

Cognitive behavior therapy for anxiety disorders: 40 years of progress

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Cognitive-behavior therapies (CBT) have been evaluated in randomized controlled studies (RCT) and anxiety disorders since 1966 and for each disorder there are at least two CBT methods that are considered evidence based (empirically supported) today. Numerous meta-analyses have evaluated the efficacy of these methods against various control conditions. However, none has looked at whether modern CBT studies lead to better treatment effects than were obtained 10–40 years ago. The aim of this paper is to present a meta-analysis focusing on the mean extent of change achieved by the CBT treatments across decades (from the 1970s onwards). Database searches yielded a total of 432 RCTs for the anxiety disorders combined and 364 of these allowed calculation of within-group effect size (ES) or percentage clinical improvement. Separate ESs were calculated for three central measures: independent assessor rating, self-report and behavioral approach test. The results showed that in most instances there was no significant change in ES across time. In a few instances, the treatment effects were greater in modern studies. However, it was more common with a negative development, or a mixed development (first positive then negative or vice versa). There was no significant change in proportion of clinical improvement. Treatment time and attrition either increased or remained stable. If the single studies that gave the highest ES each decade were compared, all anxiety disorders besides panic disorder and obsessive-compulsive disorder showed a positive development. Possible explanations to the results are discussed.

• *Anxiety disorders, Cognitive-behavior therapy, Meta-analysis.*

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Prevalence

Anxiety disorders, considered as a group, are the most prevalent mental disorders in the general population with a lifetime prevalence of almost 29% (1). The different disorders had the following prevalence figures: specific phobias 12.5%, social phobia 12.1%, post-traumatic stress disorder (PTSD) 6.8%, generalized anxiety disorder (GAD) 5.7%, panic disorder (PD) with or without agoraphobia 4.7%, obsessive-compulsive disorder (OCD) 1.6%, agoraphobia without a history of panic attacks 1.4%, and separation anxiety disorder 5.2%.

Evidence based treatments

According to recent reviews of the treatment outcome research (2), there are at least two cognitive-behavioral treatments that are empirically supported for each of the anxiety disorders in adults. These are for specific phobia exposure *in vivo* and applied tension (for blood injury phobia), for social phobia and agoraphobia exposure *in*

vivo and cognitive-behavior therapy (CBT; exposure plus cognitive therapy); for panic disorder (PD) CBT and panic control treatment; for generalized anxiety disorder (GAD) CBT and applied relaxation; for obsessive-compulsive disorder (OCD) exposure and response prevention (ERP) and CBT plus ERP; and for post-traumatic stress disorder (PTSD) exposure in imagination and CBT.

Historical background

The first randomized clinical trial (RCT) of a behavioral treatment in anxiety disorders was published in 1963 by Lang & Lazovik (3) and focused on fearful college students. In 1966, Paul (4) published his study comparing systematic desensitization (SD), insight-oriented therapy, attention-placebo and a no-treatment control group for college students fearful of public speaking. The most interesting fact with Paul's study is that five psychodynamically oriented therapists were trained to

give both treatments and still SD was by far the best treatment on almost all measures.

The first RCT with diagnosed patients was published in 1966 by Gelder & Marks (5), who compared SD and psychodynamic therapy for agoraphobic patients. The first RCT in specific phobias came in 1969; Ritter (6) on acrophobia and Bandura et al. (7) on animal phobia, and in social phobia in 1974; Argyle et al. (8) with social skills training. In OCD, the earliest study was published 1973; Stern et al. (9) with thought stopping, in GAD 1975; Carter et al. (10) comparing progressive relaxation and electro myography (EMG)-biofeedback, in PD in 1982; Taylor et al. (11) comparing progressive relaxation and diazepam, and in PTSD in 1986; and Peniston (12) with EMG-biofeedback.

Thus, the various anxiety disorders have a history of RCTs varying from 22 years (PTSD) to 42 years (agoraphobia), and large numbers of studies have been published.

Questions

With these long periods, during which RCTs have been published, it seems natural to ask if the treatments are better now than they were 10, 20, 30 or 40 years ago. More specifically, this review and meta-analysis tries to answer the following questions:

- 1) Does the average patient improve to a larger extent?
- 2) Do a higher proportion of patients achieve a clinically significant improvement (CSI)?
- 3) Is the treatment done in a shorter time?
- 4) Is the drop-out rate lower?
- 5) Are the follow-up results better now than they were 10, 20, 30 or 40 years ago?

