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# Anger Treatment for Adults: A Meta-Analytic Review

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**We included 50 between-group studies with control groups and 7 studies with only within-group data in a meta-analysis of adult anger treatments. Overall, we examined 92 treatment interventions that incorporated 1,841 subjects. Results showed that subjects who received treatment showed significant and moderate improvement compared to untreated subjects and a large amount of improvement when compared to pretest scores. In the group of controlled studies significant heterogeneity of variance and significant differences among effect sizes for different dependent variable categories were found. Anger interventions produced reductions in the affect of anger, reductions in aggressive behaviors, and increases in positive behaviors. An analysis of follow-up data suggested that treatment gains were maintained.**

**Key words:** anger, treatment, meta-analysis, outcome research, psychotherapy. [*Clin Psychol Sci Prac* 10:70-84, 2003]

Practitioners across a variety of mental health settings routinely confront clients with anger control problems. Determining the frequency and scope of such cases is difficult because psychologists currently conduct anger research in a diagnostic vacuum. Epidemiological investigations of anger-prone individuals have yet to appear. Some evidence suggests that clients with anger problems may be common in clinical settings. In a recent national survey experienced psychologists and psychiatrists ( $n = 500$ ) reported working with angry clients as frequently as with anxious clients (Lachmund & DiGiuseppe, 1997).

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Prevalence estimates for generalized anxiety disorder range from 3%–5% in the general population and 12% in clinical settings (American Psychiatric Association, 1994). This survey suggests that clients presenting with anger-related difficulties are numerous and that more rigorous epidemiological research on anger as a clinical problem is needed.

Anger has also been associated with many serious negative consequences, such as aggressive behavior (Cornell, Peterson, & Richards, 1999; Deffenbacher, Oetting, Lynch, & Morris, 1996), family violence (Jacobson et al., 1994; Whiteman, Fanshel, & Grundy, 1987), substance abuse (DeMoja & Spielberger, 1997; Wallfish, Massey, & Krone, 1990), and physical health problems (Helmert, Posluszny, & Krantz, 1994). Because anger is both common and debilitating, it is important that psychology develop, study, and disseminate effective interventions to practitioners.

The scientific study of anger treatment (and anger) has lagged far behind that of other disorders such as anxiety and depression (Kassinove & Sukhodolsky, 1995). However, anger management programs have become increasingly popular. Anger management interventions such as psychotherapy groups and classes are routinely found in school settings, community mental health centers, and correctional facilities and have been incorporated into alternative sentencing programs. Because of the recent proliferation of anger treatment groups, a growing concern has emerged that many "real world programs" fail to use empirically supported interventions and may have little or no therapeutic or lasting impact on clients (Koerner, 1999). Questions remain about whether or not anger treatment works and what interventions are most likely to be effective.

The neglect of many important methodological issues has also contributed to an incomplete understanding of

treatment effectiveness for angry clients. One of the most critical issues in conducting anger treatment outcome research is the selection of outcome measures that tap into the clinical dimensions of dysfunctional anger experiences. Practitioners working in different settings may encounter different types of angry clients. Perhaps this variability has led to a lack of agreement about which anger characteristics are most relevant. Given the potential wide range of anger dimensions clients experience and the lack of diagnostic categories, little consensus exists concerning standardized assessment for both subject selection and evaluation of progress. The type of dependent measure is likely to account for a significant amount of variance in observed outcomes. An analysis of treatment outcome by dependent variable may provide specific information regarding which treatments are more effective for different aspects of anger.

Despite the relative lack of attention given to anger, several recent meta-analytic reviews have provided useful summaries of the anger treatment literature. Tafrate (1995) identified 17 published studies and found empirical support for cognitive, relaxation-based, skills training, and multicomponent interventions. He restricted his analysis to subjective reports of anger intensity and frequency, and physiological measures. Many methodological issues hampered this literature, such as a reliance on undergraduate subjects, short treatment lengths, and a dearth of studies using individual sessions. Also, many studies were unavailable to conduct analyses of the effects of these moderator variables. For a quantitative review of the child and adolescent anger treatment literature, see Sukholdolsky and Kassinove (1997).

A second review examined essentially the same sample of studies but included a wider range of outcome measures (Bowman-Edmondson & Cohen-Conger, 1996). The authors noted that varied treatment approaches had differential effects on specific aspects of anger. However, the small number of studies did not allow for statistical examination of the differences between effect sizes. Overall, this review reached similar conclusions and found support for the same four classes of treatments identified in the earlier review.

