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Cognitive-Behavioral Therapy in the Treatment of Anger: A Meta-Analysis

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Anger has come to be recognized as a significant social problem worthy of clinical attention and systematic research. In the last two decades, cognitive-behavioral therapy (CBT) has emerged as the most common approach to anger management. The overall efficacy of this treatment has not been ascertained, and therefore, it was decided to conduct a meta-analysis of this literature. Based on 50 studies incorporating 1,640 subjects, it was found that CBT produced a grand mean weighted effect size of .70, indicating that the average CBT recipient was better off than 76% of untreated subjects in terms of anger reduction. This effect was statistically significant, robust, and relatively homogeneous across studies. These findings represent a quantitative integration of 20 years of research into a coherent picture of the efficacy of CBT for anger management. The results also serve as an impetus for continued research on the treatment of anger.

KEY WORDS: anger; cognitive-behavioral therapy; meta-analysis.

INTRODUCTION

With violent crime rising among adolescents, widespread familial abuse, continuing racial discord, and recent acts of terrorism, attention has turned to anger as a major problem in human relations (Koop & Lundberg, 1992; Novello, Shosky, & Froehlke, 1992). Yet anger disorders have been neglected in diagnostic classifications and treatment programs (Eckhardt & Deffenbacher, 1995; Kassinove & Sukhodolsky, 1995). Increasing references to anger appear in PSYCINFO and other databases, and practitioners are increasingly cognizant of the ramifications of anger in their clients (Abikoff & Klein, 1992; Fernandez & Turk, 1993, 1995; Koop & Lundberg, 1992), but little is known about how best to treat anger disorders.

In a survey of the literature on anger, it was found that the vast majority of anger treatment outcome studies had utilized a cognitive-behavioral approach. The present study therefore evaluated the efficacy of cognitive-behavioral therapy (CBT)

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in the treatment of anger. Instead of a narrative review, a meta-analysis was conducted to quantitatively integrate the results of individual studies employing CBT for anger control.

Cognitive-Behavioral Therapy Applied to Anger

Cognitive-behavioral therapy draws upon the rich traditions of behavior modification and rational-emotive or cognitive therapy (Meichenbaum, 1976), paying attention to social cognition (Dodge, 1993) as well as individual constructions of reality (Mahoney, 1993). It may combine a variety of techniques such as relaxation, cognitive restructuring, problem-solving, and stress inoculation, but rather than being a mere form of technical eclectism, it is theoretically unified by principles of learning theory and information processing. This approach has elicited much interest in the treatment of affective disorders such as anxiety and depression as revealed in recent meta-analyses by Dobson (1989) and Van Balkom (1994). The status of CBT for anger, however, remains unclear.

Yet the last 20 years has seen an accumulation of research on the efficacy of cognitive-behavioral therapy in the treatment of anger problems. This research has focused predominantly on Novaco's (1975) adaptation of Meichenbaum's stress inoculation training (SIT) initially developed for the treatment of anxiety (Meichenbaum, 1975). Using a coping skills approach, stress inoculation interventions are typically structured into three phases: cognitive preparation, skill acquisition, and application training. During this performance-based intervention, the client is exposed to cognitive reframing, relaxation training, imagery, modeling, and role-playing to enhance ability to cope with problem situations.

In SIT for anger problems, clients initially identify situational "triggers" which precipitate the onset of the anger response. After identifying environmental cues, they rehearse self-statements intended to reframe the situation and facilitate healthy responses (examples of cognitive self-statements include: "Relax, don't take things so personally" or "I can handle this. It isn't important enough to blow up over this"). The second phase of treatment requires the acquisition of relaxation skills. The cognitive self-statements can then be coupled with relaxation as clients attempt, after exposure to the trigger, to mentally and physically soothe themselves. Finally, in the rehearsal phase, clients are exposed to anger-provoking situations during the session utilizing imagery or role-plays. They practice the cognitive and relaxation techniques until the mental and physical responses can be achieved automatically and on cue. This basic outline of SIT can also be supplemented with alternative techniques such as problem-solving, conflict management, and social skills training as in the social cognitive model of Lochman and colleagues (Lochman & Lenhart, 1993).

