



The Role of Comorbid Mood Disorders in Cognitive Behavioral Therapy for Childhood Social Anxiety

Jeanine M. D. Baartmans^{1,2} · F. J. A. van Steensel³ · Anke M. Klein² · Susan M. Bögels³

Accepted: 24 May 2022 / Published online: 18 June 2022
© The Author(s) 2022

Abstract

Background Children with a social anxiety disorder have worse treatment outcomes after Cognitive Behavior Therapy (CBT) than children with other anxiety disorders. Anxiety disorders and mood disorders are strongly related and especially social anxiety is related to high comorbidity rates with mood disorders. The aim of the study was to investigate how comorbid mood disorders are related to treatment outcomes after CBT and whether this can explain the worse outcomes for childhood social anxiety.

Methods Participants were 152 referred clinically children (7–18 years) with either a social anxiety disorder ($n = 52$) or another anxiety disorder ($n = 100$) of whom 24.3% ($n = 37$) had a comorbid mood disorder. Child anxiety, internalizing symptoms, and quality of life were measured pre-treatment, post-treatment, 3 months and 1 year after treatment, using child and both parents' report.

Results Children with a primary social anxiety disorder more often had a comorbid mood disorder than children with another primary anxiety disorder. Children with a mood disorder had more severe anxiety problems before treatment. Comorbid mood disorders were related to greater anxiety reductions after treatment. The worse outcomes for children with a primary social anxiety disorder remained after controlling for comorbid mood disorders.

Conclusions Findings stress the importance of future studies examining why the presence of a comorbid mood disorder is associated with greater anxiety reductions, and other factors that explain the worse treatment outcomes found for childhood social anxiety disorder.

Keywords Social anxiety · Depression · Children · Comorbidity · Treatment outcome · CBT

Introduction

Anxiety disorders are common in childhood and adolescence with an estimated prevalence ranging up to twenty percent (American Psychiatric Association, 2013). Children who suffer from anxiety disorders often have comorbid mood disorders (Brady & Kendall, 1992; Cummings et al., 2014). It has even been debated that anxiety and depression should

be seen more as unitary than as discrete problems (Persons et al., 2003), as the disorders seem to have comparable developmental features, the symptoms partly overlap and symptoms correlate highly with each other (e.g. Erwin et al., 2002; Wright et al., 2010).

Clark and Watson's (1991) tripartite model is a theoretical model to explain the overlap between anxiety and depression. In this model anxiety is characterized by high levels of physiological hyperarousal and depression is characterized by low levels of positive affect. A negative affect (which can also be described as emotional distress) is a characteristic of both anxiety and depressive disorders. Perhaps not very surprising, it has been noted that having a comorbid mood disorder in addition to an anxiety disorder can be related to treatment outcomes for both the anxiety and depressive symptoms in adults (e.g., see review of Bauer et al., 2012). For children and adolescents, comorbidity with a mood disorder could increase the severity of the (anxiety) symptoms

✉ Jeanine M. D. Baartmans
jeanine.baartmans@gmail.com

¹ UvA Minds: Academic Treatment Centre, Amsterdam, The Netherlands

² Department of Developmental Psychology, University of Amsterdam, Nieuwe Achtergracht 129-B, 1018 WS Amsterdam, The Netherlands

³ Department of Child Development and Education, University of Amsterdam, Amsterdam, The Netherlands

and is related to the presence of other comorbid symptoms like somatic problems and attention problems (e.g., see review of Melton et al., 2016). In addition, having a comorbid mood disorder is also related to less involvement in out of school activities and worse relations with peers (Franco et al., 2007). However, the empirical evidence for a less favourable treatment outcome for children with anxiety disorders and comorbid mood disorders is inconsistent. That is, some studies found that the presence of a comorbid mood disorder (or depressive symptoms) is related to less favorable treatment outcomes (Berman et al., 2000; Ollendick et al., 2008; O’Neil et al., 2010; Rapee et al., 2013), whereas other studies found no relation between comorbid mood disorders (or depressive symptoms) and treatment effectiveness for childhood anxiety (Kendall et al., 1997; Southam-Gerow et al., 2001).

A more robust finding is that previous studies do demonstrate that children with a social anxiety disorder have less favorable treatment outcomes compared to children with other anxiety disorders (Compton et al., 2014; Crawley et al., 2008; Evans et al., 2021; Ginsburg et al., 2011; Hudson et al., 2015a, 2015b; Kodal et al., 2018; Manassis et al., 2002; Scharfstein & Beidel, 2011; Waters et al., 2018). The question that remains to be answered is why social anxiety disorder is related to a lesser treatment effect. One factor to consider is the presence of comorbid mood disorders (which seems to occur more frequently in children with social anxiety disorders; Hudson et al., 2015a). Only a few studies focused on the role of comorbid mood disorder on treatment outcome specifically for children with social anxiety disorder. Hudson et al. (2015a) conducted a large multisite study in which they compared treatment outcomes after Cognitive Behavioral Therapy (CBT) for different anxiety disorders and found that treatment outcomes for children with social anxiety disorder were worse also after controlling for comorbid depression. Also, Alfano et al. (2009) investigated depression as a moderator of the treatment for social anxiety in children and adolescents and found that depressive symptoms did not moderate treatment effects of CBT for childhood social anxiety.

Turning back to the Clark and Watson’s (1991) tripartite model, this model was originally developed to describe the overlap between anxiety and depression in adults, however, it is also applicable to youth (Laurent & Ettelson, 2001). Therefore, it might be helpful to look into studies with adult participants. Some studies involving adults found worse outcomes after treatment when patients with a social anxiety disorder had a comorbid mood disorder or that patients had a higher chance of aggravation in social anxiety symptoms after treatment finished (Chambless et al., 1997; Erwin et al., 2002; Ledley et al., 2005), while other studies using adults samples found no relation between depression and treatment outcomes (Marom et al., 2009; Moscovitch et al., 2005). One

important aspect that was noted was that the majority of the studies relied on dimensional measures of depression instead of mood disorder diagnoses (Bauer et al., 2012). Focusing on depression as a disorder could provide more information for clinical decision making. When individuals have a comorbid mood disorder the impairment of this mood problem is expected to be severe. How these results of the studies with adults relate to those of children is unclear. And despite the applicability of the tripartite model to youth, differences also need to be noted. That is, the three factors (physiological hyperarousal, positive affect, and negative affect) of the tripartite model may function differently across anxiety and depressive disorders in youth. For instance, similar as in adults, low positive affect in youth was found to be related to depression, however, not only to depression: for youth, low positive affect was also found to be related to social anxiety symptoms and diagnoses (Anderson & Hope, 2008).