In an attempt to expand the database on anger treatment outcome studies, Beck and Fernandez (1998) included studies of school children and adolescents, unpublished doctoral dissertations, and studies that used single-group pre- to posttest designs. Although their sample included 50 studies, the authors restricted their

review to interventions that had combined cognitive and behavioral components. Thus, this review excluded single-modality treatments, which included only behavioral or only cognitive interventions or other modalities. Although we commend the authors for increasing the size of the sample of studies, many methodological concerns exist with this review. Combining effect sizes from studies focused both on children and on adults fails to recognize the role of development in psychotherapy interventions and ignores the potential for different interventions to have differential effects for children and adults. A greater concern is pooling the results from studies using between- and within-group designs. Within-group comparisons of effect sizes have less variance in their measures than do between-group comparison effect sizes. In the within-groups data the same subjects are tested both at pre- and posttreatment, whereas in the between-groups measurement both person and treatment differences contribute to the amount of variance. Finally, Bowman-Edmondson and Cohen-Conger (1996) observed that the type of dependent measure accounted for part of the variance in outcome. Because Beck and Fernandez (1998) did not evaluate the influence of the dependent variables, it is not surprising that they found nonsignificant heterogeneity among their sample of effect size values and failed to examine further the effects of moderator variables. It appears unlikely that no differences exist in effect size for different types of dependent measures. Nonetheless, the authors concluded that cognitive-behavioral interventions have utility in anger management and, overall, produced moderate gains.

By improving upon previous reviews, this article provides a clinically relevant and comprehensive meta-analytic review of the anger treatment literature and adds to researchers' knowledge. First, we focus only on adults and do not complicate the review by focusing on age differences. Second, our search has uncovered more published and unpublished doctoral dissertations, and uncontrolled pre- to posttest investigations. Third, this larger database allows for an empirical analysis of the effects of methodological issues, study attributes, and subject characteristics. The *Q* statistic was used to expose the influence of moderator variables. Fourth, effect sizes were aggregated or clustered according to the type of outcome measure used for each intervention. This aggregation allowed for an empirical examination of the effects of different treatments on various anger dimensions. Fifth, we performed separate analyses for studies with between- and within-group designs.

Finally, we examined the persistence of treatment effects through the analysis of existing follow-up data. A caveat is in order. Few treatment studies of anger exist, and any conclusions based on this review must be considered tentative.

Because no agreed-upon diagnostic criteria exist for anger disorders, and because no consensus has yet emerged on what constitutes disturbed anger, we did not define an anger disorder a priori. Such a strategy would have excluded most existing studies.<sup>1</sup> We contend that different subtypes of anger disorders exist and specific interventions may have differential effectiveness for some but not other subtypes (DiGiuseppe, Tafrate, Ahmed, & Unger, 2002). Diagnostic categories can provide utility if they enhance treatment utility. It is our hope that future anger research will focus on specific subtypes of anger problems and show that interventions designed to treat subtypes will yield more effective interventions than the present "one size fits all" approach to anger treatment. The effect sizes reported here may be considered a baseline against which to compare future developments in anger treatment.

## METHOD

### Identification of Studies

We identified relevant studies through several strategies. We conducted computer searches of PsycINFO, Medline, and Dissertation Abstracts International for the years 1970 through 1998, using the following key terms alone and in combination: *anger, anger reduction, anger treatment, anger management, hostility, aggression, violence, type "A," health, high blood pressure, and treatment outcome*. These terms were then cross referenced with the following key terms for various treatment modalities: *relaxation, progressive muscle relaxation, systematic desensitization, anger management training, meditation, biofeedback, self-instructional training, cognitive therapy, rational emotive therapy, rational emotive behavior therapy, cognitive restructuring, behavior therapy, social skills training, problem solving, assertiveness training, exposure, flooding, education, catharsis, psychoanalytic, psychoanalysis, family therapy, and stress inoculation*. We also entered the authors of identified anger treatment studies into the computer search to uncover any relevant studies that were not previously discovered. In addition, several well-known anger researchers were contacted and asked to identify additional unpublished manuscripts or doctoral dissertations.