Method

Literature search

Database searches for randomized clinical trials of behavior therapy, cognitive therapy and CBT combined with each anxiety disorder were carried out in MEDLINE and PsycINFO from 1965 to 2008. Reference lists in the obtained articles were scrutinized, as were meta-analyses published on the various anxiety disorders over the years.

Inclusion criteria

In order for a study to be included in the analysis, the patients had to be randomly allocated to conditions, and they had to fulfill diagnostic criteria (DSM or ICD). In older studies, before the use of DSM-III (APA, (13)) the description of the sample must be detailed enough and plausible that the patients studied would have fulfilled diagnostic criteria had they been in use.

Effect size calculation

Since a large number of RCTs does not include a control condition, but compare two (or more) active treatments, it would be a great loss of power only to include controlled studies. Furthermore, the questions for this study concern how much improvement has taken place, and thus, uncontrolled within-group *effect sizes* (ES) were calculated for all conditions in a study using the following formula:

$$ES = (\text{mean pre-treatment} - \text{mean post-treatment}) / SD \text{ pre-treatment} \quad (14).$$

Separate ESs were calculated for the most central measures: 1) independent assessor (IA) rating, 2) patient self-rating, and 3) behavioral approach/avoidance test (BAT). There are two different ways of analyzing results in a RCT; *completers* (only those patients who complete treatment and participate in post-assessment are included) and *intent-to-treat* (those patients who are randomized to conditions are included with the last observation carried forward). Since intent-to-treat analysis only has been used the last 10–15 years, the database would be too restricted to use that model. In articles where both completer and intent-to-treat analysis are presented, the former is used.

Other measures

In addition, the following measures were used: 1) treatment time, 2) attrition and 3) CSI.

Regarding treatment time, the number of hours was calculated based on number of sessions and session length in the study. If just number of sessions was given, it was assumed that session length was 1 h. Attrition was defined as the proportion of patients who dropped out *after* having started the treatment.

CSI can be assessed in a number of ways. Perhaps the most well-known is that of Jacobson & Truax (15), requiring that the patient must fulfill two criteria: reliable change index and cut-off score (defined as mean \pm two standard deviations in the direction of functionality). Another common method is called high endstate functioning, defined as the patient's score passing a certain criterion on a number of important measures, e.g. 3/4 or 4/5. Some studies use not fulfilling DSM-IV criteria for the disorder as an index of CSI. However, this is problematic, since it only takes a rather small change for a patient to no longer fulfill criteria. Take GAD as an example. The C criterion specifies that three of six symptoms must be present. If a patient after therapy only has two symptoms, but is unchanged on the other criteria, that patient no longer fulfils the DSM-IV criteria for GAD.

In PD, it is common to report panic-free status, defined as no panic attacks during a 2–4-week period.

In specific phobias, some studies report the proportion of patients completing the highest step on the BAT, taking regular flights for flying phobics, or visiting a dentist regularly for odontophobics.

Number of studies

A total of 432 RCTs fulfilled the criteria to be included in the meta-analysis. Most RCTs were on specific phobia with 100 and agoraphobia with 100, followed by PTSD with 57, social phobia with 53, OCD with 52, GAD with 39, and PD with 31. Of the total number of studies, 364 (84%) allowed calculation of either ES or CSI and were used in this meta-analysis. In terms of number of patients, the total number of RCTs comprised 20,936 patients and the RCTs used in this meta-analysis totaled 19,242 (92%), which means that the patients in the included studies are representative of the whole population of patients in RCTs of CBT in anxiety disorders.

Statistical analyses

Uncontrolled (within-group) ESs are calculated for 1) IA ratings, 2) self-report (SR) measures and 3) BAT tests. Within each type of measure and disorder, statistical outliers are defined as more than two standard deviations above the mean, and these are replaced with the value mean + two standard deviations, the so-called Windsorizing method (16).

Comparisons across time (decades) are done with the Kruskal–Wallis test, since the ESs are not normally distributed. Significant effects are then followed up with Mann–Whitney pairwise comparisons.

Results

Development across decades

The number of RCTs per year increases gradually for specific phobia, social phobia, PD and OCD. RCTs in GAD have fluctuated over the decades, gone down for agoraphobia after peaking in the 1980s, and shown a very steep upward trajectory for PTSD. Except for agoraphobia and GAD, all the other anxiety disorders have the highest frequency of RCTs during the 2000s.