The aim of the current study is to investigate whether the presence of a comorbid mood disorder diagnosis is related to worse outcomes after CBT for children with clinical anxiety disorders, and whether this is especially true for children with a primary social anxiety disorder compared to children with another primary anxiety disorder. To that end, data of two previous studies—in which CBT for the treatment of anxiety disorders in children was examined (Bodden et al., 2008; van Steensel & Bögels, 2015)—were merged and analyzed in order to answer the research questions. Based on the large overlap between anxiety and depression and results from adult literature, we expected that having a comorbid mood disorder could be related to worse treatment outcomes for childhood anxiety disorders. And since especially social anxiety disorder and mood disorders seem to be related (and following the tripartite model both are associated with a low positive affect), we expected that having a comorbid mood disorder could (partly) predict the worse treatment outcomes for childhood social anxiety disorder.

Methods

Participants

Children (92 girls; 58.6%) were between 7 and 18 years old ($M = 12.68$, $SD = 2.81$), 52 (34.2%) had a primary social anxiety disorder and 100 children (65.8%) had another anxiety disorder as their primary disorder. In the group of children with another anxiety disorder 30 children (19.7%) had a primary separation anxiety disorder, 26 children (17.1%) had a primary generalized anxiety disorder, 29 children (19.1%) had a primary specific phobia, and 15 children (9.9%) had a primary panic disorder. At pre-treatment, 24.3% ($n = 37$) of the children met criteria of a mood disorder. Children with a primary social anxiety disorder significantly more

often had a comorbid mood disorder at pre-treatment than children with another primary anxiety disorder (respectively, 36.5%, $n = 19$ versus 18.0%, $n = 18$), $\chi^2(1) = 6.38$, $p = .012$. In addition, children with a mood disorder had significantly higher severity scores for both their primary anxiety disorder ($M = 7.51$, $SD = .73$ versus $M = 6.94$, $SD = 1.16$), $t(150) = -2.84$, $p = .005$, and their total anxiety disorder severity than children without a comorbid mood disorder ($M = 18.76$, $SD = 7.35$ versus $M = 12.21$, $SD = 7.21$), $t(150) = -4.78$, $p < .001$.

Participants were divided in four categories based on the (yes/no) presence of a primary social anxiety disorder and the (yes/no) presence of a comorbid mood disorder: (1) 12.5% ($n = 19$) of the participants had a primary social anxiety disorder with a comorbid mood disorder (Prim-Soc, MD), (2) 21.7% ($n = 33$) had a primary social anxiety disorder without a comorbid mood disorder (Prim-Soc, No-MD), (3) 11.8% ($n = 18$) had a primary other anxiety disorder with a comorbid mood disorder (Prim-Other, MD), and (4) 53.9% ($n = 82$) had a primary other anxiety disorder without a comorbid mood disorder (Prim-Other, No-MD).

Materials

Anxiety Disorders Interview Schedule for DSM-IV—Child Version (ADIS-C/P; Albano & Silverman, 1996)

The ADIS-C/P is a structured clinical interview for diagnosing anxiety disorders in children and adolescents. The interviews were conducted separately with the child (ADIS-C) and with one parent or both parents together at each time point. Composed diagnoses, primary diagnoses, and Clinical Severity Ratings (CSR's; on a scale from 0 to 8) were determined according to the ADIS-C/P-manual. The ADIS-C/P has satisfactory to good reliability (Silverman & Rabian, 1995; Silverman et al., 2001). The ADIS-C/P and corresponding CSR's had excellent interrater agreement in the current research (Bodden et al., 2008; van Steensel & Bögels, 2015). The ADIS-C/P interview resulted in dichotomous scores for the presence of an anxiety disorder and in total severity ratings which were computed by adding all CSR's for the present anxiety diagnoses at each time point.

Screen for Child Anxiety Related Emotional Disorders-71 (SCARED-71; Bodden et al., 2009)

The SCARED-71 was used to assess anxiety symptoms in the child. This questionnaire consists of nine different subscales that measure panic disorder symptoms, generalized anxiety symptoms, social anxiety symptoms, separation anxiety symptoms, obsessive-compulsive symptoms, posttraumatic stress symptoms, animal phobia symptoms, blood-injection-injury phobia symptoms, and situational-environmental

phobia symptoms. For each of the 71 statements participants (children, mothers and fathers) indicated on a 3-point scale ranging from 0 (never) to 2 (often) how much the statement applied to the child. The SCARED-71 has good psychometric properties (Bodden et al., 2009). The internal consistencies for the child version, mother version, and father version of the SCARED-71 in our sample across time-points were excellent ($\alpha = .93-.94$). The total scores on this questionnaire were used in this study.

Child Behavior Checklist-4/18 (CBCL-4/18; Achenbach, 1991; Verhulst et al., 1996)

The 'internalizing problems'-subscale of the CBCL was used to measure internalizing symptoms in the children. Both fathers and mothers reported about their child's symptoms. The internal consistency and test-retest reliability of the internalizing scale of the CBCL are good. The internal consistencies in the current sample across time-points were excellent ($\alpha = .92-.95$).

EuroQol 5-D (EQ-5D; EuroQol group, 1990)

The EQ-5D was used to measure the child's health-related quality of life. The EQ-5D consists of questions measuring quality of life related to mobility, self-care, usual activities, pain/discomfort, and anxiety/depression with three response possibilities for each item. Health state indexes, as reported by the child and parents, were used in the present study and computed with the Dutch preference weights (Lamers et al., 2006). The psychometric properties of this questionnaire are good (Brooks & de Charro, 1996; Willems et al., 2009).

