section (one session) which is a main improvement to the previous program (LISA-T: Pössel et al., 2005; Pössel, Horn, Hautzinger, & Groen, 2004) and it gives students an opportunity to consider their goals and immediate plans of action to achieve them. Based on these principles, the usefulness of the newly acquired skills is shown at the end of every session. This procedure was developed in accordance to Kanfer and Gaelick-Buys (1991) and was adapted to adolescents. All parts of the program use illustrative situations introduced by the participating adolescents.

Design and Procedure

The impact of the prevention program LARS&LISA was determined by a prospective design comparing an intervention and a control condition. The questionnaires were filled in by the adolescents and their class teachers at baseline, immediate post-intervention, and 6-month follow-up. LARS&LISA was administered once a week over a 10-week period during regular school hours. One session comprised two class periods with a total of 1.5 hours each. During this time the control classes attended their usual school lessons, because of this design adolescents

and teacher knew about the assignment of the students to the intervention or non-intervention control group. Intervention classes were conducted separately by gender, because adolescents may be hesitant to portray themselves authentically in front of peers of the opposite gender. In fact, a pilot study has shown that adolescents in this age group work more effectively and openly as a team if they participate in gender homogenous groups (Pössel, Horn, & Hautzinger, 2003).

Adolescents, parents, and teachers of intervention and control group were informed about the program's objectives to strengthen skills of the adolescents and to facilitate their coping with strains. It was explained that having a control group is essential in order to study the program's effects. The study was approved by the ethical committee of the German Psychological Association. Each intervention group was coached by a trainer and a co-trainer, who were either master level psychologists or graduate students experienced in working with adolescents. As the majority of trainers and co-trainers were female (female = 5, male = 3), it was not possible to fit their gender to the gender of the adolescents. To minimize effects of the trainer's gender, trainers/co-trainers worked in gender mixed teams. Special training was provided for all trainers in three steps. First, each future trainer went through the program as participant. Secondly, they studied the manual, all materials and procedures, and resolved unclear points with the first author. Finally, they led a group as co-trainer together with a more experienced trainer. Furthermore, supervision was provided for all trainers with the help of video recordings of each session and a 1.5-hour weekly meeting with the first author. These recordings were also used to ensure that trainers adhered to the LARS&LISA manual.

Data Analysis

To test the influence of the postulated factors separately hierarchical linear model analyses were calculated with anxiety, and the composite externalizing problems scale. Interactions

between students of the same class or school may lead to intercorrelation of variables and create a general methodological problem in school-based studies (Hopkins, 1982). Disregarding potential nuisance variables may cause misinterpretations of results because natural groups, such as classes, as well as reciprocal influences between individuals and group, leading to enhanced group-specific differences between individuals (Goldstein, 1995). Therefore, a 2-level model was calculated with students nested within classes. School was not considered a group variable because both experimental conditions were administered to each participating school.

SBB-DES score at baseline, gender of the students (dummy variable: boys = 0, girls = 1), comorbidity (SBB-ANG score or combined SDQ conduct behavior score), and intervention condition (dummy variable: control group = 0, intervention group = 1) as well as all possible interactions between these factors were entered as independent variables. The SBB-DES score at post-intervention was used as dependent variables in two HLM analyses and at 6-month follow-up in further two analyses. Because the four-way interactions did not explain significant variance in either of the analyses, these interaction analyses are not presented.

In order to examine interactions relevant for the hypotheses, residual change scores (RCS) for high and low depressed participants were calculated following the suggestions by Cohen, Cohen, West, and Aiken (2003). These RCS enable a graphical presentation of direction and height of the changes in depressive scores from baseline to post-intervention or to 6-month follow-up. In order to differentiate between high and low depressed participants a median-split was performed with the SBB-DES score at baseline.