Researchers in this field also seem to learn (albeit slowly) that in order to have statistical power in a RCT, the number of patients per condition in the study needs to increase. All anxiety disorders show significant increases across decades, and during the 2000s the mean cell sizes varies from 21.3 (specific phobia) to 39.7 (PTSD). Two of the disorders have reached the recommended criterion of 30 per cell (17), and the other disorders are approaching this figure.

Post-treatment data

CORRELATIONS WITH YEAR OF PUBLICATION

In order to evaluate if later studies had higher ESs, shorter treatment times and lower attrition rates, non-parametric correlations (Spearman's rho) were calculated (Table 1). You would expect positive correlations between year of publication and ESs and CSI. However, of a total possible 25 correlation, only one was significant (IA rating in specific phobia). Conversely, there were five significant negative correlations, indicating lower treatment effects in RCTs published later. As for treatment time and attrition, negative correlations are expected. Of a possible 14 only one was significant (attrition rate in agoraphobia), but seven were significant positive, indicating longer treatment times and higher drop-out rates in later RCTs.

SPECIFIC PHOBIAS

The ES for IA and SR increased significantly from the 1980s to the 1990s and then remained stable. On the BAT, there was a significant increase from the 1980s to the 1990s and then a decrease in the 2000s. The proportion of CSI increased gradually, but not significantly, from the 1970s to the 2000s. Treatment time increased from the 1970s to the 1980s, then decreased again to the 1990s, and then remained stable. Attrition rate did not change significantly across the decades.

SOCIAL PHOBIA

IA decreased from the 1980s to the 2000s, whereas SR was fairly stable across time. The ES for BAT increased significantly from the 1970s to the 1980s and then

Table 1. Correlations (rho) between effect measures and year of publication.

Disorder	IA	SR	BAT	CSI	Time	Attr.
Specific	0.71 ^c	−0.14	0.10	0.10	0.02	0.12
Social	0.12	0.18	0.10	0.22	0.39 ^c	0.33 ^b
Agora	0.06	−0.44 ^c	−0.34 ^b	−0.07	−0.15	−0.16 ^a
Panic	−0.54 ^a	−0.03		−0.13	−0.31	0.09
GAD	0.06	0.15		0.14	0.41 ^b	0.43 ^c
OCD	−0.44 ^c	−0.51 ^c	−0.40	0.13	−0.04	0.55 ^c
PTSD	0.26	0.12		0.01	0.34 ^b	0.39 ^c

^a $P < 0.05$, ^b $P < 0.01$, ^c $P < 0.001$.

IA, independent assessor; SR, self-report; BAT, behavioral approach/avoidance test; CSI, clinically significant improvement; Attr., attrition; GAD, generalized anxiety disorder; OCD, obsessive-compulsive disorder; PTSD, post-traumatic stress disorder.

decreased to the 1990s. CSI did not change across time, but both treatment time and attrition increased significantly from the 1980s to the 1990s and then remained stable.

AGORAPHOBIA

ES for IA remained high and stable across time, but the SR decreased significantly from the 1980s to the 1990s and further to the 2000s. The BAT effect size decreased significantly from the 1980s to the 1990s and then remained stable. There were no significant changes across the decades for CSI, treatment time and attrition.

PANIC DISORDER

The IA effect size decreased significantly from the 1990s to the 2000s, whereas the SR effect size remained stable. There were no significant changes on CSI, treatment time or dropout rate.

GAD

ES for IA remained high and stable across the decades, and the SR effect size was also stable, albeit lower. CSI was stable, but treatment time increased significantly from the 1990s to the 2000s, and attrition increased significantly from the 1980s to the 1990s and then remained stable.

OCD

On the IA measure, the ES decreased significantly from the 1970s and 1980s to the 1990s and then further to the 2000s. The SR decreased from the 1980s to the 1990s and then remained stable. There was no significant change on the BAT, even if the nominal differences in means are quite large, but the number of studies using BAT is small. Both CSI and treatment time showed non-significant fluctuations, but the attrition rate increased significantly from the 1980s to the 1990s and then remained stable.

PTSD

The IA effect size increased significantly from the 1990s to the 2000s, whereas the SR did not change significantly. CSI remained stable across decades, whereas treatment time decreased significantly from the 1980s to the 1990s, and then increased again. Attrition increased from the 1980s to the 1990s and then remained stable.