### Selection of Studies

Because one goal of the present review was to find as many studies as possible to add to the small existing database on anger treatment, inclusion criteria were set liberally. The inclusion criteria were as follows: (a) include any published in or after 1970, (b) include at least one anger outcome measure, (c) provide at least two treatment sessions, (d) focus exclusively on adult subjects, and (e) provide enough information to calculate effect sizes for group data. Most studies identified participants psychometrically, by selecting people who had a high score on a measure of anger. Some studies of anger control with prisoners used a recent history of aggression as an inclusion criteria (Forbes, 1990; Gaertner, 1983; Stermac, 1987) or a clinical interview (Clouston, 1991). Studies of parents referred for child abuse used no other selection criteria except the nature of the referral (Kolko, 1996; Nomenelli & Katz, 1983).

Using these search techniques, we located 69 studies. We excluded 12 studies from the analysis because data were presented as case studies and not group data ( $n = 1$ ), the type of therapy was not specified ( $n = 1$ ), and insufficient statistical information was available to calculate effect sizes ( $n = 10$ ). (A list of excluded studies is available from the first author). Thus, 57 studies were included in the present meta-analysis. Fifty of these studies compared at least one treatment to a control condition (between-group investigations) and 7 studies evaluated at least one treatment with pre- to posttreatment measures only (within-group investigations). In addition, 18 of the between-group studies included follow-up data. None of the within-group studies provided follow-up data.

### Calculation of Effect Sizes

Effect size ( $d$ ) calculations were done with the D-STAT program (Johnson, 1989). For between-group investigations,  $d$  was calculated by dividing the difference between the means of the experimental group and the control group at posttest (and follow-up, if provided), by the pooled standard deviation of the two conditions (Hedges & Olkin, 1985). If the study failed to provide means and standard deviations, effect sizes were estimated from  $t$  and  $F$  statistics, or  $r$  or  $p$  values. For within-group (pre- to posttreatment only) studies,  $d$  was computed by dividing the difference between the pretreatment and posttreatment means by the pooled standard deviation of both scores.

Effect sizes that favored treatment conditions or symptom improvement were given a positive value, and effect sizes that favored control or placebo conditions or indicated a worsening of symptoms were given negative values. D-STAT also provided an adjustment for sample size.

#### Aggregating Effect Sizes

Because we believed that anger interventions would not influence all dependent measures equally, we categorized the types of dependent variables. Bowman-Edmondson and Cohen-Conger's (1996) review presented effect sizes by methods of assessment (e.g., self-report vs. other report). Dependent variables differed by the content of the construct measured (e.g., anger, aggression, and positive behaviors) and the type of informant reporting the data (e.g., self-report, other report, structured interviews, and physiological measures). Sixteen different types of dependent variables were used in the studies. An inspection of the results and Mann-Whitney *U* tests indicated that there were no differences between type of informants for the same construct. However, similar visual inspection and the same significance tests suggested larger and significant differences between constructs when they were collapsed across type of informant. Therefore, we collapsed the variables across types of informants and analyzed the data by the type of construct the dependent measures assessed. All of the constructs combined across informants resulted in the following nine classes of dependent measures: anger (self-report or other report), aggression (self or other report), positive behaviors (self-report or other report), other emotions (self-report), physiological arousal (self-report or physiological measurement), attitudes and cognitions (self-report), type A behavior (self-report or structured interview), self-esteem (self-report), and relationship measures (self-report).

Many studies in the present review evaluated more than one type of intervention. From the 50 between-group studies, 81 interventions were evaluated and from the 7 within-group studies, 11 interventions were examined. The 18 studies that included follow-up data examined 32 total interventions. Effect sizes were aggregated across the following types of treatments: self-instructional training, cognitive restructuring, problem solving, relaxation, systematic desensitization, exposure, behavioral skills training, combined interventions (multicomponent), anger management training (relaxation plus exposure), experiential

group process based on Yalom's (1995) group treatment, humor, education, meditation, and biofeedback.

Thus, we averaged effect sizes within similar classes of dependent measures and within each intervention examined in a study. This resulted in 230 aggregated effect sizes for between-group interventions at posttest, 29 for the within-group interventions pre- to posttest, and 103 for between-group interventions at follow-up. This strategy helped to control spurious inflation of effect sizes from studies that used multiple outcome measures, and it allowed for an examination of effects of different treatments on various anger dimensions.

#### Reliability Check

Each study was coded and the effect sizes were calculated by two separate research assistants who were graduate students in psychology. Any discrepancies were identified and subsequently discussed by the research assistants and authors until unanimous agreement was reached regarding classification.