Furthermore, effect sizes following Hedges's g [= (mean of one group - mean of the other group) divided by pooled standard deviation of both groups] and their 95% confidence interval were calculated (Cohen, 1988). Effect sizes are displayed as positive values when the severity of

depressive symptoms decreased over time or when the intervention condition shows lower depression scores as the control condition. A comparison is stated to be only significant when the confidence interval of the effect size does not include null.

Results

Pre-intervention Comparisons

No significant differences between the conditions were found for self-reported depressive, $t(299) = -0.97$, $p = .334$, and anxiety, $t(299) = 1.09$, $p = .276$, symptoms at baseline, composite externalizing problems at baseline, $t(294) = 1.41$, $p = .161$, and gender, $\chi^2(1) = -0.88$, $p = .377$. It is of further interest that depressive and anxiety symptoms reported by the participants cover almost the whole range of the scales (depression score: 0.00 to 2.50; anxiety score: 0.00 to 1.90). These data indicate the representation of depressive and anxiety symptoms on all severity levels in the sample. This contrasts the data for the composite externalizing problems, where more severe scores are not represented in the sample (Range: 0 to 15). The descriptive statistics are shown in Table 1. Furthermore, correlations between self-reported depressive and anxious symptoms as well as the composite externalizing problems at all time points are reported in Table 2.

Intervention Effects with anxiety symptoms

In the post-intervention HLM analysis with comorbid anxiety symptoms the main effect of gender and condition, as well as the expected two-way interaction of baseline depressive symptoms by condition were significant. In the 6-month follow-up analysis the main effect of gender, as well as the two-way interactions of baseline depressive symptoms by gender and baseline depressive symptoms by condition were significant. None of the other main or

interaction effects were significant. Especially anxiety symptoms have no impact on the effect of the prevention program (Table 3).

Based on the calculated effect sizes and visualized in figure 1 depressive symptoms in adolescents with less severe depressive symptoms at baseline in the control group increased from baseline to post-intervention, $g = -0.84$, 95%; CI for effect size = - 1.19 to - 0.48, and from baseline to 6-month follow-up, $g = -0.73$, 95%; CI for effect size = - 1.07 to - 0.39. In the intervention group the depressive symptoms increased from baseline to 6-month follow-up, $g = -0.43$, 95%; CI for effect size = - 0.76 to - 0.11, only. Furthermore, while adolescents with less severe depressive symptoms at baseline in the intervention group report significantly more severe depressive symptoms than their peers in the control group at baseline, $g = 0.35$, 95%; CI for effect size = 0.01 to 0.69, no significant difference between students in both conditions can be shown at post-intervention, $g = -0.29$, 95%; CI for effect size = -0.64 to 0.05, or 6-month follow-up, $g = 0.11$, 95%; CI for effect size = -0.23 to 0.44. Finally, depressive symptoms in adolescents with less severe depressive symptoms at baseline in the control group increase significantly more than symptoms in adolescents in the intervention group from baseline to post-intervention, $g = 0.38$, 95%, CI for effect size = 0.03 to 0.72. These results are mostly consistent with the posited prevention effect in adolescents with less severe depressive symptoms at baseline.

Intervention effects with composite externalizing problems

In the post-intervention HLM analysis with composite externalizing problems the main effect of depressive symptoms at baseline and externalizing problems, as well as the expected two-way interaction of depressive symptoms at baseline by condition and the three-way interaction of depressive symptoms at baseline by gender by condition were significant. In the 6-month follow-

up analysis only the three-way interaction of depressive symptoms at baseline by gender by condition reached significance. None of the other main or interaction effects were significant. Especially the composite externalizing problem scores have no impact on the effect of the prevention program (Table 4).