Procedure

Participants were derived from two studies (Bodden et al., 2008; van Steensel & Bögels, 2015) that focused on examining the outcomes after (the same) CBT-program for childhood anxiety problems. All participants received treatment in and were recruited via community mental health care centers across the Netherlands. Inclusion criteria were: having an anxiety disorder and an estimated IQ > 70 (based on school performance). Exclusion criteria were: untreated attention deficit hyperactivity disorder, physical or sexual abuse, autism spectrum disorder, psychotic episodes or recent suicide attempts. Both studies Ethical approval was provided by the ethical committee of the University of Amsterdam and University Maastricht (Bodden et al., 2008; van Steensel & Bögels, 2015). All participants were referred to community mental health care centers. Children received treatment with the Dutch treatment protocol 'Discussing + Doing = Daring' (Bögels, 2008) consisting of 12 sessions of child-focused CBT and 3 sessions in which

parents were included. There were four assessments: before treatment (pre), directly after CBT (post), 3 months after CBT (follow-up 1) and 12 months CBT (follow-up 2). The ADIS-C/P interviews were conducted at each assessment in the treatment center by clinically trained researchers who were independent from the clinicians who provided treatment, and children, mothers, and fathers were asked to complete questionnaires.

Data-analyses

All dichotomous variables (presence of anxiety or mood disorders) were transformed according to the Last Observation Carried Forward (LOCF) method to correct for missing data. *Chi-squared*-tests were performed to test differences in treatment effects (i.e., free of diagnosis) between the four groups. Next, mixed model analyses with Maximum Likelihood estimation procedures were conducted. Random intercept models were used, since some of the groups differed in their pre-treatment anxiety scores. In addition, we controlled for age. In the multilevel analyses it was tested whether the presence of a comorbid mood disorder predicted the reduction beyond the primary anxiety disorder (Prim-Soc/Prim-Other) in the total anxiety severity (CSR-total scores). These analyses were repeated for respectively the total scores on the SCARED-71, the score in the internalizing scale of the CBCL-4/18, and the scores on the EQ-5D. Hence, the primary anxiety disorder diagnosis (Prim-Soc/Prim-Other) and the dichotomous variable of the yes/no-presence of a mood disorder (MD/No-MD) were added as dichotomous factors, and in the interaction with each other. Post-hoc probing of the three-way interactions (time*social anxiety disorder (Prim-Soc/Prim-Other)*mood disorder (MD/No-MD)) was performed in order to interpret the results.

Results

Descriptives

At pre-treatment, 24.3% ($n = 37$) of the children met criteria of a mood disorder, and respectively 5.3%, 2.6% and 2.6% of the children met criteria for a mood disorder at post-treatment, follow-up 1 and follow-up 2. At pre-treatment, children with a mood disorder had significantly higher severity scores for both their primary anxiety disorder ($M = 7.51$, $SD = .73$ versus $M = 6.94$, $SD = 1.16$), $t(150) = -2.84$, $p = .005$, and their total anxiety disorder severity than children without a comorbid mood disorder ($M = 18.76$, $SD = 7.35$ versus $M = 12.21$, $SD = 7.21$), $t(150) = -4.78$, $p < .001$. Children with a primary social anxiety disorder significantly more often had a comorbid mood disorder at pre-treatment than children with another primary anxiety

disorder (respectively, 36.5%, $n = 19$ versus 18.0%, $n = 18$), $\chi^2(1) = 6.38$, $p = .012$. Including two dichotomous predictors in the multilevel analysis (yes/no social anxiety disorder and yes/no mood disorder) resulted in a division of all participants in four categories; 12.5% ($n = 19$) of the participants had a primary social anxiety disorder with a comorbid mood disorder (Prim-Soc, MD), 21.7% ($n = 33$) had a primary social anxiety disorder without a comorbid mood disorder (Prim-Soc, No-MD), 11.8% ($n = 18$) had a primary other anxiety disorder with a comorbid mood disorder (Prim-Other, MD), and 53.9% ($n = 82$) had a primary other anxiety disorder without a comorbid mood disorder (Prim-Other, No-MD).

Free of Diagnosis

The four groups significantly differed in how often the children were free of their primary diagnosis (i.e. based on the ADIS-C/P assessment) at post-treatment, $\chi^2(3) = 17.43$, $p = .001$, follow up 1, $\chi^2(3) = 14.72$, $p = .002$, and follow up 2: $\chi^2(3) = 10.26$, $p = .017$ (see Table 1). However, there was no significant difference between the group of children with and without a comorbid MD in the complete group or within the Prim-Other or Prim-Soc-group (p 's $> .10$). This means that a comorbid MD did not explain differences between the Prim-Other- and the Prim-Soc-group. Therefore, the group difference was driven by the presence of a social anxiety disorder: children with a social anxiety disorder were less often free of their primary anxiety disorder compared to children without a social anxiety disorder (see also Baartmans et al., 2022).

A significant difference between the four groups in how often the children were free of all of their anxiety diagnoses was found at post-treatment, $\chi^2(3) = 10.01$, $p = .018$, but not a follow up 1, $\chi^2(3) = 4.64$, $p = .200$, or at follow-up 2: $\chi^2(3) = 4.81$, $p = .186$. Children with social anxiety disorder were less often free of all their anxiety disorders compared to children with another anxiety disorder (Baartmans et al., 2022). However, there was no significant difference at post-treatment between children with and without a comorbid mood disorder in the complete group, $\chi^2(1) = .89$, $p = .345$, or within the Prim-Soc-group or Prim-Other-group (p 's $> .08$).

