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Patterns of sub-optimal change following CBT for childhood anxiety

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Background: Children and adolescents demonstrate diverse patterns of symptom change and disorder remission following cognitive behavioural therapy (CBT) for anxiety disorders. To better understand children who respond sub-optimally to CBT, this study investigated youths (N = 1,483) who continued to meet criteria for one or more clinical anxiety diagnosis immediately following treatment or at any point during the 12 months following treatment. **Methods:** Data were collected from 10 clinical sites with assessments at pre-and post-treatment and at least once more at 3, 6 or 12-month follow-up. Participants were assigned to one of three groups based on diagnostic status for youths who: (a) retained an anxiety diagnosis from post to end point (minimal responders); (b) remitted anxiety diagnoses at post but relapsed by end point (relapsed responders); and (c) retained a diagnosis at post but remitted to be diagnosis free at end point (delayed responders). Growth curve models assessed patterns of change over time for the three groups and examined predictors associated with these patterns including demographic, clinical and parental factors, as well as treatment factors. **Results:** Higher primary disorder severity, being older, having a greater number of anxiety disorders, having social anxiety disorder, as well as higher maternal psychopathology differentiated the minimal responders from the delayed and relapsed responders at the baseline. Results from the growth curve models showed that severity of the primary disorder and treatment modality differentiated patterns of linear change only. Higher severity was associated with significantly less improvement over time for the minimal and relapsed response groups, as was receiving group CBT, when compared to the delayed response group. **Conclusions:** Sub-optimal response patterns can be partially differentiated using variables assessed at pre-treatment. Increased understanding of different patterns of change following treatment may provide direction for clinical decision-making and for tailoring treatments to specific groups of clinically anxious youth. Future research may benefit from assessing progress during treatment to detect emerging response patterns earlier. **Keywords:** Anxiety; childhood; cognitive behavioural therapy; sub-optimal response; response patterns.

Introduction

As one of the most prevalent mental health disorders in childhood anxiety disorders generate significant distress and functional impairment and if left untreated often follow a chronic course into adulthood (Copeland, Angold, Shanahan, & Costello, 2014). Research shows that cognitive behavioural therapy (CBT) is an efficacious treatment for anxious children and adolescents (hereafter youth). There are multiple methods to determine treatment success ranging from determining the amount of change on a single-reporter symptom measure (e.g., child report) to more comprehensive diagnostic assessments conducted by clinicians to determine the presence or absence of anxiety diagnosis or diagnoses following treatment. For treatment trials targeting multiple anxiety disorders, it is recommended that remission of the most interfering diagnosis as well as remission of all anxiety diagnoses be reported (see the consensus statement Creswell et al., 2020). In line with this, on average, 49.4% of youth show remission of their most interfering anxiety diagnosis immediately after

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treatment and 46% show remission of all anxiety diagnoses (James, Reardon, Soler, James, & Creswell, 2020). Typically, remission rates and subsequently predictors of remission, are reported separately at post treatment and other follow-up points (when available). Therefore, our knowledge of predictors of remission status is limited to binary data at single time points rather than patterns of remission. For example, at post treatment a child might be free of both the disorders bringing them to treatment, but 1 year later, the symptoms of one disorder may relapse. Optimal treatment response and perhaps the most conservative definition, is when all anxiety diagnoses are remitted at all assessment points. Similarly, when anxiety symptoms are reported across time, average symptoms at pre, post and follow-up are compared, more often than not, typically examining linear trends only. Therefore, it has become crucial to investigate more nuanced patterns of response following treatment.

Most treatment outcome studies have investigated predictors that differentiate treatment responders from non-responders at a specific point in time, whereas the factors that predict disorder patterns beyond a single assessment occasion remains little understood. Systematic reviews and meta-analyses of CBT treatment outcome in general, have reported inconsistent findings regarding predictors of static outcome for several child demographic and clinical factors, as well as parental factors (Higa-McMillan, Francis, Rith-Najarian, & Chorpita, 2016; Kunas, Lautenbacher, Lueken, & Hilbert, 2021). In contrast, occasional studies with larger sample sizes have identified several factors that more robustly predict which children are more or less likely to respond to standard CBT at a specific point in time. Among these, poorer treatment response (as defined by static primary anxiety disorder remission) was associated with several baseline variables such as a diagnosis of social anxiety disorder (Hudson, Rapee, et al., 2015), higher baseline symptom severity (Kunas et al., 2021), a comorbid depression diagnosis as well as comorbid externalising disorders (Hudson, Keers, et al., 2015) and higher parental psychopathology (Compton et al., 2014).

Treatment factors have also been investigated to ascertain which characteristics may be predictive of better treatment outcomes. Examinations of treatment modality reported that generally there were no significant differences between formats for children with different primary anxiety diagnoses (McKinnon et al., 2018). Treatment intensity has been associated with treatment outcome, with some studies reporting that lower intensity treatments (i.e., less therapist time) may benefit younger children, as well as those diagnosed with generalised anxiety disorder (GAD) (Thirlwall, Cooper, & Creswell, 2017). Earlier studies have also shown that greater therapist experience strongly predicted improved treatment CBT outcome (Podell et al., 2013). Finally, it has been suggested that the level of parental involvement may impact treatment outcome, with higher parental involvement and the use of contingency management with a transfer of control showing better outcomes than other types of parental involvement (Manassis et al., 2014). Knowing which treatment factors may improve or deteriorate treatment response in youth will advance the quest for personalisation of anxiety treatment.