The purpose of the present study was to evaluate the overall effectiveness of such cognitive-behavioral treatments for anger by using the methodology of meta-analysis. This entailed computing various summary statistics of the strength of treatment effect, as well as inferential tests of the specific research hypothesis that CBT statistically significantly reduces anger. Finally, these results were converted into

measures of practical significance. This is particularly informative in the current climate of managed health care where there is a premium on time-limited interventions like CBT and growing demands for empirical evidence to support the choice of treatments. This quantitative synthesis of the literature will also familiarize readers with the main parameters of research on this topic and generate considerations for further research in this area.

Meta-Analysis

Meta-analysis is a quantitative procedure for evaluating treatment effectiveness by the calculation of effect sizes (Fernandez & Boyle, 1996; Glass, McGaw, & Smith, 1981; Rosenthal, 1991). The effect size expresses the magnitude of difference between treated and untreated subjects. Because effect size is expressed in standard deviation units, it enables comparisons among studies and the computation of summary statistics such as the grand average effect size, an index of overall effectiveness for the treatment. Despite its advantages over narrative and quasistatistical methods of review (Fernandez & Turk, 1989), meta-analysis has raised certain concerns which call for specific solutions (Fernandez & Boyle, 1996). For example, it has been argued that effect sizes obtained from studies of varying quality may not be directly comparable; consequently, it is now customary to weight effects sizes, typically according to objective criteria such as sample size (which determines statistical power). Concern has also been raised about possible inflation in effect sizes due to sampling only published studies which are more likely to report significant results than are non-published studies (the file-drawer problem); this can be counteracted to some extent by including unpublished studies and also by conducting tests of robustness that provide a margin of tolerance for null results (Rosenthal, 1995).

To date, the only documented attempt to meta-analyze studies of anger management was done by Tafrate (1995). However, this review has certain methodological limitations. First, stringent inclusion criteria restricted the number of CBT studies reviewed to only nine. This small number of studies is unrepresentative of the last 20 years of research on CBT. Tafrate confined his survey to adult samples of mostly college students. No doubt, students have anger problems too, but the neglect of numerous studies of CBT for oppositional children and adolescents (populations of primary concern) is problematic. Only three of the studies reviewed by Tafrate were based on clinical samples, thus placing limits on the ecological significance of results. Unpublished results were ignored, and due to the small number of studies actually reviewed, the conclusions reached were probably susceptible to sampling bias. Finally, Tafrate neglected tests of homogeneity, tests of significance or tests of robustness, or weighing of effect sizes based on any of the design features of the studies; as emphasized earlier, these statistics have now become standard practice in meta-analytic reviews, and they can significantly affect the conclusions reached.

To improve upon Tafrate's (1995) initial review, the present study expanded inclusion criteria, incorporated unpublished studies, and weighted all effect sizes. As detailed below, the scope of the review was broadened to incorporate diverse

samples receiving a combination of cognitive and behavioral techniques. In this way, more than five times the number of CBT studies reviewed by Tafrate were meta-analyzed here.

METHOD

Inclusion Criteria

A computer search of PSYCINFO and *Dissertation Abstracts International* from 1970 to 1995 was conducted. Using keywords such as *anger control*, *anger treatment*, and *anger management* and cross-references among articles, a total of 58 relevant studies of CBT were identified. Eight of these were single-case or small-sample studies ($n < 4$) and hence were excluded. The final sample consisted of 50 nomothetic studies incorporating a total of 1640 subjects. All studies provided data on at least one anger-related dependent variable.

In terms of the independent variable, only cognitive-behavioral treatments for anger were selected. Studies using *purely* cognitive or behavioral interventions alone were not included, nor were treatments aimed solely at relaxation. Typically, the study included was one in which some form of cognitive reappraisal or restructuring was *combined* with some technique of promoting relaxation. The samples were predominantly clinical such as prison inmates, abusive parents, abusive spouses, juvenile delinquents, adolescents in residential treatment, children with aggressive classroom behavior, and mentally handicapped clients, but also included college students with reported anger problems.

Thirty-five studies used self-reported anger as a dependent variable. Effect sizes for 28 of the 35 studies were calculated exclusively from self reports of anger. The remaining seven studies combined dependent measures of anger and aggression into effect size estimates. Fifteen studies of school children and adolescents in placement (either residential or detention facility) referred to anger but only reported behavioral ratings of aggression. Since aggressive behavior has been the focus in CBT interventions for children and adolescents, aggression ratings served as the dependent variable for these studies. For younger populations, measures of self-reported anger are not always feasible and behavioral ratings of aggression become a valid alternative, just as self-reports of depression and anxiety in children may be less accessible than the behaviors corresponding to these mood disturbances.