Decrease of CSR

The multi-level analysis predicting the total anxiety severity (CSR-total) showed that both the type of anxiety disorder (Prim-Soc/Prim-Other) and the presence of a comorbid mood disorder (MD/No-MD) were significant predictors; the children in the Prim-Soc-group improved significantly less on the total anxiety severity than children in the Prim-Other-group, while being in the MD-group was related to significantly greater improvements on the total anxiety

Table 1 Numbers and percentages of recovery from primary anxiety disorder and all anxiety disorders (based on ADIS-C/P assessments) for the primary social anxiety disorder (Prim-Soc) and primary other anxiety disorder (Prim-Other) group

			Prim-Other, No-MD-MD		Prim-Soc, No-MD-MD		Prim-Other, MD		Prim-Soc, MD		Total	
			n	%	n	%	n	%	n	%	n	%
			Post-treatment	Primary	Free	64	78.0%	15	45.5%	16	88.9%	10
		Not free	18	22.0%	18	54.5%	2	11.1%	9	47.4%	47	30.9%
	All	Free	50	61.0%	10	30.3%	7	38.9%	9	47.4%	76	50.0%
		Not free	32	39.0%	23	69.7%	11	61.1%	10	52.6%	76	50.0%
Follow up 1	Primary	Free	68	82.9%	19	57.6%	16	88.9%	10	52.6%	113	74.3%
		Not free	14	17.1%	14	42.4%	2	11.1%	9	47.4%	39	25.6%
	All	Free	44	53.7%	16	48.5%	6	33.3%	6	31.6%	72	47.4%
		Not free	38	46.3%	17	51.5%	12	66.7%	13	68.4%	80	52.6%
Follow up 2	Primary	Free	74	90.2%	25	75.8%	16	88.9%	12	63.2%	127	83.6%
		Not free	8	9.8%	8	24.2%	2	11.1%	7	36.8%	25	16.4%
	All	Free	47	57.3%	20	60.6%	7	38.9%	7	36.8%	81	53.5%
		Not free	35	42.7%	13	39.4%	11	61.1%	12	63.2%	71	46.7%

severity than being in the No-MD-group (Table 2). There was a significant three-way interaction between the two factors (Prim-Soc/Prim-Other; MD/No-MD) and time, which suggests different effects of the MD-comorbidity between the Prim-Soc- and Prim-Other-group. Therefore, we probed the interaction by rerunning the analyses for the Prim-Soc-group and the Prim-Other-group separately (Table 3). Results showed that having a comorbid mood disorder was related to a significantly *greater* reduction of the total anxiety severity at all assessments after treatment in both the Prim-Soc-group and the Prim-Other-group, but this effect was significantly stronger in the Prim-Other-group. Thus,

when children had a comorbid MD, they decreased more in anxiety severity during treatment. In the Prim-Other-group this steeper decrease when a comorbid MD was present was even stronger than in the Prim-Soc-group.

Change on Questionnaire Reports

For total anxiety symptoms (SCARED-71), a non-significant three-way interaction was found, but a main effect of MD was found: being in the MD-group was found to be related to significantly *larger* treatment effects than being in the No-MD-group. In contrast, being in the Prim-Soc-group was

Table 2 Parameter estimates (and standard errors) of the models concerning the effects of Time (post-treatment, follow up 1, and follow up 2 versus pre-treatment), Anx (Prim-Soc versus Prim-Other), Dep (MD versus No-MD-MD), and their interactions on the anxiety severity (CRS), anxiety symptoms (SC71), internalizing problems (CBCL), and quality of life (EQ-5D)

	CSR-total	SC71-total	CBCL	EQ-5D
Intercept	0.61* (0.26)	0.95** (0.25)	0.07 (0.29)	0.00 (0.27)
Age	0.01 (0.02)	-0.02 (0.02)	0.02 (0.02)	-.05* (0.02)
Time 1 (post)	-1.14** (0.02)	-0.88** (0.04)	-0.59** (0.03)	.81** (0.04)
Time 2 (fu-1)	-1.26** (0.02)	-1.07** (0.04)	-0.71** (0.03)	.82** (0.04)
Time 3 (fu-2)	-1.46** (0.02)	-1.11** (0.04)	-0.70** (0.03)	.94** (0.05)
Anx	0.00 (0.14)	0.81** (0.18)	0.48* (0.16)	-.46* (0.20)
Dep	0.98** (0.19)	-0.27^ (0.14)	0.73* (0.21)	0.23 (0.25)
Anx*Dep	-0.31 (0.26)	-0.31 (0.26)	-0.18 (0.29)	-0.23 (0.28)
Time 1*Anx	0.31** (0.04)	0.22* (0.07)	-0.12* (0.05)	-.20* (0.08)
Time 2*Anx	0.18** (0.04)	0.29** (0.07)	-0.08^ (0.05)	-.19* (0.08)
Time 3*Anx	0.18** (0.04)	0.25** (0.07)	-0.09^ (0.05)	-.19* (0.08)
Time 1*Dep	-0.65** (0.06)	-0.25* (0.09)	-0.47** (0.07)	.39* (0.11)
Time 2*Dep	-0.88** (0.06)	-0.37** (0.10)	-0.40** (0.08)	.31* (0.12)
Time 3*Dep	-0.80** (0.07)	-0.31* (0.10)	-0.32** (0.09)	0.05 (0.14)
Time 1*Anx*Dep	0.17* (0.08)	0.22 (0.14)	0.16 (0.10)	-0.03 (0.16)
Time 2*Anx*Dep	0.39** (0.09)	0.11 (0.14)	-0.26* (0.12)	.34^ (0.18)
Time 3*Anx*Dep	0.50** (0.10)	0.14 (0.15)	-0.38* (0.13)	.86** (0.19)

^p < .01, *p < .05, **p < .001

Table 3 Additional mixed model analyses to interpret the significant 3-way interactions between time, social anxiety and mood disorders (reported in Table 2); models examining the effects of time and mood disorders for the children with a primary social anxiety disorder (Prim-Soc) and the children with a primary other anxiety disorder (Prim-Other)