From baseline to post-intervention as well as to 6-month follow-up the depressive symptoms increased significantly in boys with less severe depressive symptoms at baseline in the control group (baseline – post-intervention: $g = -1.29$, 95%; CI for effect size = - 1.80 to - 0.79; baseline – 6-month follow-up: $g = -0.93$, 95%; CI for effect size = - 1.40 to - 0.45) as well as in the intervention group (baseline – post-intervention: $g = -0.60$, 95%; CI for effect size = - 1.03 to - 0.18; baseline – 6-month follow-up: $g = -0.56$, 95%; CI for effect size = - 0.97 to - 0.15). Nevertheless, boys with less severe depressive symptoms at baseline in the intervention group report significantly more severe depressive symptoms than their peers in the control group at baseline, $g = 0.53$, 95%; CI for effect size = 0.06 to 1.00. No significant difference can be shown between both conditions at post-intervention, $g = 0.40$, 95%; CI for effect size = -0.07 to 0.87, or 6-month follow-up, $g = 0.15$, 95%; CI for effect size = -0.29 to 0.60. Finally, depressive symptoms in boys with less severe depressive symptoms at baseline in the control group increase significantly more than symptoms in boys in the intervention group from baseline to post-intervention, $g = 0.51$, 95%, CI for effect size = 0.04 to 0.98. Like in the analyses with comorbid anxiety, these results are mostly consistent with the posited prevention effect in boys with less severe depressive symptoms at baseline.

In boys with more severe depressive symptoms at baseline, however, the severity of depressive symptoms increased significantly in the intervention group (baseline – post-intervention: $g = -0.43$, 95%; CI for effect size = - 0.85 to - 0.01; baseline – 6-month follow-up:

$g = -0.50$, 95%; CI for effect size = - 0.95 to - 0.05) while the self-reported severity of depressive symptoms in the control group showed no significant changes. This result is contrary to the posited therapy effect in boys with more severe depressive symptoms at baseline. These results are attenuated by the lack of significant differences between boys with more severe baseline depressive symptoms at any time point.

Unlike the results in boys, the severity in depressive symptoms decreased significantly in girls with less severe depressive symptoms at baseline in the intervention group from baseline to post-intervention, $g = 0.61$, 95%; CI for effect size = 0.09 to 1.13, and in girls with more severe depressive symptoms at baseline in the intervention group from baseline to 6-month follow-up, $g = 0.52$, 95%; CI for effect size = 0.08 to 0.95. Contrary to these improvements in the intervention group, the depression scores in girls the control group showed no significant changes over time and girls did not differ between both conditions at any time point (Figure 2). Nevertheless, depressive symptoms in girls with less severe depressive symptoms at baseline in the control group increase significantly more than symptoms in girls in the intervention group from baseline to post-intervention, $g = 0.52$, 95%, CI for effect size = 0.02 to 1.01. These results provide mostly evidence for a therapy effect in girls, independent of their depressive symptoms at baseline.

Discussion

In adolescents with less severe depressive symptoms at baseline participating in LARS&LISA no increase in the severity of self-reported depressive symptoms from baseline to post-intervention could be observed. Beyond this, depressive symptoms increase significantly less in these adolescents than in adolescents in the control group. In the long-term, increase in the

severity of depressive symptoms in these adolescents is reduced from baseline to follow-up while depression scores in the control group increase significantly from baseline to post-intervention and from baseline to follow-up. Furthermore, a significant difference between adolescents with less severe depressive symptoms at baseline in both conditions at baseline is leveled out at the later time points by this increase in the severity of self-reported depressive symptoms in the control group. These results are mostly in line with the expected prevention effect and findings of the previous prevention program (Pössel, Horn, Hautzinger, & Groen, 2004; Spence et al., 2003).

Focusing on gender, these positive effects on self-reported depressive symptoms in the intervention group based in part on boys with less severe depressive symptoms at baseline and especially on girls mostly independent of their depressive symptoms at baseline. The increase in depressive symptoms in boys with less severe depressive symptoms at baseline in the intervention group is reduced compared to the non-intervention control group. Furthermore, depressive symptoms in boys with less severe depressive symptoms at baseline in the intervention group increase significantly less than in adolescents in the control group from baseline to post-intervention. Finally, the difference between these boys in both conditions at baseline is leveled out at the later time points by an increase in depressive symptoms in the control group. Finally, the severity of depressive symptoms in girls with less severe depressive symptoms at baseline are even significantly reduced from baseline to post-intervention as well as in girls with more severe depressive symptoms at baseline from baseline to follow-up. These results are partially in line with the expected prevention and therapy effect. Moreover, the short-term reduction in the severity of depressive symptoms in girls with less severe depressive

symptoms at baseline exceeds the expectations and earlier results (Pössel, Horn, Hautzinger, & Groen, 2004).