Follow-up data

SPECIFIC PHOBIA

The length of the follow-up period increased from the 1980s to the 1990s and then remained stable. ES for IA increased from the 1980s to the 1990s, whereas that for SR fluctuated quite a lot. A decrease from the 1970s to the 1980s was followed by an increase to the 1990s and another decrease to the 2000s. The BAT effect size

increased from the 1970s to the 1980s and then decreased from the 1990s to the 2000s, but the CSI remained fairly stable across decades.

SOCIAL PHOBIA

The follow-up periods increased in length from the 1980s to the 1990s and then decreased again. The IA effect sized increased from the 1970s to the 2000s, but the intervening decades did not differ from either one. There were no significant changes on SR, BAT or CSI.

AGORAPHOBIA

Follow-up length increased from the 1970s to the 1980s and then remained stable. ES for IA was maintained on a high level throughout, whereas that for SR decreased from the 1990s to the 2000s. The BAT effect size was stable across time, as was the CSI.

PANIC DISORDER

The length of follow-up decreased significantly from the 1980s to the 1990s and then remained low. There were no significant changes in IA, SR or CSI across decades.

GAD

The follow-up period increased from the 1980s to the 1990s and then remained stable. Changes in IA, SR and CSI were too small to reach significance.

OCD

The ES for SR decreased significantly from the 1980s to the 1990s and further to the 2000s. Even if there are fluctuations in the other measures, they do not reach a significant level.

PTSD

Follow-up time, IA, SR and CSI did not show any significant changes across decades.

Net outcome of treatment

If we take the proportion of patients who are clinically significantly improved minus the proportion of patients dropping out of treatment, we arrive at those who complete treatment and obtain a good effect from it. Analysis of this measure did not yield any significant differences between decades for any of the anxiety disorders, even if the difference in percentage points was as large as 33 (for agoraphobia).

“The last resort”

The above analyses in general did not show better treatment effects, shorter treatment time and lower attrition across decades when means for the different time periods were compared. What if we take the single study, during each decade, which showed the highest SR

Table 2. The individual studies having the highest self-report effect size per decade.

Disorder	1970s	1980s	1990s	2000s
Specific	PM 4.45	E 4.30	E 6.75	AR 8.15
Social	CR 1.27	SST 2.88	E 2.12	E 3.14
Agora	E 2.67	E 3.80	CBT 12.3	PCT 1.29
Panic	–	AR 3.42	CT 2.40	CBT 1.23
GAD	EMG 0.56	CBT 2.48	CBT 3.63	CBT 2.25
OCD	ERP 6.90	ERP 5.46	ERP 3.54	ERP 1.74
PTSD	–	E 1.32	E+CT 6.09	CBT 4.53

PM, participant modelling; E, exposure *in vivo*; AR, applied relaxation; CR, cognitive restructuring; SST, social skills training; CBT, cognitive-behavior therapy; PCT, panic control treatment; CT, cognitive therapy; EMG, electro myography-biofeedback; ERP, exposure and response prevention.

ES, would we then see a positive trend? The results are displayed in Table 2.

In specific phobia, there is a positive trend from the 1980s over the 1990s to the 2000s. Social phobia shows a positive trend from the 1970s to the 1980s, it plateaus in the 1990s and then continues upward in the 2000s. Agoraphobia shows a clear positive trend from the 1970s over the 1980s and into the 1990s. Then it dips dramatically in the 2000s. PD displays a steady downward trend from the 1980s to the 2000s, and OCD shows a “perfect” negative trajectory from the 1970s to the 2000s. GAD shows a positive trend from the 1970s over the 1980s and into the 1990s, followed by a minor dip in the 2000s. Finally, PTSD increases dramatically from the 1980s to the 1990s and then decreases somewhat in the 2000s. This analysis then showed progress for five of the seven anxiety disorders, whereas for two the treatments declined in efficacy across time.

Discussion

The main result from this meta-analysis is that we cannot see a positive progression of treatment efficacy across time. Regarding mean ES, there was a positive development for specific phobia and PTSD on IA, an initially positive that turned into a negative development for specific phobia on BAT, and social phobia on IA and BAT. An initial negative that turned into positive development was seen for specific phobia on SR and agoraphobia on BAT. However, there were negative developments for PD and OCD on IA, and agoraphobia and OCD on SR.