	CSR-total		CBCL		EQ-5D	
	Prim-Soc	Prim-Other	Prim-Soc	Prim-Other	Prim-Soc	Prim-Other
Intercept	1.28* (0.48)	0.36 (0.32)	0.76 (0.65)	−0.01 (0.33)	0.20 (0.32)	−0.33 (0.54)
Age	−0.04 (0.04)	0.03 (0.03)	0.00 (0.05)	0.02 (0.03)	−.07 [^] (0.03)	−0.01 (0.04)
Time 1 (post)	−0.82** (0.03)	−1.13** (0.02)	−0.71** (0.05)	−0.59** (0.02)	.81** (0.04)	.61** (0.06)
Time 2 (fu-1)	−1.07** (0.03)	−1.26** (0.02)	−0.79** (0.05)	−0.71** (0.02)	.82** (0.04)	.63** (0.06)
Time 3 (fu-2)	−1.28** (0.03)	−1.46** (0.02)	−0.79** (0.05)	−0.71** (0.03)	.94** (0.05)	.59** (0.07)
Dep	0.76** (0.18)	0.91** (0.20)	0.58* (0.25)	0.71* (0.20)	−.40 [^] (0.21)	−0.78* (0.22)
Time 1*Dep	−0.48** (0.06)	−0.65** (0.06)	−0.31* (0.09)	−0.47** (0.06)	.39* (0.11)	0.36* (0.11)
Time 2*Dep	−0.48** (0.07)	−0.88** (0.06)	−0.66** (0.11)	−0.40** (0.06)	.31* (0.12)	0.66** (0.13)
Time 3*Dep	−0.30** (0.07)	−0.80** (0.07)	−0.71** (0.11)	−0.32** (0.08)	0.04 (0.14)	0.91** (0.13)

[^] $p < .01$, * $p < .05$, ** $p < .001$

significantly negatively related to treatment effects on total anxiety symptoms compared to being in the Prim-Other-group, meaning that children in the Prim-Soc-group had a less steep decline than children in the Prim-Other-group (Table 2). In the model predicting the change in internalizing problems (CBCL-4/18) there was a significant three-way interaction between social anxiety disorder, mood disorder and time. Probing this interaction by repeating the analyses for the Prim-Soc-group and the Prim-Other-group separately showed that having a comorbid mood disorder was related to a significantly greater reduction of internalizing symptoms, but this effect was significantly stronger in the Prim-Soc-group than in the Prim-Other-Group at follow up 1 and follow up 2 (Table 3). Thus, when children had a comorbid MD they decreased more in internalizing symptoms during treatment. In the Prim-Soc-group this steeper decrease when a comorbid MD was present, was even stronger than in the Prim-Other-group.

The final multilevel model, to measure change in perceived quality of life over the course of treatment, showed a significant three-way interaction. Probing the significant three-way interaction showed that the Prim-Soc-group with a comorbid MD had a significantly greater improvement in quality of life at post-treatment and follow up 1, but not at follow up 2. In the Prim-Other-group this effect of a comorbid MD (greater improvement in quality of life) was significant at all assessments after treatment (Tables 2, 3).

Discussion

The aim of the current study was to study the role of a comorbid mood disorder in treatment outcomes after a CBT-program for children with anxiety disorders. More specifically, we aimed to investigate whether this mood disorder

comorbidity could explain the worse treatment outcomes for children with a social anxiety disorder compared to children with another primary anxiety disorder, that has been consistently reported in child anxiety disorder cognitive-behavior treatment studies (see “Introduction”) as well as in our own study Baartmans and colleagues (2022). The results first showed that children with a primary social anxiety disorder have twice as often a comorbid mood disorder than children with a primary other anxiety disorder. However, when controlling for mood disorders, the lower treatment gains for social anxiety disorder remained. Unexpectedly, having a comorbid mood disorder in general was found to be related to greater reductions of anxiety severity, anxiety symptoms, and internalizing problems, and a greater increase in quality of life, independent of the presence of a primary social anxiety disorder. These results are discussed in more detail below.

The finding that having a comorbid mood disorder was, on average, related to greater treatment gains, is in contrast with previous studies that found no—or a negative—relation between the presence of a comorbid mood disorder and the effectiveness of child anxiety disorder treatment (Berman et al., 2000; Hudson et al., 2015b; Kendall et al., 1997; O’Neil et al., 2010; Ollendick et al., 2008; Rapee et al., 2013; Southam-Gerow et al., 2001). Several explanations are proposed for our finding that having a comorbid mood disorder is related to better treatment outcomes.

First, it is important to note that children with a comorbid mood disorder had more severe anxiety problems before treatment, meaning that there was more room for improvement. This finding is in line with other studies that found that having a comorbid mood disorder is related to more severe (social) anxiety before treatment (Campbell-Sills et al., 2012; Erwin et al., 2002; Ledley et al., 2005).

Second, children with a mood disorder have a negative view about themselves, others and their future (Kircanski et al., 2012) and therefore may present their anxiety (symptoms) more negatively before treatment. As only 5% of the children met criteria for a comorbid mood disorder at post-treatment (compared to 24% at pre-treatment), it might be that respondents presented their anxiety more positively after treatment because of a less negative perspective. That the generic CBT for child anxiety in the current study was directly or indirectly through the change in (social) anxiety—effective for mood disorders as well can be seen as an important implication for clinical practice. It should however be noted that this attrition of mood disorders after treatment is in contrast with a study in adults by Joormann et al. (2005) who found that depressive symptoms remained stable after the treatment for adults with social anxiety disorder. The authors also found comparable outcomes on the anxiety measures for patients without and without comorbid mood problems. To our awareness, no research in the child literature is available investigating this relation.

Third, several studies indicate that social anxiety disorder and mood disorders are highly intertwined, since they share common factors like withdrawn behavior, an interpersonal component, and repetitive negative thinking (Erwin et al., 2002; Klemanski et al., 2017; Wright et al., 2010). As a result, one could expect that the treatment of one disorder might also affect the other disorder (Bauer et al., 2012). For example, Moscovitch et al. (2005) suggested that improvements in social anxiety mediated the majority of the improvements in depression over time, while improvements in depression only accounted for a small amount of decrease in social anxiety over time during the treatment. Social anxiety disorder can be seen as a preceding factor of depression (Kaufman & Charney, 2000). This could imply that comorbid depression improves as a result of improvement in social anxiety due to the treatment. It has been mentioned that reductions in social anxiety after treatment elicit parallel reductions in secondary depressive symptoms (Bauer et al., 2012). The difference in findings between our study and literature focusing on adults (Joormann et al., 2005) could suggest that (improvement in) anxiety and depressive symptoms are more intertwined at a young age.