If clinical and treatment predictors of response patterns (beyond treatment) can be identified, these factors have the potential to aid our understanding of how best to personalise treatment to improve outcomes through guiding families towards treatment selection and modification. Based on a large, pooled sample, Skriner et al. (2019) investigated patterns observed in anxiety symptoms (either parent or youth report) across time, showing a small number of participants demonstrated improvement determined by a steep decline in symptoms at post-treatment and then a slight increase at follow-up (rapid responders: 7%–12%), 78%–93% of participants experienced a steady reduction in anxiety symptoms from pre- to post-treatment and continued improvement until the final assessment point and was seen as steady responders. In contrast, 7%–22% of participants only showed improvement by 1-year follow-up and was classed as delayed responders. To understand where the risk of non-response was greatest, the same study examined predictors that significantly predicted class belonging. Results showed that older youths were more likely to belong in the rapid response group, whereas number of baseline diagnoses and receiving family CBT predicted membership in the delayed response group.

All considered, the ability to predict diverse response and recovery patterns in the longer term, as well as predict which children are at greater risk of non-recovery remains crucial to improve treatment outcomes for anxious youth. It may further enhance clinicians' ability to modify treatment plans for youth who may demonstrate delayed or relapse patterns of response following CBT. Therefore, the present study conducted its investigation on a group of children and adolescents who continued to meet clinical diagnosis at post-treatment and beyond, making a novel and important contribution to the existing literature. We categorised participants into three unique response groups (minimal, relapsed and delayed responders) based on the presence or absence of all anxiety disorders at all assessment occasions during the follow-up period. The present study used all anxiety diagnoses (total number of anxiety disorders) as a conservative and comprehensive measure of treatment outcome. This presents an extension of earlier research that used single reporter symptoms as anxiety outcomes. The first objective was to examine whether any baseline differences could be identified across these three groups in terms of demographic and clinical variables. Building upon our understanding of response patterns, the next objective was to statistically examine differences in group response patterns and whether any

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pre-treatment or treatment factors were associated with differences in the patterns of change over time for these three groups. Given the exploratory nature of this objective, no directional hypotheses were stated.

Methods

Sample

Participants were drawn from a combined sample of 2091 participants from 10 global sites. Inclusion criteria for the present study comprised (a) meeting DSM-IV criteria for a primary (most interfering or severe) diagnosis of an anxiety disorder (APA, 2000), assigned at the individual site after a semi-structured diagnostic interview; (b) receiving a course of manualized CBT for anxiety and (c) meeting criteria for any anxiety disorder (i.e., either the primary or any comorbid anxiety disorders) assessed at post-treatment or at any one or more of the follow-up assessments (3, 6 or 12-months). This would allow for the investigation of patterns of suboptimal change that were different to those participants who demonstrated full remission at post-treatment (i.e., stable responders) and the final sample contained data for 1,483 youth. Further, although the variables examined in the present study have previously been included in subgroup investigations (Coleman et al., 2016; Hudson et al., 2023; Hudson, Keers, et al., 2015; McKinnon et al., 2018; Rapee et al., 2017; Schniering, Einstein, Kirkman, & Rapee, 2022), none of the published manuscripts had similar study objectives.

Measures

This study used the average number of anxiety disorders across time as the primary anxiety outcome with diagnoses made using the Anxiety Disorders Interview Schedule Child and Parent Version (ADIS-IV-C/P) (Silverman, Albano, & Barlow, 1996). The ADIS is a semi-structured clinical interview that is administered to both parents and children and assesses both anxiety diagnosis and severity based on a composite report. Clinical severity ratings (CSR) were ascertained per disorder on a scale of 0–8 and according to DSM criteria, diagnosis was made when a CSR score of 4 or more was assigned, indicating a moderate level of impairment. All sites assigned diagnoses according to the ADIS-IV-C/P except for two (Bochum and Basel), where a diagnostically comparable measure, the Kinder-DIPS for DSM-IV-TR (Diagnostisches Interview bei psychischen Störungen im Kindes-und Jugendalter or Diagnostic interview for mental disorders for children and adolescents) (Schneider, Unnewehr, & Margraf, 2009), was used. The Kinder-DIPS has good validity, interrater and re-test reliability for anxiety disorders (Margraf, Cwik, Pflug, & Schneider, 2017) and the test–re-test (Silverman, Saavedra, & Pina, 2001) and concurrent validity (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002) are reported as excellent for the ADIS-C/P for DSM-IV. Assessments were completed at pre- and post-treatment and at least once more at 3, 6 or 12 months, following treatment.

Response groups. Using the data from the diagnostic interviews, children were divided into three groups based on remission of all anxiety disorders across all follow-up time points. The first group retained at least one anxiety diagnosis across the follow-up period and was categorised minimal responders (n = 951, 64.1%). The second group remitted all anxiety diagnoses at post initially but relapsed at least one anxiety disorder at a later period and was categorised relapsed responders (n = 119, 8%). The third group retained at least one diagnosis at post but then remitted, remaining free of all anxiety diagnoses at final follow-up and was categorised delayed responders (n = 413, 27.8%). This categorisation constituted the 'response group' variable. Mean number of anxiety disorders per response group is presented in Figure 1.