Contrasting earlier results depression in boys with more severe depressive symptoms at baseline increases over time in the intervention group while no such change could be observed in control group boys with more severe depressive symptoms at baseline. Nevertheless, it has to be considered that gender was not used as independent variable in the evaluation studies of the previous program (LISA-T: Pössel, Horn, Hautzinger, & Groen, 2004; Pössel et al., 2005). In the literature, however, seven studies focus on the impact of gender on the effects of prevention of depressive symptoms. While in some studies no gender effect was found (Chaplin et al., 2006; Clarke et al., 1993, 2nd study; Merry et al., 2004; Shochet et al., 2001), in others studies boys (Clarke et al., 1993, 1st study; Shatte, 1996) or girls (Gillham, Hamilton, Freres, Patton, & Gallop, 2006; Petersen et al., 1997), respectively, benefit more than the other gender from participating in the prevention programs. The gender effect seems to be independent of the type of the program (universal vs. selective), topics of the program (educational, cognitive, social, cognitive & social), age of the students (6th to 10th grade), time of assessment (post-assessment to 24-month follow-up), and gender composite of the groups (co-ed vs. gender homogenous). Chaplin et al. (2006), for example, found no gender effect in their study with students from 6th to 8th grade while Shatte (1996) and our study found a gender effect in 7th and 8th grade students, respectively. These contradictory results do not support the idea that differences in the development (cognitive development, maturational status) are responsible for gender differences in prevention programs. Furthermore, our study demonstrates that gender effects exist not only in co-ed groups (e.g., Petersen et al., 1997) but in gender homogeneous groups, too. Finally, Chaplin et al. (2006) found no difference in the effect of prevention on depressive symptoms in

girls depending on their participation in co-ed or girls-only groups, which reduces the likelihood that the separation of the adolescents by gender is responsible for the gender effect in our study. So far no explanation for the partially obvious gender effect exists, so that research focusing on possible mediators and moderators is needed.

Furthermore, the increase in the severity of depressive symptoms in boys contrasting stable values in girls in the non-intervention control group is of interest as this result is opposed to most studies which show decreased depression scores in boys and increased depression scores in girls (e.g., Angold, Erkanli, Silberg, Eaves, & Costello, 2002). Yet, Ge, Lorenz, Conger, Elder, and Simons (1994) found stable depressive symptoms in boys and increased scores in girls in their 4-year longitudinal study. Hankin et al. (1998) showed an increase of lifetime prevalence and new diagnosed disorders of major depression in both gender between 15 and 18 years. Finally, Reivich (1996) reported a decrease of self-reported depressive symptoms in girls and stable values in boys of the non-intervention control group in the initial evaluation study of the Penn Resilience Program. Up to now, reasons for these differences between the studies remain unclear. Hankin et al. (1998) suggest the use of different instruments as cause for different gender effects, which is supported by the literature because the studies that used diagnoses and self-ratings of the severity of depressive symptoms (Ge et al., 1994; Hankin et al., 1998; Reivich, 1996) found stable symptoms or a (temporary) increase of depression in boys while the studies that used self-ratings of the frequency of depressive symptoms (Angold et al., 2002) found decreasing symptoms in boys.

Contrary to the expectations the effects of the cognitive-behavioral prevention program are independent from self- and teacher-reported comorbidity in adolescents at both post-intervention and 6-month follow-up. Neither anxiety symptoms nor externalizing problems seem to have an

impact on the effects of the prevention program. Similar results were found in some previous psychotherapy studies in depressed adolescents (Brent et al., 1998; Rohde et al., 2001; Weersing & Weisz, 2002).