## RESULTS

### Between Versus Within Comparisons

We searched for studies that provided sufficient data to calculate both between- and within-group effect sizes. We found 50 studies with both sets of information and investigated the relationship between these two types of effect sizes. The correlation between the within- and between-group effect sizes was .703 ( $p < .000$ ). The nonparametric Mann-Whitney *U* test and *t*-tests indicated that the within-group *d* was significantly larger than the between-group *d*. A scatterplot of these two types of effect size statistics suggested that their distribution was not linear. We used a multiple regression using the within-group *d* to predict the between-group *d*. A cubic function was significant with  $R = .703$ ,  $R^2 = .494$ ,  $df = 60$ ,  $F = 18.564$ , and  $p < .0000$ . The within-group effect sizes were larger and not linearly related to the between-group effect sizes. A graph of these two variables indicated that, as the within-group effect size became larger, an increase occurred in the rate at which the between-group effect size became larger. At the end of the distributions of the within-group *d*s, the largest within-group effect sizes were related to lowered between-group effect sizes. In accordance with these results, we decided that any further analysis would focus on between-group effect sizes. Within-group effect sizes were

**Table 1.** Summary of between-group effect sizes at posttest for dependent variable categories

Dependent variable	No. of Aggregated ESs	Average ES ( <i>d</i> )	SE of ES	<i>p</i> value of ES	Q	<i>p</i> value of Q
Overall	230	0.71	.04	.00	3647.44	.00
Anger	70	0.71	.07	.00	320.23	.00
Aggression	28	1.16	.17	.00	95.83	.00
Positive behaviors	36	0.83	.08	.00	66.71	.00
Other emotions	39	0.48	.07	.00	58.26	.02
Physiological arousal	35	0.52	.08	.00	58.19	.01
Attitudes/cognitions	7	0.81	.17	.00	1.98	.92
Type A behavior	9	1.00	.17	.00	4.03	.85
Self-esteem	3	0	.18	.51	0.14	.93
Relationships	3	0.14	.29	.25	0.36	.84

Notes. Q = test of homogeneity; ES = effect size.

used only for those studies for which between-group effect sizes could not be calculated.

#### Between-Group Studies at Posttest

The overall effect size averaged across all types of dependent variables was 0.71 ( $n = 230$ ). This indicates that 76% of those who received treatment were improved, compared to those in the control condition. This was significantly different from the null hypothesis of no effect (Rosenthal, 1991), and indicates that anger treatments are generally effective. An analysis of the homogeneity of variance of effect size values was significant  $Q(229) = 3647.44, p < .00$ . This suggests that moderator variables influence the magnitude of the effect sizes.

**Dependent Variable Type.** The first moderator variable we chose to analyze was type of dependent measure. The first columns of Table 1 present the number of aggregated effect sizes, average effect size values, standard error, and the *p* value (*d* compared to zero). Average effect sizes for types of dependent measures ranged from a high of 1.16 to a low of zero. The dependent variables of anger, aggression, positive behaviors, other emotions, physiological arousal, attitudes and cognitions, and type A behaviors were significant, showing that these effect sizes were greater than expected by chance. The magnitudes of change found on measures of self-esteem and interpersonal relationships were not significant.

A Kruskal-Wallis test revealed  $X^2(8) = 32.08, p < .000$ . This indicated a significant difference among the effect sizes for the different types of dependent variables. Table 2 displays the multiple comparisons among the dependent variables, using the Mann-Whitney *U* tests. Of the 36 comparisons, 17 were statistically significant. Several of

these comparisons involved groups with small numbers of aggregated effect sizes and, therefore, had low statistical power. More significant differences might have been found if our *n* had been larger and, therefore, power might have been higher. Measures of aggression produced the largest average effect size. This was significantly larger than measures of anger, other emotions, physiological arousal, self-esteem, or interpersonal relationships. A very large effect size was also reported for measures of type A behavior. However, type A tended not to differ significantly from measures of anger, aggression, positive self-behavior, or attitudes and cognitions associated with anger. Overall, the dependent variables that more closely represent the core construct of anger, such as anger self-reports, aggression, and positive nonangry behaviors, were significantly different from measures less closely associated with anger such as self-esteem, satisfaction with interpersonal relationships, and other emotions. This result supports the idea that anger interventions are specific to the constructs of anger, aggression, and hostility and do not appear to work because of a generalized improvement in negative affect, mental disturbance, or positive well-being.