Predictors. Clinical predictors included comorbid depression and externalising diagnoses (conduct disorder, oppositional defiant disorder or attention-deficit-hyperactivity disorder). These clinical predictors were diagnosed at the baseline using the ADIS-IV-C/P or Kinder/DIPS-C/P except for Bergen. Both measures have good clinical relevance, reliability and validity when assessing comorbid disorders (Byrne, Lebowitz, Ollendick, & Silverman, 2018; Neuschwander, In-Albon, Adornetto, Roth, & Schneider, 2013) and inter-rater agreement on mood disorders and externalising disorders has been shown to be good to excellent (κ = .65–.77) (Lyneham, Abbott, & Rapee, 2007; Margraf et al., 2017). In Bergen, the Development and Well-being Assessment (DAWBA) (Goodman, Ford, Richards, Gatward, & Meltzer, 2000) was used. The DAWBA is a sensitive and diagnostically comparable measure when assessing both internalising and externalising disorders (Aebi et al., 2012). Parental predictors included parental psychopathology for both mothers and fathers, assessed using the Depression Anxiety Stress Scales (DASS) (Lovibond & Lovibond, 1995) at all sites except for Groningen and Basel. The DASS has excellent internal consistency, temporal stability and convergent and discriminant validity (Crawford & Henry, 2003). Treatment variables included treatment modality (individual, group or another CBT format). Other CBT includes treatment including guided self-help, bibliotherapy or online/digital therapy. Additional factors included treatment intensity (low, medium and high), parental involvement (low, active/low or active/high) and therapist experience (low: student/novice/trainee, medium: mix of novice and experienced and high: experienced). Treatment details are presented in Appendix S1. Together, the impact of five pre-treatment predictors on change in number of anxiety disorders were examined, which included severity of the primary anxiety disorder, a diagnosis of SoAD, a comorbid mood or externalising disorder and maternal psychopathology. Finally, the potential impact of all treatment variables on change in number of anxiety disorders over time was explored.

Analytic overview

Descriptive and comparative statistics, as well as sensitivity analyses were conducted using ANOVAs and Chi-square tests. Linear mixed models (LMM) with repeated measures nested by individual were used to explore differences between the response groups and their patterns of change in number of anxiety disorders. LLM are used to examine longitudinal patterns of treatment effects over time because it allows for: (a) unbalanced data in repeated measures; (b) the use of time variant and invariant predictors; and (c) increase precision and power given it can accommodate for assessment occasions (Shek & Ma, 2011). Assumptions underlying individual growth curve (IGC) analyses include normality, independence and homoscedasticity (Meteyard & Davies, 2020). Data was analysed with maximum likelihood estimation which assumes residual effects and random effects deviations are normally distributed (Curran, Obeidat, & Losardo, 2010).

An unconditional model was estimated first to examine within-individual and between-individual variance in number of anxiety disorders (Shek & Ma, 2011). The variable *Time* was added to assess individual changes over time as a recommended time-structured predictor (Singer & Willett, 2003). This presents another strength of growth curve modelling because it allows for the irregularity of number and spacing of assessments. Pre-treatment assessment was set at 0 and subsequent assessments coded according to the number of months following treatment commencement, coded as time = 0.25 years (post-treatment), 0.50 years (3-month

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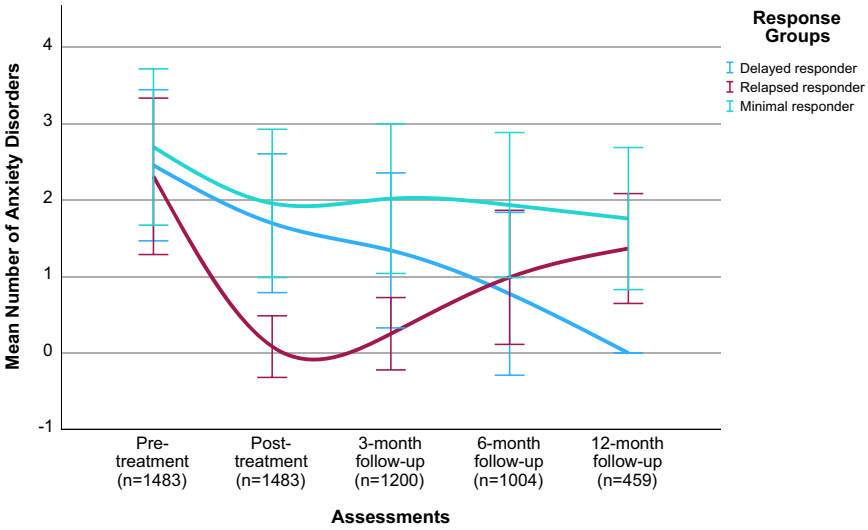

Figure 1 Three response groups and their response patterns based on average number of anxiety disorders across assessment occasions. Error bars represent ±1 SD

follow-up), 0.75 years (6-month follow-up) and 1.25 years (12-month follow-up). Next, the time-structured predictor was added to the model where linear parameters (*Time*) would refer to the initial direction and rate of change. The quadratic parameters ($Time^2$) would refer to an acceleration or deceleration in the linear rate of change and the cubic parameters ($Time^3$) would reference rate changes in the acceleration or deceleration (Chu, Skriner, & Zandberg, 2013).