One explanation for these results might be that the link between depression and externalizing problems in adolescents constitutes a depressogenic attribution style. Toth, Cicchetti, and Kim (2002), for example, have suggested a global and internal attribution of negative events to cause frustration which could be expressed as aggressive behavior. Similar relations of depressogenic attributional style to externalizing problems and to depression support this hypothesis (Hankin & Abramson, 2002). Other studies, however, found that depressogenic attributional style predicts depression but not externalizing (e.g., Robinson, Garber, & Hilsman, 1995). Furthermore, minors with depressive and externalizing symptoms show distinct differences in the attributions they tend to make regarding social situations (Dodge, 1993). Finally, Toth et al's. (2002) theory can not explain why some previous studies found that externalizing problems reduce the long-term effects of cognitive-behavioral therapy (Brent et al., 1999; Rohde et al., 2001; Rohde, Clarke et al., 2004) while no comparable influence on the effects of the prevention program was described although the program used methods taken from cognitive-behavioral therapies.

It has to be considered that most studies focusing on the influence of comorbid mental disorders used clinician-reports to assess the comorbid problems while in the present study externalizing problems were measured by a composite score of self- and teacher-report and anxiety symptoms were measured by self-report only. It is unknown if and how these different informants may be a cause of different results.

The sample size in the current study can be another possible explanation for the absence of an impact of comorbid symptoms. The calculated sample size based upon 6 of 20 comparisons

reported in the literature and is adequate only to detect medium or larger effect sizes ($f^2 = .07$) in the total sample size of 301 adolescents. It is possible that the impact of comorbid symptoms is smaller in the excluded comparisons. This leads to an overestimation of the real impact of comorbid symptoms, which might be more in the area of small to medium effect sizes. As consequence, the calculated sample size in the presented study might be too small to detect the impact of comorbid symptoms. Another possible explanation for the lack of an observable impact of comorbid symptoms, especially regarding externalizing problems, might be that adolescents who dropped out show significantly higher composite externalizing problems scores compared to those who remained in the study. It is likely that those adolescents most at risk to inhibit positive effects because of comorbid problems are not available in the follow-up assessment. Furthermore, a limited severity of anxiety symptoms as well as externalizing problems might be another reason why both comorbid symptoms have no impact on the effects of the prevention program on depressive symptoms. Contrary to this possible explanation anxiety symptoms reported by the participants cover almost the whole range of the used scale, so that all severity levels seem to be represented in the sample. For the composite externalizing problems, however, the more severe scores are not represented in the sample. Nevertheless, with a range of 0 to 15 the composite score includes relevant problems (> 8) as well. Furthermore, the mean of the same composite score of externalizing problems in a clinical sample is 5.8 (Becker, Hagenberg, Roessner, Woerner, Rothenberger, 2004). All these data do not support the idea of limited severity anxiety symptoms and externalizing problems being responsible for the lack of impact on the effects of the prevention program. At least, it has to be taken under consideration that previous studies reported just 24-month follow-ups while up to now the present study

includes only a follow-up after six months. It might be that externalizing problems have a more long-term influence.

Certain limitations of this study may have suppressed potential intervention effects. The most important limitation is the absence of any formal intervention as control condition. Although this is very common in prevention research (e.g., Clarke et al., 1993; Gillham, Reivich, Jaycox, & Seligman, 1995) this problem should not be neglected. Thus, it is unclear whether the findings are specific or only due to an attention effect. The situation is even more complex because the adolescents and their teachers knew about the assignment of the students to the intervention or non-intervention control group due to the fact that common school lessons take place in the control group. This may have influenced the answers of both, adolescents and teachers. However, if this is true the effects should be similar for both genders, but the findings show different effects for girls and boys.