Calculation of Effect Sizes

Glass's *d* (effect size) was calculated for each study where means and standard deviations were available for treatment and control groups (Glass et al., 1981). For studies utilizing single group, pre- versus posttest designs, and any other studies not reporting means and standard deviations, effect size was estimated from *t*- and *F*-values. Where multiple dependent variables were reported, effect sizes were av-

eraged across variables to yield one effect size per study, thus minimizing nonindependence in the data.

Adopting procedures recommended by Rosenthal (1991), each effect size was weighted by sample size, and averaged to yield a grand weighted mean *d* based on 50 studies. Weighting effect sizes by sample size is an unbiased and objective procedure for assigning different weights to studies that vary in statistical power. The grand weighted mean *d* was tested for significance (*d* compared to zero) using a one-sample *t*-test, and 95% confidence intervals were calculated. A chi square was also calculated to test for heterogeneity of variance within the set of effect sizes. The heterogeneity test is the basis for a decision on whether or not to search for moderator variables; in case of significant heterogeneity, it would be necessary to disaggregate the effect sizes according to the variables influencing effect size. Finally, to address the file-drawer problem a fail-safe *N*, as recommended by Rosenthal (1991), was calculated to test for robustness. A robust finding indicates that the probability of a Type I error arising from unpublished, nonsignificant results, is negligible. As strongly recommended by Rosenthal (1995), a Binomial effect size display (BESD) was also constructed to provide a more concrete impression of the relative outcomes in treatment and control groups.

RESULTS

A total of 50 effect sizes was obtained for the 50 studies (Table I). Of these, 40 utilized control groups while 10 used single-group, repeated-measures designs. The sample size and design features for each study are also tabulated.

As summarized in Table II, the effect sizes ranged from −0.32 to 1.57, $SD = 0.43$. With only one exception, all effect sizes were positive in value. The grand mean unweighted *d* was 0.81. The grand mean weighted effect size was 0.70. This differed significantly from zero, $t(49) = 13.28$, $p < .0001$. The 95% confidence intervals for the mean unweighted effect size ranged from 0.69 to 0.93. A stem and leaf plot is shown in Table III to display batches of effect sizes. As can be seen, the effect sizes approximated a normal distribution. Most of the effect sizes were between 0.5 and 0.99, and six effect sizes reached about 1.2, thus making this the mode. A notable outlier was the one negative value in the data set.

Since any effect size is a standard deviation unit (*z*-score), it can be converted into a percentile by ascertaining the area under the normal curve that is bounded between that *z*-score and the tail end of the curve. Thus, the grand weighted mean effect size of 0.70 corresponds to an area under the curve of 0.5 + 0.258, which in turn means that the average subject in the CBT treatment condition fared better than 76% of those not receiving CBT.

To further illustrate the practical importance of these results, a binomial effect size display was added (Table VI). This first entailed conversion of the grand weighted mean *d* to *r*, which turned out to be 0.33; as noted in the table, half the value of *r* was then added or subtracted from 0.5, revealing that subjects receiving CBT experienced a 67% treatment success rate whereas control subjects had only a 33% success rate.

Table I. Effect Sizes and Sample Sizes for Individual Studies of CBT on Anger[a]