Strengths of the current study were the use of multiple outcome measures, multiple informants, community mental health care treatment centers, and studying the interaction between pretreatment comorbid mood disorder and social versus other anxiety disorder on child anxiety CBT outcome where other studies mostly focused on controlling for comorbid depression or comparing children with and without a comorbid depressive disorder (without making a distinction between children with and without social anxiety disorder). A limitation of the study is that we did not measure anxiety and depression during the treatment, that

is, measuring these symptoms during the treatment with multiple measures could provide information about the order in which symptoms change. In addition, the sample size of the subgroups with a comorbid mood disorder were relatively low which raises power issues. Another limitation of the current study is that we did not have enough power to discriminate between different age groups. Even though the children in our sample were relatively equally distributed across different ages, we recommend future studies to investigate comorbidity between anxiety and depression and treatment outcomes in different age groups (e.g., children versus adolescents).

In conclusion, the findings of this study indicate that children with a social anxiety disorder twice as often have a comorbid mood disorder than children with another primary anxiety disorder and that children with a comorbid mood disorder have more severe anxiety before treatment. Nevertheless, the presence of a comorbid mood disorder did not seem to explain why children with a primary social anxiety disorder have worse outcomes after CBT than children with a primary other anxiety disorder. In fact, this study suggested a stronger decline in anxiety after treatment when children had a comorbid mood disorder. These results stress the importance of future research to obtain a better understanding of treatment predictors, comorbidity, and the change of depressive symptoms in order to improve treatment programs for childhood (social) anxiety.

Declarations

Conflict of Interest Jeanine M. D. Baartmans, Bonny F. J. A. van Steensel, Anke M. Klein and Susan M. Bögels declare that they have no conflict of interest.

Ethical Approval The ethical committees of the University of Amsterdam and University Maastricht approved the study.

Informed Consent Informed consent was obtained of all participants before conducting the study.

Animal Rights No animal studies were carried out by the authors for this article.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Achenbach, T. M. (1991). *Integrative guide for the CBCL/4-18, YSR, and TRF profiles*. University of Vermont.
- Albano, A. M., & Silverman, W. K. (1996). *Anxiety Disorders Interview Schedule for DSM-IV-Child Version: Clinician manual*. Psychological Corporation.
- Alfano, C. A., Pina, A. A., Villalta, I. K., Beidel, D. C., Ammerman, R. T., & Crosby, L. E. (2009). Mediators and moderators of outcome in the behavioral treatment of childhood social phobia. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48(9), 945–953. <https://doi.org/10.1097/CHI.0b013e3181af8216>
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders 5th ed. (DSM-5)*. American Psychiatric Association. <https://doi.org/10.1176/appi.books.9780890425596>
- Anderson, E. R., & Hope, D. A. (2008). A review of the tripartite model for understanding the link between anxiety and depression in youth. *Clinical Psychology Review*, 28(2), 275–287. <https://doi.org/10.1016/j.cpr.2007.05.004>
- Baartmans, J. M. D., Van Steensel, F. J. A., Klein, A. M., & Bögels, S. M. (2022). Worse outcomes for children with a social anxiety disorder after cognitive behavioral therapy. Manuscript submitted for publication.
- Bauer, I., Wilansky-Traynor, P., & Rector, N. A. (2012). Cognitive-behavioral therapy for anxiety disorders with comorbid depression: A review. *International Journal of Cognitive Therapy*, 5(2), 118–156.
- Berman, S. L., Weems, C. F., Silverman, W. K., & Kurtines, W. M. (2000). Predictors of outcome in exposure-based cognitive and behavioral treatments for phobic and anxiety disorders in children. *Behavior Therapy*, 31(4), 713–731. [https://doi.org/10.1016/S0005-7894\(00\)80040-4](https://doi.org/10.1016/S0005-7894(00)80040-4)
- Bodden, D. H. M., Bögels, S. M., & Muris, P. (2009). The diagnostic utility of the Screen for Child Anxiety Related Emotional Disorders-71 (SCARED-71). *Behaviour Research and Therapy*, 47(5), 418–425. <https://doi.org/10.1016/j.brat.2009.01.015>
- Bodden, D. H. M., Bögels, S. M., Nauta, M. H., de Haan, E., Ringrose, J., Appelboom, C., Brinkman, A. G., & Appelboom-Geerts, K. C. M. M. J. (2008). Child versus family cognitive-behavioral therapy in clinically anxious youth: An efficacy and partial effectiveness study. *Journal of the American Academy of Child and Adolescent Psychiatry*, 47(12), 1384–1394. <https://doi.org/10.1097/CHI.0b013e318189148e>