The variable 'Response Group' was then added to the model. Significant interactions with time would indicate differences in the conditional means of the growth factors for each response group over time (Curran et al., 2010), suggesting that the variability could in part be explained by between-individual predictors (Shek & Ma, 2011). Next, predictor variables were added in two instances including clinical and treatment factor models to see if any variables differentiated the patterns of change between the response groups. Model selection was assessed based on −2log likelihood (LL), Akaike's information criterion (AIC) and the Swartz's Bayesian information criterion (BIC), where smaller values of these indices indicate better model fit (Shek & Ma, 2011). Full reporting of the model building is presented in Appendix S2. Results are reported according to best practice guidelines for linear mixed-effect models in psychological science (Meteyard & Davies, 2020). All analyses were conducted with the Statistical Package for Social Sciences (SPSS) Version 29. Given the exploratory nature of predictive analyses conducted in the present study, statistical significance for all analyses was considered for four predictive models at $p < .013$ ($p < .05/4$ IGC models).

Results

Missing data

Available follow-up data differed by occasion because sites assessed cases at different time points. Data for were available at pre- and post-treatment ($n = 1483$, 100%), 3-month follow-up ($n = 1200$, 81%), 6-month follow-up ($n = 1004$, 68%) and 12-month follow-up ($n = 459$, 31%). Multiple imputation was considered to estimate missing data and the results were compared to mixed-model analyses without imputed data. Given the same pattern of significance between analyses, the non-imputed results are reported here. However, to better account for potential variation, *site* was also included as a covariate in the predictive models. Baseline predictor data were available for all cases, except for parental psychopathology where mother data were available for 91% of participants compared to father data at 63%. Given no significant differences for father psychopathology data between response groups ($p = .074$), only mother DASS scores were included in the predictor analysis. Data were available for the following number of assessment occasions: two, $n = 283$, three, $n = 196$, four, $n = 545$ and five, $n = 459$. To note, given this study included trial data with two or more assessment occasions, missing data may have occurred more by design than availability of participant information.

Model assumptions

Assumptions for IGCM were assessed by plotting residuals and random effects. A variance–covariance approach was used to address the assumptions of independence and homoscedasticity of errors (Shek & Ma, 2011). Given the nature of time-course data included in IGCM, an autoregressive covariance structure (AR1-H) was assumed to partially address expected correlated error terms and pre-emptively assume the variance to be heterogeneous (Field, 2018).

Sample characteristics

The final sample consisted of 1,483 youth who were 5 to 18 years of age ($M = 10.1$, $SD = 2.4$), balanced by gender (female = 54%) and overall contained more children than adolescents (5–12 years; 83%). Data contained in the final sample were pooled from 10 sites across eight countries as follows: Australia ($n = 883$); UK ($n = 258$); Denmark ($n = 86$); Norway ($n = 134$); Germany ($n = 60$); Switzerland ($n = 23$); the Netherlands ($n = 22$) and the USA ($n = 17$).

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Sensitivity analysis

Comparisons were conducted to ascertain whether bias was introduced to the sample by removing stable responders (n = 608; 29%) and conducting analyses based on youth who still met criteria for one or more anxiety disorders following treatment (n = 1,483; 71%). Results show that there were no differences on severity of primary anxiety disorder but that the stable responders were younger than the remaining participants and included fewer female and more male youth. Therefore, *age* and *gender* were included as covariates in the predictive models.

Baseline difference in demographic and clinical factors were explored and results showed that children in the minimal response group were older, had a higher mean severity of the primary anxiety disorder, as well as had mothers who self-reported higher symptoms of depression, anxiety and stress when compared with children in the delayed response group. Minimal responders were more frequently diagnosed with a social anxiety disorder and on average had more pre-treatment anxiety diagnoses when compared to both the delayed and the relapsed response groups. Next, treatment factors were examined and chi-squared tests showed differences between all three groups for treatment modality, intensity, level of parental involvement and therapist experience. All significant variables were added to the growth curve models. Descriptive and comparative statistics of the three response groups at the baseline are presented in Table 1.

Model building: Estimating growth parameters

A series of growth models, consisting of two levels, were fitted to the data (n = 1,483) and all model results are presented in the Supplementary material. The unconditional model investigated the differences in individual change in the number of anxiety disorders without regard to time and showed that around 31% of variation in number of anxiety disorders at the baseline could be ascribed to between-individual differences. Significance in all growth parameters of the model would suggest there were substantial differences between participants around the initial status (baseline), as well as the linear, quadratic and cubic parameters. The inclusion of *Time* revealed significant negative values for linear slope parameters, suggesting the mean number of anxiety disorders decreased with time. The inclusion of $Time^2$ showed significant positive values for quadratic growth, indicating that the rate of growth increased over time resulting in a deceleration (i.e., improvement slowed down). The inclusion of $Time^3$ showed a significant negative effect of cubic growth, the deceleration rate gradually diminished over time = improvement. Together, these significant findings indicate that a certain portion of the variation may be explained by the addition of predictors to the model. Finally, model fit statistics indicated improved model fit over previous models ($\Delta\chi^2$ (1) = 1640.40, $p < .001$) and was retained as the base model for further analysis.