Another limitation is the exclusive usage of self-reports for the measurement of depressive symptoms. Demand characteristics may have led adolescents in the intervention condition to infer desired answers from the content of the intervention. However, previous studies have demonstrated adolescents to be a reliable source of information for internalization disorders such as depression (Inderbitzen, 1994), and self-reports of adolescent behavior to be valid measurements (Hops, Alpert, & Davis, 1997). Finally, depression self-report has a high predictive validity (Gotlib, Lewinsohn, & Seeley, 1995). Nevertheless, additional information from teacher, parents, or behavioral observations should be integrated in future research.

Despite these limitations it has to be considered that this is the first study focusing on the influence of comorbidity in prevention of depressive symptoms. Another advantage is the low drop-out rate of approximately 10% and no recruiting difficulties which support a high

generalization of the results. Finally, the use of teacher as source for information about the externalizing symptoms is advantageous, as adolescents are proven to be less useful informants to measure this symptomatology (Ford, Goodman, & Meltzer, 2003).

Clinical Implications

In sum, girls independent of their baseline depression showed a significantly decrease in the severity of self-reported depressive symptoms and in boys with less severe depressive symptoms at baseline an increase in the severity of depressive symptoms could be reduced. Furthermore, a significant difference in the severity of depressive symptoms at baseline between these boys in both conditions could be leveled out by the increase in severity of depressive symptoms in boys in the non-intervention control group. Unexpectedly, boys with more severe depressive symptoms at baseline in the intervention group reported an increase in the severity of depressive symptoms while no change could be observed in control group boys with more severe depressive symptoms at baseline. However, no significant difference between boys in intervention and control condition could be shown. Contrary to the hypotheses, the effect of the prevention program on depressive symptoms is not influenced by anxiety or externalizing symptoms. The low drop-out rate and high recruiting rate support the generalizability of the results. Based on the study results, we conclude that the school-based cognitive-behavioral prevention program LARS&LISA has favorable effects in adolescents. Nevertheless, we recommend refraining from including boys with more severe depressive symptoms at baseline in the training until the causes and mechanisms of negative intervention effects are understood.

The implementation of the studied prevention program in schools within the usual school curriculum remains an important challenge. Therefore, it seems crucial to reduce the number of trainer needed to implement the groups in LARS&LISA. Addressing this issue, a study testing

the effects of LARS&LISA in gender homogenous groups led by only one trainer is in preparation.

Moreover, the profession of the future trainer is a relevant issue with regard to the implementation of the program in regular school curricula, as it is not feasible to permanently deploy external psychologists. However, recent studies show that the effect size of an Australian prevention program of depressive symptoms is only about half of the size when groups are led by teacher (Merry et al., 2004) compared to groups led by psychologists (Shochet et al., 2001). Although the reasons for this difference are unclear up to now, this result supports the idea not to focus on teachers, but on school counselors as trainer in future research.

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Table 1: Descriptive statistics of the intervention and non-intervention control group

	Intervention group		Control group	
	boys (n = 91)	girls (n = 72)	boys (n = 70)	girls (n = 68)
	M (SD)	M (SD)	M (SD)	M (SD)
Age	13.74 (.66)	13.72 (.59)	13.67 (.58)	13.59 (.58)
SBB-DES baseline	.51 (.42)	.70 (.50)	.52 (.46)	.56 (.41)
SBB-DES post-intervention	.73 (.65)	.57 (.49)	.75 (.62)	.57 (.47)
SBB-DES 6-month follow-up	.67 (.66)	.55 (.48)	.67 (.66)	.58 (.45)
SBB-ANG baseline	.42 (.37)	.54 (.37)	.45 (.39)	.60 (.32)
composite externalizing				
problems baseline	4.03 (2.60)	3.20 (2.45)	4.41 (2.85)	3.76 (2.39)

Note. SBB-DES = Self-report Questionnaire – Depression; SBB-ANG = Self-report

Questionnaire – Anxiety; composite externalizing problems = adolescent SBQ conduct behavior