Study	Sample	DV	Design	*N*	*d*
Acton & During (1992)	Abusive parents	SR	PP	29	0.85
Barth, Blythe, Schinke, & Schilling (1983)	Abusive parents	SR	TC	20	1.09
Benson, Rice, & Miranti (1986)	MR individuals	SR, BR	PP	54	0.40
Boswell (1984)	School children	SR	TC	30	-0.32
Cain (1987)	Adult volunteers	SR	TC	62	0.83
Dangle, Deschner, & Rasp (1989)	Clinical adolescents	BR	PP	12	0.92
Deffenbacher, Story, Stark, Hogg, & Brandon (1987)	College students	SR	TC	32	1.04
Deffenbacher, Story, Brandon, Hogg, & Hazaleus (1988)	College students	SR	TC	30	1.27
Deffenbacher, McNamara, Stark, & Sabadell (1990a)	College students	SR	TC	32	0.59
Deffenbacher, McNamara, Stark, & Sabadell (1990b)	College students	SR	TC	29	0.45
Deffenbacher & Stark (1992)	College students	SR	TC	36	1.43
Deffenbacher, Thwaites, Wallace, & Oetting (1994)	College students	SR	TC	94	0.82
Deffenbacher, Lynch, Oetting, & Kemper (1996)	School children	SR	TC	80	1.32
Deschner & McNeil (1986)	Abusive spouses	SR, BR	PP	47	0.32
Faulkner, Stoltenberg, Cogen, Nolder, & Shooter (1992)	Abusive spouses	SR, BR	PP	32	1.57
Feindler, Ecton, Kingsley, & Dubey (1986)	Clinical adolescents	BR	TC	21	1.16
Feindler, Marriott, & Iwata (1984)	Adolescent (school)	BR	TC	36	0.68
Gaertner (1984)	Inmates	SR	TC	19	1.33
Glick & Goldstein (1987)	Juvenile delinquents	BR	TC	111	0.72
Hinshaw, Henker, & Whalen (1984)	School children	BR	TC	22	1.29
Jackson (1992)	Clinical adolescents	SR	TC	40	0.32
Kennedy (1992)	Inmates	SR, BR	PP	37	1.29
Larson (1991)	School children	SR	TC	37	0.21
Lochman (1985)	School children	BR	TC	80	0.38
Lochman, Burch, Curry, & Lampron (1984)	School children	BR	TC	76	0.28
Lochman & Curry (1986)	School children	BR	PP	20	0.36
Lochman, Lampron, Gemmer, Harris, & Wyckoff (1989)	School children	BR	TC	32	0.24
Lochman, Nelson, & Sims (1981)	School children	BR	PP	12	0.65
Macpherson (1986)	Inmates	SR	TC	21	1.28
Mandel (1991)	Adolescent volunteers	SR, BR	TC	26	0.53
McDougall, Boddis, Dawson, & Hayes (1990)	Juvenile delinquents	BR	TC	18	0.64
Moon & Eisler (1983)	College students	SR, BR	TC	20	1.52
Moore & Shannon (1993)	Clinical adolescents	SR	TC	42	0.22
Napolitano (1992)	Inmates	SR	TC	75	0.68
Novaco (1975)	College and adult	SR, BR	PP	17	1.03
Olson (1987)	Clinical adult	SR	TC	83	0.76
Omizo, Hershberger, & Omizo (1988)	School children	BR	TC	24	0.84
Pascucci (1991)	Clinical adolescents	BR	TC	28	0.56
Rhoades (1988)	Forensic in-patients	SR	TC	21	0.91
Rokach (1987)	Inmates	SR	TC	95	0.69
Rosengren (1987)	Adolescent volunteers	SR	TC	13	1.00
Saylor, Benson, & Einhaus (1985)	Clinical adolescents	SR	TC	14	1.13
Schlichter & Horan (1981)	Juvenile delinquents	SR	TC	19	1.20
Shivrattan (1988)	Juvenile delinquents	BR	TC	28	0.22
Smith & Beckner (1993)	Inmates	SR	PP	18	0.55
Steele (1991)	Juvenile delinquents	BR	TC	19	0.57

Table I. (*continued*)

Study	Sample	DV	Design	*N*	*d*
Stermac (1986)	Forensic patients	SR	TC	40	1.31
Whiteman, Fanshel, & Grundy (1987)	Abusive parents	SR	TC	24	1.52
Wilcox & Dowrick (1992)	Clinical adolescents	SR	PP	10	1.20
Wu (1990)	Divorced women	SR	TC	26	0.49

[a]CBT = Cognitive-behavioral therapy; DV = dependent variable; *N* = sample size; *d* = effect size; SR = self-reported anger, BR = behavioral ratings of anger/aggression, TC = treatment versus control design, PP = pre/postdesign.

Table II. Meta-Analytic Summary Statistics for Studies of CBT on Anger[a]

Total N = 1,640 subjects
Grand weighted mean d: 0.70
95% confidence intervals for unweighted d: 0.69 to 0.93
d compared with zero: t (49) = 13.28, $p < .0001$
Heterogeneity of ds: χ^2 (49) = 61.71, $p > .10$
Fail-safe N: 790; criterion = 225

[a]CBT = cognitive-behavioral therapy.