- Bögels, S. M. (2008). *Behandeling van angststoornissen bij kinderen en adolescenten: Met het cognitief-gedragstherapeutisch protocol Denken + Doen*. Bohn Stafleu van Loghum.
- Brady, E. U., & Kendall, P. C. (1992). Comorbidity of anxiety and depression in children and adolescents. *Psychological Bulletin*, 111(2), 244–255.
- Brooks, R., & de Charro, F. (1996). EuroQol: The current state of play. *Health Policy*, 37(1), 53–72. [https://doi.org/10.1016/0168-8510\(96\)00822-6](https://doi.org/10.1016/0168-8510(96)00822-6)
- Campbell-Sills, L., Sherbourne, C. D., Roy-Byrne, P., Craske, M. G., Sullivan, G., Bystritsky, A., Lang, A. J., Chavira, D. A., Rose, R. D., Welch, S. S., & Stein, M. B. (2012). Effects of co-occurring depression on treatment for anxiety disorders: Analysis of outcomes from a large primary care effectiveness trial. *Journal of Clinical Psychiatry*, 73(12), 1509–1516. <https://doi.org/10.4088/JCP.12m07955>
- Chambless, D. L., Tran, G. Q., & Glass, C. R. (1997). Predictors of response to cognitive-behavioral group therapy for social phobia. *Journal of Anxiety Disorders*, 11(3), 221–240. [https://doi.org/10.1016/S0887-6185\(97\)00008-X](https://doi.org/10.1016/S0887-6185(97)00008-X)
- Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, 100(3), 316. <https://doi.org/10.1037/0021-843x.100.3.316>
- Compton, S. N., Peris, T. S., Almirall, D., Birmaher, B., Sherrill, J., Kendall, P. C., March, J. S., Gosch, E. A., Ginsburg, G. S., Rynn, M. A., Piacentini, J. C., McCracken, J. T., Keeton, C. P., Suveg, C. M., Aschenbrand, S. G., Sakolsky, D., Iyengar, S., Walkup, J. T., & Albano, A. M. (2014). Predictors and moderators of treatment response in childhood anxiety disorders: Results from the CAMS trial. *Journal of Consulting and Clinical Psychology*, 82(2), 212–224. <https://doi.org/10.1037/a0035458>
- Crawley, S. A., Beidas, R. S., Benjamin, C. L., Martin, E., & Kendall, P. C. (2008). Treating socially phobic youth with CBT: Differential outcomes and treatment considerations. *Behavioural and Cognitive Psychotherapy*, 36(4), 379–389. <https://doi.org/10.1017/S1352465808004542>
- Cummings, C. M., Caporino, N. E., & Kendall, P. C. (2014). Comorbidity of anxiety and depression in children and adolescents: 20 years after. *Psychological Bulletin*, 140(3), 816–845. <https://doi.org/10.1037/a0034733>
- Erwin, B. A., Heimberg, R. G., Juster, H., & Mindlin, M. (2002). Comorbid anxiety and mood disorders among persons with social anxiety disorder. *Behaviour Research and Therapy*, 40(1), 19–35. [https://doi.org/10.1016/S0005-7967\(00\)00114-5](https://doi.org/10.1016/S0005-7967(00)00114-5)
- Evans, R., Clark, D. M., & Leigh, E. (2021). Are young people with primary social anxiety disorder less likely to recover following generic CBT compared to young people with other primary anxiety disorders? A systematic review and meta-analysis. *Behavioural and Cognitive Psychotherapy*. <https://doi.org/10.1017/S135246582000079X>
- Franco, X., Saavedra, L. M., & Silverman, W. K. (2007). External validation of comorbid patterns of anxiety disorders in children and adolescents. *Journal of Anxiety Disorders*, 21(5), 717–729. <https://doi.org/10.1016/j.janxdis.2006.10.002>
- Ginsburg, G. S., Kendall, P. C., Sakolsky, D., Compton, S. N., Piacentini, J., Albano, A. M., Walkup, J. T., Sherrill, J., Coffey, K. A., Rynn, M. A., Keeton, C. P., McCracken, J. T., Bergman, L., Iyengar, S., Birmaher, B., & March, J. (2011). Remission after acute treatment in children and adolescents with anxiety disorders: Findings from the CAMS. *Journal of Consulting and Clinical Psychology*, 79(6), 806–813. <https://doi.org/10.1037/a0025933>
- Hudson, J. L., Keers, R., Roberts, S., Coleman, J. R. I., Breen, G., Arendt, K., Bögels, S., Cooper, P., Creswell, C., Hartman, C., Heiervang, E. R., Hötzel, K., In-Albon, T., Lavalley, K., Lyneham, H. J., Marin, C. E., McKinnon, A., Meiser-Stedman, R., Morris, T., ... Eley, T. C. (2015a). Clinical predictors of response to cognitive-behavioral therapy in pediatric anxiety disorders: The Genes for Treatment (GxT) study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 54(6), 454–463. <https://doi.org/10.1016/J.JAAC.2015.03.018>
- Hudson, J. L., Rapee, R. M., Lyneham, H. J., McLellan, L. F., Wuthrich, V. M., & Schniering, C. A. (2015b). Comparing outcomes for children with different anxiety disorders following cognitive behavioural therapy. *Behaviour Research and Therapy*, 72, 30–37. <https://doi.org/10.1016/J.BRAT.2015.06.007>
- Joormann, J., Kosfelder, J., & Schulte, D. (2005). The impact of comorbidity of depression on the course of anxiety treatments. *Cognitive Therapy and Research*, 29(5), 569–591. <https://doi.org/10.1007/s10608-005-3340-5>
- Kaufman, J., & Charney, D. (2000). Comorbidity of mood and anxiety disorders. *Depression and Anxiety*, 12(S1), 69–76. [https://doi.org/10.1002/1520-6394\(2000\)12:1+%3c69::AID-DA9%3e3.0.CO;2-K](https://doi.org/10.1002/1520-6394(2000)12:1+%3c69::AID-DA9%3e3.0.CO;2-K)