We conducted an analysis to determine the homogeneity of variance of effect sizes within each dependent variable. If heterogeneity of variance was uncovered, we proceeded to analyze other moderator variables that might influence the magnitude of effect sizes for that dependent variable. The last two columns of Table 1 display the *Q* statistic and the *p* value of *Q* calculated separately for each of the nine categories of dependent variables. Significant heterogeneity of variance was uncovered within the dependent measures of anger, aggression, positive behaviors, other emotions, and physiological arousal. Because homogeneity of variance was established for the variables of attitudes

Table 2. Mann-Whitney *U* tests for differences in effect sizes among dependent variable categories

	Anger	Aggression	Positive Behaviors	Other Emotions	Physiological Arousal	Attitudes/Cognitions	Type A	Self-esteem
Aggression	684.00 (.020)							
Positive behaviors	1085.00 (.243)	403.50 (.174)						
Other emotions	1018.00 (.028)*	255.00 (.000)*	395.50 (.001)*					
Physiological arousal	1016.50 (.156)	257.50 (.001)*	405.50 (.010)*	637.50 (.626)				
Attitudes/cognitions	221.00 (.671)	74.00 (.322)	124.00 (.948)	92.00 (.173)	83.50 (.188)			
Type A	215.00 (.123)	120.00 (.832)	139.00 (.514)	76.00 (.009)*	80.00 (.024)*	25.00 (.491)		
Self-esteem	21.50 (.020)*	5.50 (.015)*	8.00 (.015)*	16.50 (.040)*	14.00 (.037)*	1.00 (.030)*	.00 (.013)*	
Relationships	45.00 (.095)	10.00 (.032)*	14.00 (.035)*	33.00 (.213)	30.00 (.223)	4.00 (.138)	2.50 (.042)*	4.00 (.827)

Note. Probabilities reported in parentheses.  
\* $p < .05$ .

and cognitions, type A behavior, self-esteem, and interpersonal relationships, no further analyses of moderator variables were conducted for these dependent variable categories. These four variable categories had the lowest number of effect sizes, and the homogeneity of variance may be a result of the small number of effect sizes. As  $n$  increases, heterogeneity of variance may be established for these variables.

*Type of Treatment.* For each dependent variable that demonstrated heterogeneity of variance by a significant  $Q$  test, we calculated separate  $F$  tests and Kruskal-Wallis tests to determine if there were significant differences between the types of treatment approach. No main effects were significant. This suggests little difference between treatments. This may have resulted from insufficient power due to the small number of studies that used each type of treatment. In addition, most of the interventions were cognitive, behavioral, or cognitive-behavioral. There may not have been sufficient variability in treatment approaches to produce noticeable differences.

Table 3 displays the average effect size,  $n$ , and the minimum and maximum effect size for each treatment for each type of dependent measure. This table reveals great disparity between the minimum and maximum effect size values in several cells. For example, the use of cognitive restructuring on the dependent measure of anger reveals a minimum effect size of 0 and a maximum of 1.26. Combined interventions on measures of anger yielded a minimum effect size of -1.08 and a maximum effect size of 1.94. This degree of variability mitigates against finding significant differences between treatments, because of the large degree of error variance created. It also suggests that other variables may account for a substantial portion of the variance.

In addition, many cells on this table have no entries, and others have a small  $n$ . Researchers may use this table to plan future studies and investigate the relationship of treatments to dependent variables where data are lacking. Researchers could develop hypotheses concerning what treatment-by-dependent-variable interactions may be worth further investigation.

*Additional Moderator Variables.* The effects of several additional moderator variables on effect size magnitude were also investigated. These included the use of treatment manuals, whether the study was published or an unpublished dissertation, the presence of random assignment, the type of subjects, the number of sessions, individual versus group format, checks for treatment integrity, and participant gender. We calculated these analyses separately for each dependent variable that demonstrated heterogeneity of variance. The effects of these moderator variables were tested with a random-effects regression model proposed by Hedeker, Gibbons, and Flay (1994). This model does not assume that a datum is independent. Effect sizes for dependent variables are nested within treatments that may have used other dependent variables or may have been one of several treatments included in a study. Nested variables could be influenced by the clustering variables. This random-effects model adjusts the effects of the predictor variable on the dependent variable after estimating the effects of the clustering variables. The nested variable was the variable indicating the study number, thereby controlling for any common variance shared by different variables or interventions that were part of the same study. A moderator variable was considered significant if the slope of its regression equation on the dependent variable of effect size was significant.