Response groups: Examining growth parameters

The variable 'response groups' was examined as a time-invariant predictor to test the effect of response groups on the change in number of anxiety disorders over time. Significant fixed effect interactions showed that minimal responders had a significantly higher number of anxiety disorders at the baseline (initial status) relative to both delayed and relapsed responders. Significant negative effects of *Time* showed that all three response groups initially reduced in number of anxiety disorders from the baseline. As was expected, effects of $Time^2$ and $Time^3$ showed significant differences between the three groups in quadratic and cubic growth in the change in number of anxiety disorders over time. After controlling the effects of gender, age and site in the covariate model, the 'response groups' variable accounted for 27.8% of within-individual variations in number of anxiety disorders. Results of the response group model are presented in Table 2.

Predictors: Differentiating the growth parameters

Five clinical variables were entered to the model to evaluate their effects on the change in number of anxiety disorders over time for the three response groups. Although a diagnosis of a mood disorder was not associated with initial status (β = .03, SE = .08, t = .41, and p = .681) or any changes in IGCs, significant main effects were observed for an externalising disorder diagnosis (β = −.23, SE = .07, t = −3.27, and p = .001) and mother psychopathology also (β = .004, SE = .001, t = 2.74, and p = .006). These main effects indicated that youths without an externalising disorder diagnosis had a lower number of anxiety disorders at the baseline, while youths with mothers who reported higher depression, anxiety and stress symptoms, had a higher mean number of anxiety disorders at the baseline. A significant main effect for a diagnosis of SoAD (β = .14, SE = .06, t = 2.36, and p = .018) indicated that youths without a social anxiety disorder diagnosis had a higher mean number of anxiety disorders at the baseline, but this result did not withstand correction for multiple testing. However, none of these variables interacted with time to predict linear, quadratic or cubic parameters in patterns of change in number of anxiety disorders.

Primary anxiety severity was significantly associated with the initial status (β = .30, SE = .03, t = 9.52, and $p < .001$), indicating that youths with higher severity of the primary anxiety disorder had a higher mean number of anxiety disorders at the baseline. It was also the only clinical predictor to

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Table 1 Descriptive and comparative statistics for the suboptimal response groups

Factor	Final sample (n = 1,483)		Delayed responders (n = 413)		Relapsed responders (n = 119)		Minimal responders (n = 951)		Comparison statistics
Demographic									
Age *M* (*SD*)	10.1	(2.4)	9.3	(2.2)	10.1	(2.5)	10.3	(2.5)	F (2, 1,472) = 9.575, p < .001*
Gender (female %)		54%		51%		53%		55%	χ^2 (2, 1,480) = .2.018, p = .365
Clinical									
Primary AD severity *M* (*SD*)	6.3	(1.0)	6.1	(1.0)	6.3	(1.0)	6.4	(0.9)	F (2, 1,480) = 16.476, p < .001*
Primary anxiety diagnosis, n									
GAD	562		163		53		346		χ^2 (2, 1,483) = 3.589, p = .166
SAD	312		91		25		196		χ^2 (2, 1,483) = .352, p = .839
SoAD	362		86		21		255		χ^2 (2, 1,483) = 8.808, p = .012 *
SP	145		45		13		87		χ^2 (2, 1,483) = 1.190, p = .552
Other	102		28		7		67		χ^2 (2, 1,483) = .232, p = .891
ADIS-C/P Comorbidity n_{youths}, *M* (*SD*)									
Anxiety disorders	1,255	1.9 (0.9)	339	1.8 (0.8)	87	1.8 (0.8)	829	1.9 (0.8)	F (2, 1,252) = 5.766, p = .003*
Mood disorders	198	1.0 (0.1)	38	1.0 (0.2)	11	1.0 (0.0)	149	1.0 (0.1)	F (2, 195) = .147, p = .863
Externalising disorders	269	1.1 (0.3)	61	1.0 (0.3)	18	1.1 (0.3)	190	1.1 (0.3)	F (2, 266) = 0.273, p = .761
Contextual									
DASS *M* (*SD*)									
Mother (n = 1,328)	26.2	(19.0)	23.4	(17.3)	25.2	(17.6)	27.4	(19.8)	F (2, 1,325) = 5.953, p = .003*
Father (n = 934)	22.2	(16.9)	22.3	(17.9)	18.2	(13.4)	22.7	(16.8)	F (2, 931) = 2.606, p = .074
Treatment									
CBT treatment type, n (%)									
Individual	457	31%	141	34%	50	42%	266	28%	
Group	775	52%	192	46%	61	51%	522	55%	χ^2 (4, 1,483) = 21.541, p < .001*
Other	251	17%	80	19%	8	7%	163	17%	
CBT treatment intensity, n (%)									
Low	208	14%	48	12%	3	3%	157	16%	
Medium	1,226	83%	352	85%	108	91%	766	80%	χ^2 (4, 1,483) = 23.511, p < .001*
High	49	3%	13	3%	8	7%	28	3%	
CBT parental involvement, n (%)									
Low	286	19%	56	14%	27	23%	203	21%	
Active/Low CM/TC	69	5%	21	5%	10	8%	38	4%	χ^2 (4, 1,483) = 17.045, p = .002*
Active/High CM/TC	1,128	76%	336	81%	82	69%	710	75%	
CBT therapist experience, n (%)									
Low: Students/Trainees/ Novice	339	23%	106	26%	35	29%	198	21%	
Medium: Mixed experience	705	48%	204	49%	45	38%	456	48%	χ^2 (4, 1,474) = 11.885, p = .018*
High: experienced	430	29%	102	25%	39	33%	289	30%	