Table III. Stem and Leaf Display of Effect Sizes from Studies of CBT on Anger[a]

Frequency	Stem	Leaf
1.00	–0.	3
12.00	0.	222223333444
18.00	0.	555556666677888899
16.00	1.	0000112222223334
3.00	1.	555

Range = –0.32 to 1.57
Mean (unweighted) d = 0.81
Standard deviation = 0.43
Median = 1.75
Mode = 1.2

[a]CBT = cognitive behavioral therapy; Each stem which represents the first digit of an effect size is attached to several leaves, each denoting the first decimal place of an effect size.

The fail-safe N of 790 was well above the minimal criterion of 225, indicating a robust finding. The test of heterogeneity revealed a χ^2 (49) = 61.71, $p > .10$. This indicates homogeneity of effect size values, and therefore, no need to search for moderator variables.

Table IV. Binomial Effect Size Display of Treatment (CBT) Versus No Treatment of Anger[a]

Condition	Success	Failure	Σ
Treatment	67	33	100
Control	33	67	100
Σ	100	100	200

[a]CBT = cognitive-behavioral therapy. The numbers are in percentages. To obtain them, *d* must first be converted to *r* (cf. Rosenthal, 1991), which is halved and then added to or subtracted from 0.5 (depending on the condition), before multiplication by 100.

DISCUSSION

Effectiveness of Cognitive-Behavior Therapy in the Treatment of Anger

Researchers have increasingly focused their attention on CBT as a treatment for anger disorders. Over the past 20 years, many individual studies have suggested that CBT is an effective, time-limited treatment of anger problems. Our meta-analysis of 50 nomothetic studies of 1,640 subjects revealed a weighted mean effect size of 0.70, suggestive of moderate treatment gains. Since this is in standard deviation units, it can be inferred that the average subject in the CBT condition was better off than 76% of control subjects. Moreover, this effect was significantly different from what would be expected under chance. The grand effect size was also robust enough to be unaffected by unpublished null results, and it was relatively homogeneous across studies. Since the populations investigated consisted largely of abusive parents or spouses, violent and resistant juvenile offenders, inmates in detention facilities, and aggressive school children, it is apparent that CBT has general utility in the clinical management of anger.

These findings imply that the apparent popularity of CBT in the treatment of anger is justified by its effectiveness in achieving the desired treatment goals. The results are congruent with other meta-analyses documenting the effectiveness of CBT in the treatment of other affective disturbances, in particular, depression (Dobson, 1989) and anxiety (Van Balkom et al., 1994).

At the same time, it may be noted that the grand weighted effect size of 0.70 in this review is smaller than Tafrate's (1995) reported effect size of 1.00 for CBT studies (which were labeled as "multicomponent"); this is probably because the latter consisted of only nine published studies, none of which were weighted according to statistical power. On the other hand, by sampling unpublished results, reviewing studies with clinical populations, and weighing effect sizes by sample size, the present study may have produced a slight deflation of effect size, but one that is probably more reliable.

Future Considerations

This study was an attempt to summarize and document the progress made over the last two decades of research on CBT for anger treatment research. The clinical implications of the meta-analysis are encouraging. Clinicians treating clients with anger control problems can now substantiate their choice of CBT in the treatment of anger, and expect at least moderate improvements in their clients. Moreover, the present findings may serve as a benchmark against which to evaluate other psychological and pharmacological treatments for anger. Outcome efficacy aside, future research might also address the cost-effectiveness of these treatments, an issue of growing interest in the current era of managed care.

New variations of CBT might also be explored. Deffenbacher and colleagues have already taken a step in this direction with the development of a package called "cognitive relaxation." On the other hand, Lochman and colleagues have emphasized training people in encoding of social stimuli and problem-solving within a social context. With additional studies in these areas, it is forseeable that the most active ingredients of CBT may be identified and integrated to produce an even more effective regimen for managing anger.

Another viable frontier of research might be client variables related to treatment outcome. These may center around self-efficacy, locus of control, impulsivity versus reflectivity, and a host of traits predisposing individuals to respond to treatment in select ways. Clarification of these variables may enable the careful matching of clients to specific treatment regimens.

Finally, ecological validity remains a goal for most treatment outcome research. In anger management, well-controlled laboratory studies have revealed encouraging treatment effects. But the generalizability of these findings to various clinical and multicultural populations often needs to be established. Ultimately, the ability to predict and control anger as it occurs spontaneously in different groups of people within their own naturalistic settings is a challenge worth addressing.

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