Table 3. Average effect sizes (d) for different treatments by type of dependent measure

	SIT	CR	PS	Relax.	SD	Exp.	BS	Comb.
Anger Q = 0.003 NS KW = 12.93 NS	d = 0.69 n = 9 min = 0.25 max = 1.33	d = 0.51 n = 9 min = 0 max = 1.26	d = 0.82 n = 3 min = 0.76 max = 0.92	d = 0.74 n = 9 min = 0.35 max = 1.61	d = 0.62 n = 4 min = -0.35 max = 1.24	d = 0.51 n = 1	d = 0.73 n = 6 min = 0.01 max = 1.02	d = 0.76 n = 18 min = -1.08 max = 1.94
Aggression Q = 0.018 NS KW = 5.41 NS	d = 0.58 n = 4 min = -0.42 max = 1.63	d = 1.87 n = 2 min = 0.28 max = 3.45		d = 1.06 n = 2 min = 0.56 max = 1.56	d = 0.80 n = 1		d = 1.74 n = 4 min = 0.72 max = 3.84	d = 1.12 n = 9 min = 0.29 max = 2.17
Positive Behaviors Q = 0.002 NS KW = 5.04 NS	d = 0.74 n = 4 min = 0.34 max = 1.10	d = 0.86 n = 3 min = 0.34 max = 1.17	d = 0.51 n = 3 min = -0.01 max = 0.83	d = 0.67 n = 2 min = 0.58 max = 0.76	d = 1.16 n = 1	d = 1.07 n = 1	d = 0.79 n = 8 min = -0.07 max = 2.38	d = 0.97 n = 10 min = -0.012 max = 1.75
Other Emotions Q = 0.004 NS KW = 6.48 NS	d = 0.66 n = 2 min = 0.44 max = 0.82	d = 0.29 n = 5 min = -0.22 max = 0.60	d = 0.45 n = 1	d = 0.63 n = 4 min = 0.33 max = 0.41	d = 0.63 n = 3 min = 0.20 max = 1.14		d = 0.54 n = 2 min = 0.35 max = 0.72	d = 0.47 n = 13 min = -0.84 max = 1.22
Physiological Q = 0.017 NS KW = 8.07 NS	d = 0.53 n = 8 min = -0.16 max = 1.04		d = 0.71 n = 2 min = 0.63 max = 0.78	d = 0.23 n = 5 min = -0.96 max = 0.88	d = 0.48 n = 1	d = 0.50 n = 1	d = 0.65 n = 3 min = 0.52 max = 0.86	d = 0.66 n = 8 min = 0.34 max = 1.13
Attitudes/Cognitions Q = 0.73 p = 0.000 KW = 5.58 NS Type A Q = -0.042 NS KW = 5.16 NS	d = 1.44 n = 1	d = 0.89 n = 2 min = 0.56 max = 1.21			d = 0.24 n = 1	d = 1.19 n = 1		d = 0.50 n = 1
Self-esteem Q = 0.064 NS KW = 2.00 NS		d = -0.33 n = 1						d = 0.64 n = 3 min = 0.39 max = 0.78
Relationship Q = 0.121 p = 0.000 KW = 2.00 NS				d = -0.36 n = 1	d = 0.14 n = 1			d = 0.29 n = 1
All outcome (tx) Q = 0.007 NS KW = 15.96 NS	d = 0.66 n = 28 min = -0.042 max = 1.63	d = 0.66 n = 23 min = -0.032 max = 3.45	d = 0.65 n = 9 min = -0.01 max = 0.92	d = 0.59 n = 23 min = -0.96 max = 1.16	d = 0.59 n = 13 min = -0.35 max = 1.24	d = 0.82 n = 4 min = 0.50 max = 1.19	d = 0.95 n = 24 min = -0.07 max = 3.84	d = 0.75 n = 63 min = -1.08 max = 2.17

The moderator variables of publication status, subject type, number of sessions, and participants' gender failed to predict the effect size of any type of dependent variable. Both the use of a treatment manual and integrity checks significantly predicted higher effect sizes on the dependent measure of aggression. The use of a treatment manual and the use of integrity checks did not have a significant effect on any other dependent variable category. The slope of the random effect regression for using a manual was 1.07, and the slope for integrity checks was 2.28 ( $p < .045$ ). The use of a treatment manual and integrity checks were dichotomous dummy-coded variables. Therefore, the change from not using a treatment manual to using one increased the effect size on measures of aggression by 1.07 ( $p < .000$ ). The

mean effect size for those not using a manual was 0.94 ( $n = 24$  interventions), and the mean effect size for using one was 2.4 ( $n = 4$  interventions). The mean effect size for studies not implementing integrity checks was 0.91 ( $n = 25$  interventions) and for those studies that checked treatment fidelity the mean effect size was 3.15 ( $n = 3$  interventions).