ADIS-C/P, Anxiety Disorders Interview Schedule Child and Parent Version; CBT, Cognitive Behavioural Therapy; DASS, Depression, Anxiety and Stress Scale.
*p < .05.

interact with *Time* to indicate changes in linear parameters (β = −.70, *SE* = .22, t = −3.17, and p = .002). For the whole sample, youth with higher anxiety severity demonstrated a greater reduction in number of anxiety disorders (improvement). Post-hoc investigations revealed significant group × time × primary severity interactions, suggesting that youth with higher severity of their primary anxiety disorder in the minimal and the relapsed response groups demonstrated less improvement over time (reduction in number of anxiety disorders), compared to delayed responders with higher severity of their primary disorder. A figure representing anxiety severity by response group is presented in supplementary material to aid visual interpretation (See Figure S1).

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Table 2 Descriptive and comparative statistics for the suboptimal response groups

Fixed Effects					
	Estimate/beta	*SE*	95% CI	*t*	*p*
Intercept	2.7	0.33	[2.61;2.74]	82.23	.000
Delayed responder	−0.24	0.59	[−0.36;-0.12]	−4.07	<.001
Relapsed responder	−0.39	0.10	[−0.58;-0.20]	−3.99	<.001
Minimal responder[a]	–	–	–	–	–
Time	−4.03	0.21	[−4.45;-3.61]	−18.80	<.001
Delayed responder	0.97	0.38	[0.22;1.71]	2.55	=.011
Relapsed responder	−10.06	0.62	[−11.28;-8.84]	−16.16	<.001
Minimal responder[a]	–	–	–	–	–
$Time^2$	6.41	0.49	[5.46;7.40]	13.18	<.001
Delayed responder	−4.64	0.85	[−6.30;-2.98]	−5.48	<.001
Relapsed responder	19.02	1.39	[16.29;21.74]	13.67	<.001
Minimal responder[a]	–	–	–	–	–
$Time^3$	−3.04	0.27	[−3.57;-2.51]	−11.21	<.001
Delayed responder	2.24	0.47	[1.32;3.15]	4.79	<.001
Relapsed responder	−8.70	0.77	[−10.21;-7.18]	−11.25	<.001
Minimal responder[a]	–	–	–	–	–

Random effects			
		Variance	*SD*
Level 1	Residual	0.50	0.01
Level 2	Intercept (Individual)	0.52	0.03
	Time	0.12	0.06

[a]Comparison group.

Four treatment factors were entered to the second predictor model and results showed that therapist experience and the intensity level of treatment had no association with initial status or IGCs. The level of parental involvement in therapy showed significant main effects for low involvement (β = −.25, *SE* = .12, *t* = −2.04, and *p* = .042), but it did not withstand correction for multiple testing. However, treatment modality was significantly associated with initial status (β = .28, *SE* = .11, t = 2.62, and *p* = .009) and linear parameters (β = −2.11, *SE* = .70, *t* = −3.02, and *p* = .003). For the whole sample, youth receiving group therapy demonstrated a greater reduction in number of anxiety disorders (improvement) over time relative to individual therapy and other types of treatment modality. Post-hoc investigations revealed significant group × linear time × treatment modality interactions, suggesting that youth who received group therapy in the minimal and the relapsed response groups demonstrated less improvement over time (reduction in number of anxiety disorders), compared to delayed responders who received group therapy. There was similarly less overall improvement for relapsed responders who received individual therapy, with no notable differences between minimal and delayed responders. A figure representing treatment modality by response group is presented in the Supplementary material to aid visual interpretation (Figure S2).

Discussion

The present study used a large global sample of children and adolescents who retained an anxiety disorder after completing a course of CBT, with the aim of investigating different patterns of suboptimal response for these youths. This study examined baseline differences between groups, as well as differences in the patterns of change in number of anxiety disorders over time. This was achieved by investigating the effects of pre-treatment and treatment factors that were associated with different patterns of sub-optimal response.