+ adolescent SBQ conduct behavior

Table 3: HLM analyses with comorbid anxiety symptoms

	post-intervention			6-month follow-up		
	Estimate	SE	<i>t</i>	Estimate	SE	<i>t</i>
baseline depression	.29	.28	1.05	-.14	.30	-0.45
anxiety symptoms	.14	.29	0.48	.27	.31	0.88
gender	-.40	.20	-2.01*	-.45	.22	-2.00*
condition	-.39	.16	-2.48*	-.30	.17	-1.72
baseline depression by condition	.83	.33	2.52*	.87	.37	2.36*
baseline depression by anxiety symptoms	-.01	.22	-0.04	.44	.27	1.63
baseline depression by gender	.31	.38	0.81	.89	.43	2.06
anxiety symptoms by gender	-.19	.38	-0.49	.11	.42	0.25
anxiety symptoms by condition	.27	.38	0.72	.28	.43	0.66
condition by gender	.18	.20	0.87	.05	.23	0.23
baseline depression by anxiety by condition	-.52	.29	-1.82	-.69	.36	-1.93
baseline depression by gender by condition	-.57	.36	-1.59	-.63	.41	-1.55
anxiety symptoms by gender by condition	.08	.43	0.19	.30	.47	0.63
baseline depression by anxiety symptoms by gender	.31	.30	1.04	-.68	.37	-1.85

Note. * = $p \leq .05$; df = 258 for all analyses with post-intervention; df = 260 for all analyses with 6-month follow-up (only exception is the main effect condition with df = 10)

Table 4: HLM analyses with comorbid externalizing problems

	post-intervention			6-month follow-up		
	Estimate	SE	<i>t</i>	Estimate	SE	<i>t</i>
baseline depression	.48	.14	2.27*	.47	.28	1.66
externalizing problems	.09	.21	3.52*	.03	.03	0.97
gender	-.19	.03	-0.92	-.22	.23	-0.94
condition	-.06	.20	-0.29	.09	.21	0.42
baseline depression by condition	.67	.32	2.12*	-.01	.37	-0.03
baseline depression by externalizing problems	-.03	.03	-1.08	.00	.04	0.11
baseline depression by gender	.53	.32	1.66	.57	.39	1.46
externalizing problems by gender	-.08	.04	-1.94	-.01	.05	-0.25
externalizing problems by condition	-.05	.04	-1.27	-.06	.04	-1.49
condition by gender	.04	.22	0.19	.03	.24	0.13
baseline depression by externalizing by condition	-.02	.05	-0.47	.08	.05	1.43
baseline depression by gender by condition	-.79	.27	-2.89*	-.67	.33	-2.05*
externalizing problems by gender by condition	.06	.05	1.31	.06	.05	1.10
baseline depression by externalizing by gender	.02	.05	0.40	-.06	.05	-1.19

Note. * = $p \leq .05$; $df = 253$ for all analyses with post-intervention; $df = 253$ for all analyses with 6-month follow-up (only exception is the main effect condition with $df = 10$)

Figure 1: Based on the regression analyses with anxiety symptoms RCS on the SBB-DES as a function of depressive symptoms by condition interaction are present. Black bars denote low baseline depression adolescents (SBB-DES scores $\leq .4615$); white bars denote high baseline depression adolescents (SBB-DES scores $> .4615$). In the upper part RCS from baseline to post-intervention and in the lower part RCS from baseline to 6-month follow-up are presented.

Figure 2: Based on the regression analyses with composite externalizing scores RCS on the SBB-DES as a function of depressive symptoms by gender by condition interaction are present. Black bars denote low baseline depression adolescents (SBB-DES scores boys $> .4231$; SBB-DES scores girls $> .50$); white bars denote high baseline depression adolescents. In the upper part RCS from baseline to post-intervention and in the lower part RCS from baseline to 6-month follow-up are presented.