The type of treatment format (group vs. individual) significantly predicted higher effect sizes on measures of positive behaviors. Treatment format was again a dichotomous dummy-coded variable. Changing from a group to individual format increased the effect size of the intervention by the slope of the regression 0.526 ( $p < .005$ ). The mean effect size for interventions relying on individual treatment ( $n = 11$  interventions) was 1.16 and the mean effect size for

Table 3. Continued

	AMT	Group	Humor	Edu.	Med.	BFB	All treatments (DVs) Q = -0.043, p = 0.022 KW = 71.26, p = 0.000
Anger Q = 0.003 NS KW = 12.93 NS	d = 1.33 n = 5 min = 0.52 max = 2.70	d = 0.76 n = 1	d = 0.33 n = 1	d = 0.22 n = 2 min = 0.12 max = 0.32	d = 0.23 n = 2 min = -0.02 max = 0.47		d = 0.71 n = 70 min = -1.08 max = 2.70 d = 1.16 n = 28
Aggression Q = 0.018 NS KW = 5.41 NS	d = 1.07 n = 3 min = 0.27 max = 2.05	d = 0.69 n = 1	d = 1.89 n = 1	d = 0.51 n = 1			min = -0.42 max = 3.84 d = 0.83 n = 36
Positive Behaviors Q = 0.002 NS KW = 5.04 NS	d = 0.78 n = 2 min = 0.24 max = 1.31			d = 0.81 n = 1	d = 0.77 n = 1		min = -0.12 max = 2.36
Other Emotions Q = 0.004 NS KW = 6.48 NS	d = 0.49 n = 5 min = 0.29 max = 0.65	d = 0.65 n = 1	d = 0.58 n = 1		d = 0.05 n = 1	d = 0.48	n = 39 min = -0.84 max = 1.22 d = 0.52 n = 35
Physiological Q = 0.017 NS KW = 8.07 NS	d = 0.41 n = 4 min = 0.34 max = 1.13	d = 0.45 n = 1			d = -0.42 n = 1	d = 1.41 n = 1	min = -0.96 max = 1.40 d = 0.81 n = 7
Attitudes/Cognitions Q = 0.073 p = 0.000 KW = 5.58 NS Type A Q = -0.042 NS KW = 5.16 NS					d = 0.50 n = 1		min = 0.24 max = 1.44 d = 1.00 n = 9 min = 0.39 max = 1.83 d = 0 n = 3
Self-esteem Q = 0.064 NS KW = 2.00 NS	d = 0 n = 1						min = -0.32 max = 0.29 d = 0.14 n = 3
Relationship Q = 0.121 p = 0.000 KW = 2.00 NS All outcome (tx)			d = 0.63 n = 1				min = -0.36 max = 0.63 d = 0.71 n = 230
Q = 0.007 NS KW = 15.96 NS	d = 0.82 n = 23 min = -0.03 max = 2.70	d = 0.64 n = 4 min = 0.45 max = 0.76	d = 0.86 n = 4 min = 0.33 max = 1.89	d = 0.36 n = 5 min = 0.06 max = 0.81	d = 0.24 n = 6 min = -0.42 max = 0.77	d = 1.41 n = 1	min = -1.08 max = 3.84

Notes. SIT = self-instructional training; CR = cognitive restructuring; PS = problem solving; Relax. = relaxation; SD = systematic desensitization; Exp. = exposure; BS = behavioral skills; Comb. = combined; AMT = anger management training; Group = group process; Edu. = education; Med. = meditation; BFB = biofeedback.

interventions relying on a group format was 0.68 ( $n = 25$  interventions). Random assignment of treatments had a significant effect, predicting the effect size of dependent variables measuring emotions other than anger (e.g., anxiety or depression). Random assignment was a dichotomous dummy-coded variable. Changing from nonrandom to random assignment increased the effect size of the intervention on these dependent variables, but not on any anger- or aggression-related dependent variables. Non-randomly assigned interventions had a mean effect size of 0.525 ( $n = 23$ ) and the randomly assigned interventions had a mean effect size of 0.738 ( $n = 207, p < .027$ ).