Response groups

The delayed response group demonstrated steady improvement between post-treatment and final follow-up and by definition resulted in full remission. This is in line with studies identifying a delayed response group characterised by a steady reduction of symptom severity towards remission at 1-year follow-up (Skriner et al., 2019), as well as at longer-term follow-up (Kodal et al., 2018). It may be that these children took longer to implement the skills learned in treatment but continued to apply these skills in the long-term. The relapsed response group, despite showing clinical improvement from pre- to post-treatment, received a clinical diagnosis at an assessment point during the follow-up period which they retained at final follow-up. The opportunity to categorise this relatively small but important group is likely the consequence of the large sample size used in the present study. Likewise, other long-term follow-up studies identified similar response patterns (Ginsburg et al., 2018) and there is some evidence to show that a responder at

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post-treatment is more likely to remain free from anxiety disorders over the longer term (Ginsburg et al., 2014). However, in the present study the relapsed response group demonstrates that a subset of youths does not retain the benefit of treatment during follow-up, which emphasises the potential utility of a check-in or booster session to identify children who may demonstrate alternative response pathways as a means to enhance efforts at relapse prevention. Further research is required to understand which children may respond initially but who do not maintain the benefits derived from treatment. Lastly, the group of minimal responders supports earlier evidence that there are children who only partially respond to treatment and whose impairment remains stable (Ginsburg et al., 2018; James et al., 2020), a finding indicative of the more chronic nature of anxiety disorders for some children and adolescents. Curiously, a few recent studies did not identify a class of minimal responders in their treatment response investigations (Kennedy, Halliday, & Ehrenreich-May, 2020; Skriner et al., 2019). This may be due to differences in study design and methodologies, as well significant variation in the way treatment response is defined (Loerinc et al., 2015). For example, using symptom severity as the outcome measure in earlier studies may have identified groups of children who demonstrated symptom improvement but did not indicate whether they retained a clinical diagnosis at post-treatment and subsequent assessment points. It is this group that requires increased research attention to develop and evaluate enhanced treatment options and provide prognostic data for children and adolescents.

Predictors

At the baseline, the clinical predictor model results showed that four predictors significantly differentiated the minimal, relapsed and delayed response groups. This aligns with findings from earlier treatment studies and recent systematic and meta-analytic reviews that higher severity of the primary disorder, a diagnosis of social anxiety disorder and higher parent psychopathology (Hudson, Keers, et al., 2015; Hudson, Rapee, et al., 2015; Kunas et al., 2021) significantly predicted negative CBT outcome for anxious children. Although it has not been shown to be as robust as some of the other predictors, a study by Hudson, Keers, et al. (2015) and Hudson, Rapee, et al. (2015)showed that comorbid externalising disorder may also contribute to diagnostic complexity and impede positive treatment response. The same study also provided evidence that a comorbid mood disorder was a robust predictor of poorer treatment outcomes although it did not differentiate minimal responders from delayed and relapsed responders at the baseline in the present study. As a mood disorder is more typically diagnosed in older youth, this finding may be a result of the few adolescents in this combined sample (17%). Still, these factors more robustly contribute to a risk profile predictive of poorer treatment response to CBT for a subgroup of youth, supporting the argument for increasing our understanding of diagnostic complexity and the potential interactions between these risk factors.

Differences in the patterns of change over time in number of anxiety disorders were to be expected given the way the groups were formed. Adding predictors to the model would enhance our understanding of whether clinical or treatment factors contributed to these different patterns in change between the groups. Higher severity of the primary anxiety disorder was the only clinical predictor significantly associated with differences in change in number of anxiety disorders for the three groups and only for linear parameters. Youths with higher severity of their primary anxiety disorder in the delayed group demonstrated significantly greater improvement over time, when compared to youths in both the minimal and relapsed groups. This finding aligns with earlier studies and reviews showing that youth with higher primary disorder severity typically demonstrate faster improvement (decrease in anxiety) (Compton et al., 2014; Knight, McLellan, Jones, & Hudson, 2014). However, this was not the case for minimal or relapsed responders, whereby higher severity was associated with less improvement, confirming earlier research that higher severity is also a negative predictor of CBT remission at post-treatment and long-term follow-up (Gibby et al., 2017).

There are inconsistent findings in the literature regarding the efficacy of group CBT compared to individual CBT, with some evidence suggesting that group CBT may be more effective for childhood anxiety disorders (Zhou et al., 2019), while other evidence suggests group therapy is less effective (Reynolds et al., 2012) or equally as effective as individual therapy (Sigurvinsdóttir, Jensínudóttir, Baldvinsdóttir, Smárason, & Skarphedinsson, 2020). Findings from the current study shed some light on these discrepancies, showing that the enhanced efficacy of group therapy was only present for the delayed response group. For youths in the minimal and relapsed groups, group therapy resulted in less change than other therapy formats. As the mental health field moves towards precision care (that is, using individual data to drive treatment planning with the intention of enhancing outcomes), the current results provide some initial hints about how treatment could be personalised to enhance outcomes. The data from this study suggest that children presenting with social anxiety disorder, higher parental anxiety and depression, higher severity (primary diagnosis), higher number of anxiety disorders will be more likely to show minimal treatment response or to relapse following treatment. As group therapy was not as advantageous for

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children who relapsed or showed minimal improvement, we could extrapolate that group therapy is not the ideal choice for children presenting for treatment with these clinical features that increase their chances of being in the relapsed or minimal response group (e.g., Social anxiety disorder, parental psychopathology). This finding is important as it is the outcomes of the children who relapse or who respond only minimally that we want to improve through innovative or optimised treatments. With larger samples of combined data, we will be in a better position to be able to detect alternate pathways for children with specific clinical profiles that increase the likelihood of a suboptimal response.