Looking at CSI, no disorder showed any significant development. As for treatment time, there was an initial positive going negative development for PTSD, a starting negative turning into positive development for specific phobia, and completely negative developments for social phobia and GAD. Finally, regarding attrition, there was a negative development for social phobia, GAD, OCD and PTSD.

Possible explanations

One possible explanation for these results may be that patients in later studies were more severe than patients in earlier studies, and thus more difficult to treat. This possibility can be evaluated by analyzing the mean pre-treatment scores on measures that have been used during a long period. In RCTs on GAD, the Hamilton Anxiety Rating Scale has been used since the early 1980s. The mean scores were 24.3, 22.0 and 24.8 during the 1980s, 1990s and 2000s, respectively, a non-significant difference. In OCD, the Yale–Brown Obsessive Compulsive Scale has been used since the early 1990s, and the means were 25.2 for the 1990s and 25.3 for the 2000s. Finally, in PTSD, the Clinician-Administered PTSD Scale has been used since the early 1990s with means of 67.4 for the 1990s and 72.4 for the 2000s, a non-significant difference. For the other anxiety disorders, there are no similar measures that have been used for a long time. Thus, this is probably not a viable explanation.

Another possibility is that earlier studies were often done by the originator of a treatment and later studies by researchers who might not have the same training and competence in carrying out the treatment. It is almost impossible to evaluate whether training and competence differ between therapists in the original and the following studies. However, an indication can be obtained by looking at ESs in the original versus following studies. In PD, Öst (18) presented good results for applied relaxation with ESs of 3.31 for IA and 3.42 for SR. Clark et al. (19) obtained 2.00 and 1.40 for IA and SR, respectively, and Arntz & van den Hout (20) obtained 1.27 for SR. Also in PD, Clark et al. (19) achieved very good effects for cognitive therapy with 2.38 for IA and 2.30 for SR. Öst & Westling (21) obtained somewhat worse ESs with 2.29 for IA and 1.11 for SR, and Arntz & van den Hout (20) only obtained 0.53 on SR. However, there are other treatments that do not show this pattern. In social phobia, Heimberg et al.’s (22) cognitive-behavioral group treatment (CBGT) achieved 2.96 on IR and 0.76 on SR. Only two subsequent studies of the CBGT have used IR; one obtained 1.63 and the other 2.86. There are six studies using SR; two obtained slightly worse ESs and four obtained better effects sizes. Finally, in PTSD, Foa et al.’s (23) prolonged exposure achieved an IR effect size of 2.07. Of the five subsequent studies, two obtained worse effects, one obtained equal and two obtained better effects than the original study. Thus, there is no straightforward conclusion that can be drawn regarding this possibility.

A third possibility is that later studies tested *weaker* variations of the original treatments, e.g. by reducing the treatment time. Just comparing the mean number of hours during the earliest and the most recent decade, we find that it is increased for social phobia and GAD, but was unchanged for the other anxiety disorders. Whether

Table 3. How effective are current cognitive-behavior therapies?

Disorder	Treatment	EScon	ESunc	CSI (%)
Specific	1-session exp.	1.39	2.54	84
Social	CT	1.49	1.76	76
Agora	Exposure	1.39	1.77	72
Panic	CT	2.40	2.07	78
GAD	CBT	1.14	1.55	53
OCD	ERP	0.97	1.61	48
PTSD	CBT	1.63	2.19	66

EScon, controlled effect size; ESunc, uncontrolled effect size; CSI, clinically significant improvement; GAD, generalized anxiety disorder; OCD, obsessive-compulsive disorder; PTSD, post-traumatic stress disorder; CT, cognitive therapy; CBT, cognitive-behavior therapy; ERP, exposure and response prevention.

certain components of the original treatments have been changed, or deleted, is very difficult to judge.

“The bottom line”

The picture painted by this meta-analysis might seem gray since there are few positive developments across time. However, the best CB treatments for anxiety disorders are quite good, as can be seen in Table 3. The mean controlled ESs are all high in Cohen’s terms, and varied from 0.97 for OCD to an astonishing 2.40 for PD. The uncontrolled (within-group) ESs are higher: from 1.55 in GAD to 2.54 in specific phobia. Finally, the proportion of clinically significantly improved patients varied from 48% in OCD to 84% in specific phobia. There are no psychological or pharmacological therapies that achieve as good results as CBT in anxiety disorders.

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