- Kendall, P. C., Flannery-Schroeder, E., Panichelli-Mindel, S. M., Southam-Gerow, M., Henin, A., & Warman, M. (1997). Therapy for youths with anxiety disorders: A second randomized clinical trial. *Journal of Consulting and Clinical Psychology, 65*(3), 366–380. <https://doi.org/10.1037/0022-006X.65.3.366>
- Kircanski, K., Joormann, J., & Gotlib, I. H. (2012). Cognitive aspects of depression. *Wiley Interdisciplinary Reviews: Cognitive Science, 3*(3), 301–313. <https://doi.org/10.1002/wcs.1177>
- Klemanski, D. H., Curtiss, J., McLaughlin, K. A., & Nolen-Hoeksema, S. (2017). Emotion regulation and the transdiagnostic role of repetitive negative thinking in adolescents with social anxiety and depression. *Cognitive Therapy and Research, 41*(2), 206–219. <https://doi.org/10.1007/s10608-016-9817-6>
- Kodal, A., Fjermestad, K., Bjelland, I., Gjestad, R., Öst, L. G., Bjaastad, J. F., Haugland, B. S. M., Havik, O. E., Heiervang, E., & Wergeland, G. J. (2018). Long-term effectiveness of cognitive behavioral therapy for youth with anxiety disorders. *Journal of Anxiety Disorders, 53*, 58–67. <https://doi.org/10.1016/j.janxdis.2017.11.003>
- Lamers, L. M., McDonnell, J., Stalmeier, P. F. M., Krabbe, P. F. M., & Busschbach, J. J. V. (2006). The Dutch tariff: Results and arguments for an effective design for national EQ-5D valuation studies. *Health Economics, 15*(10), 1121–1132. <https://doi.org/10.1002/hec.1124>
- Laurent, J., & Ettelson, R. (2001). An examination of the tripartite model of anxiety and depression and its application to youth. *Clinical Child and Family Psychology Review, 4*(3), 209–230. <https://doi.org/10.1023/a:1017547014504>
- Ledley, D. R., Huppert, J. D., Foa, E. B., Davidson, J. R. T., Keefe, F. J., & Potts, N. L. S. (2005). Impact of depressive symptoms on the treatment of generalized social anxiety disorder. *Depression and Anxiety, 22*(4), 161–167. <https://doi.org/10.1002/da.20121>
- Manassis, K., Mendlowitz, S. L., Scapillato, D., Avery, D., Fiksenbaum, L., Freire, M., Monga, S., & Owens, M. (2002). Group and individual cognitive-behavioral therapy for childhood anxiety disorders: A randomized trial. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*(12), 1423–1430. <https://doi.org/10.1097/00004583-200212000-00013>
- Marom, S., Gilboa-Schechtman, E., Aderka, I. M., Weizman, A., & Hermesh, H. (2009). Impact of depression on treatment effectiveness and gains maintenance in social phobia: A naturalistic study of cognitive behavior group therapy. *Depression and Anxiety, 26*(3), 289–300. <https://doi.org/10.1002/da.20390>
- Melton, T. H., Croarkin, P. E., Strawn, J. R., & McClintock, S. M. (2016). Comorbid anxiety and depressive symptoms in children and adolescents: A systematic review and analysis. *Journal of Psychiatric Practice, 22*(2), 84. <https://doi.org/10.1097/PRA.0000000000000132>
- Moscovitch, D. A., Hofmann, S. G., Suvak, M. K., & In-Albon, T. (2005). Mediation of changes in anxiety and depression during treatment of social phobia. *Journal of Consulting and Clinical Psychology, 73*(5), 945–952. <https://doi.org/10.1037/0022-006X.73.5.945>
- O’Neil, K. A., Podell, J. L., Benjamin, C. L., & Kendall, P. C. (2010). Comorbid depressive disorders in anxiety-disordered youth: Demographic, clinical, and family characteristics. *Child Psychiatry and Human Development, 41*(3), 330–341. <https://doi.org/10.1007/s10578-009-0170-9>
- Ollendick, T. H., Jarrett, M. A., Grills-Tauchel, A. E., Hovey, L. D., & Wolff, J. C. (2008). Comorbidity as a predictor and moderator of treatment outcome in youth with anxiety, affective, attention deficit/hyperactivity disorder, and oppositional/conduct disorders. *In Clinical psychology review* (Vol. 28, Issue 8, pp. 1447–1471). Pergamon. <https://doi.org/10.1016/j.cpr.2008.09.003>
- Persons, J. B., Roberts, N. A., & Zalecki, C. A. (2003). Anxiety and depression change together during treatment. *Behavior Therapy, 34*(2), 149–163. [https://doi.org/10.1016/S0005-7894\(03\)80010-2](https://doi.org/10.1016/S0005-7894(03)80010-2)
- Rapee, R. M., Lyneham, H. J., Hudson, J. L., Kangas, M., Wuthrich, V. M., & Schniering, C. A. (2013). Effect of comorbidity on treatment of anxious children and adolescents: Results from a large, combined sample. *Journal of the American Academy of Child and Adolescent Psychiatry, 52*(1), 47–56. <https://doi.org/10.1016/j.jaac.2012.10.002>
- Scharfstein, L., & Beidel, D. C. (2011). Behavioral and cognitive-behavioral treatments for youth with social phobia. *Journal of Experimental Psychopathology, 2*(4), 615–628. <https://doi.org/10.5127/jep.014011>
- Silverman, W. K., & Rabian, B. (1995). Test-retest reliability of the DSM-III-R childhood anxiety disorders symptoms using the anxiety disorders interview schedule for children. *Journal of Anxiety Disorders, 9*(2), 139–150. [https://doi.org/10.1016/0887-6185\(94\)00032-8](https://doi.org/10.1016/0887-6185(94)00032-8)
- Silverman, W. K., Saavedra, L. M., & Pina, A. A. (2001). Test-retest reliability of anxiety symptoms and diagnoses with the anxiety disorders interview schedule for DSM-IV: Child and parent versions. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*(8), 937–944. <https://doi.org/10.1097/00004583-200108000-00016>
- Southam-Gerow, M. A., Kendall, P. C., & Weersing, V. R. (2001). Examining outcome variability: Correlates of treatment response in a child and adolescent anxiety clinic. *Journal of Clinical Child and Adolescent Psychology, 30*(3), 422–436. https://doi.org/10.1207/S15374424JCCP3003_13
- The EuroQol Group. (1990). EuroQol—A new facility for the measurement of health-related quality of life. *Health Policy, 16*(3), 199–208. [https://doi.org/10.1016/0168-8510\(90\)90421-9](https://doi.org/10.1016/0168-8510(90)90421-9)
- van Steensel, F. J. A., & Bögels, S. M. (2015). CBT for anxiety disorders in children with and without autism spectrum disorders. *Journal of Consulting and Clinical Psychology, 83*(3), 512–523. <https://doi.org/10.1037/a0039108>
- Verhulst, F. C., van der Ende, J., & Koot, H. M. (1996). *Manual for the Child Behavior Checklist (in Dutch)*. Department of Child and Adolescent Psychiatry, Erasmus Medical Centre/Sophia.
- Waters, A. M., Groth, T. A., Purkis, H., & Alston-knox, C. (2018). Predicting outcomes for anxious children receiving group cognitive-behavioural therapy: Does the type of anxiety diagnosis make a difference? *Clinical Psychologist, 22*(3), 344–354. <https://doi.org/10.1111/cp.12128>
- Willems, D. C. M., Joore, M. A., Nieman, F. H. M., Severens, J. L., Wouters, E. F. M., & Hendriks, J. J. E. (2009). Using EQ-5D in children with asthma, rheumatic disorders, diabetes, and speech/language and/or hearing disorders. *International Journal of Technology Assessment in Health Care, 25*(3), 391–399. <https://doi.org/10.1017/S0266462309990171>
- Wright, M., Banerjee, R., Hoek, W., Rieffe, C., & Novin, S. (2010). Depression and social anxiety in children: Differential links with coping strategies. *Journal of Abnormal Child Psychology, 38*(3), 405–419. <https://doi.org/10.1007/s10802-009-9375-4>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.