Strengths, limitations and future research directions

The major contribution of this study is in refining our understanding of the heterogeneity in the patterns of change in youth who received treatment for their anxiety disorders. A major strength was the combined data from multiple trials across several clinical settings that provided a far larger and more heterogeneous sample than those previously studied. Given that data were available for majority of the participants across at least three time points the present study was able to model non-linear response patterns, which may otherwise have proven difficult. Also, the present study examined treatment outcome modelled on number of anxiety disorders reflecting a more encompassing, albeit more conservative, scope that adds to existing literature that has mostly focussed on anxiety symptom changes. Despite its novel contribution to understanding variability in patterns of suboptimal response during the follow-up period, results from the present study should be interpreted with consideration to study limitations. Although the small number of adolescents in the sample provide a more age-specific analysis that may be considered a strength from a pre-adolescent developmental research perspective, it limits the generalisation of findings to younger anxious children. Considering a more age-balanced sample in future studies may facilitate interpretations for adolescents who are more at risk, given evidence that older age is associated with more frequent primary diagnoses of SoAD, as well as more frequent diagnoses of mood disorders (Waite & Creswell, 2014). As is often the case with pooled treatment data, that although comparable, sites used different CBT manuals containing different treatment contents. However, the results were observed despite controlling for site differences in our analysis which may more accurately reflect clinical trial practices. Finally, it is important to note a limitation to the interpretation of the findings in the present study, which assumes that youths with more diagnoses of anxiety disorders are more impaired than those with fewer diagnoses. For example, while a child with three disorders seems more severe, it may in fact impact their lives to a lesser extent compared to a youth who has one persistent diagnosis (i.e., CSR of 8). Similarly, while some children retain one or more anxiety diagnoses, if they remitted any during the study period, treatment was successful to some extent.

On a study level, the field will benefit from future research that examines interactions between baseline predictors and treatment ingredients in larger samples to better understand the complexity of a child's risk profile and how these predictors interact to affect treatment outcome. Larger samples will also present opportunities for replication and confirmation of current findings, besides future comparisons of suboptimal patterns with stable responders that may provide evidence of prospective predictors associated with all anxiety disorder remission. Future studies could also include control group data to delineate specific from non-specific predictors to establish differential treatment outcomes which would further assist clinicians in treatment decision-making. On an individual level, more research is required to examine factors that influence the speed of recovery. Differences between response groups observed for higher severity of the primary anxiety disorder and treatment modality were interpreted based on significant effects of time in linear parameters only. As such, further research is required to identify additional factors that may better explain patterns of change that include quadratic and cubic shapes during the follow-up period. This may direct focus towards assessment during treatment to predict minimal response or relapsed response patterns earlier. Only a few studies have investigated response patterns during treatment to identify different groups early as well as identify mid-treatment variables that may be used for intra-therapy tailoring of treatment (Bai et al., 2023; Kennedy et al., 2020; Pettit, Silverman, Rey, Marin, & Jaccard, 2016). Advances in this area of research may move the field closer to personalising treatment for those children who do not respond optimally to treatment.

Conclusions

Immediately following a course of CBT, a substantial number of children continue to meet criteria for an anxiety disorder. Using a large clinical dataset, the present study investigated children with an anxiety diagnosis at any assessment point following treatment with three groups consisting of delayed, relapsed and minimal responders. Growth curve modelling showed that minimal responders differed from the other two groups at the baseline with risk factors that included higher baseline severity, more frequent diagnosis of SoAD, having an externalising diagnosis and higher maternal psychopathology. Only higher severity of the primary anxiety disorder and group treatment modality were significantly

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associated with differences in the patterns of change in number of anxiety disorders, indicating less improvement over time for minimal responders and relapsed responders when compared to the delayed response group. Together, the findings provide new insight into the timing and durability of treatment outcomes for distinct groups of youth, as well as which factors are associated with patterns of changes. This may have important implications for clinical practice because we are closer to understanding when treatment benefit can be expected for certain subgroups of children. In addition, this may also enhance a clinician's ability to modify treatment plans for youth who may not respond optimally to CBT for their anxiety disorders.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Figure S1. Patterns of change for response groups based on their primary disorder severity ratings and their average number of anxiety disorders across assessment occasions.

Figure S2. Patterns of change for response groups based on treatment modality and their average number of anxiety disorders across assessment occasions.

Appendix S1. Site and treatment information.

Appendix S2. Results for growth model building.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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Key points

What is known?

There is great variability in treatment response and remission among children and adolescents receiving CBT for anxiety disorders and a substantial number of youths retain one or more anxiety disorders following treatment.

What is new?

Three suboptimal response groups (relapsed, delayed and minimal) were examined in one of the largest samples utilised to investigate sub-optimal responders to CBT. Some youths do not retain benefit derived from treatment, some may take longer to implement and apply skills learned in treatment and some demonstrate the more chronic nature of anxiety and resistance to treatment.

What is relevant?

Findings provide new insight into the timing and durability of different patterns of change following treatment which may move the field closer to understanding when treatment benefit can be expected for certain groups of children. Findings may enhance a clinician's ability to modify treatment plans for youth who may not optimally respond to CBT for their anxiety disorders.

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