#### Within-Group Studies at Posttest

The overall effect size for the within-group studies was 0.99 (see Table 4). This result again showed a significant effect of treatment (Rosenthal, 1991) and indicated that at posttest 83% of the subjects did better than their pretest score. The Q test for homogeneity of variance was not significant. Therefore, no further analyses were done on the within-group data. Table 4 also displays the within-group effect sizes for different types of dependent variables. As noted, within-group effect sizes were larger than those reported for between-group data. Given the small number of within-group effect sizes and the lack of signif-

**Table 4.** Summary of within-group (single-group designs) effect sizes at posttest for dependent variable categories

Dependent variable	No. of Aggregated ESs	Average ES ( <i>d</i> )	SE of ES	<i>p</i> value of ES	Q	<i>p</i> value of Q
Overall	29	0.99	.15	.00	28.75	.43
Anger	8	1.13	.27	.00		
Aggression	2	0.78	.02	.00		
Positive behaviors	6	1.55	.54	.16		
Other emotions	2	0.83	.01	.00		
Physiological arousal	6	0.64	.07	.00		
Attitudes/cognition	4	0.53	.12	.00		
Type A	0					
Self-esteem	0					
Relationships	1	1.19				

Notes. Q = test of homogeneity; ES = effect size.

**Table 5.** Summary of between-group effect sizes at follow-up for dependent variable categories

Dependent variable	No. of Aggregated ESs	Aggregated Follow-up ES ( <i>d</i> )	Posttest ES ( <i>d</i> )	SE of ES	<i>p</i> value of ES	Q	<i>P</i> of Q
Overall	103	0.59	0.63	.04	.00	34.10	1.0
Anger	29	0.69	0.59	.06	.00		
Aggression	17	0.99	0.82	.15	.00		
Positive behaviors	16	0.99	0.79	.12	.00		
Other emotions	21	0.53	0.44	.07	.00		
Physiological arousal	16	0.59	0.52	.07	.00		
Attitudes/cognition	1	1.05	0.83				
Type A	1	0.81	1.01				
Self-esteem	2	0.04	0.12	.02	.00		

Notes. Mean length of follow-up was 18.9 weeks and the median was 5 weeks. Q = test of homogeneity.

icant heterogeneity, these data add little additional information to the data presented.

#### Follow-Up Studies

One hundred three aggregated effect sizes were calculated from follow-up data. The length of follow-up varied from 2 to 64 weeks ( $M = 18.9$ ,  $Mdn = 5.0$ ) and was not significantly related to effect size magnitude. The average effect size at follow-up was 0.59. This result means that, on average, clients in the experimental group at follow-up did better than 72% of those in the control condition. The Q test indicated homogeneity of effect size values  $Q(103) = 34.10$ ,  $p = 1.0$ . Therefore, no further analyses were done. The variability by dependent measure that was evident at posttest was not sustained. The follow-up effects were much more homogeneous. We displayed the means at follow-up in Table 5 by type of dependent variable so they could be compared with the posttest data presented in Table 1. Table 5 also includes the aggregated posttest effect sizes for the studies that included follow-ups. These

numbers are different from the aggregated posttest effect sizes in Table 1 because they are calculated on different studies, only those that have follow-up measures. From this data in Table 5 one can compare whether the posttest effect size was higher or lower than the follow-up effect size. For some dependent measures the posttest effect size is larger and for others it is smaller. However, *t* tests indicated that none of these differences were significant.

The average effect size for self-reports of anger was almost identical to the average effect size observed at posttest. It is noteworthy that the large effect size calculated for aggression was about half its posttest value at follow-up. The average effect size for positive behaviors showed a reduction of about 25% from its posttest levels. Attitudes and cognitions showed an increase in the effect size at follow-up. However, only one intervention was assessed against this type of variable. The average effect size for physiological arousal showed little change from posttest to follow-up.

## DISCUSSION

Although the popularity of anger management programs has grown in recent years, concerns about the effectiveness of treating clients with disordered anger have also increased. Our meta-analytic review found that anger treatment is effective and that several successful treatment strategies exist for adults. Results from 50 between-group (treatment vs. no-treatment control) studies indicated that subjects who received treatment were better off than 76% of control subjects. Results from seven within-group (pre- to posttest single-group designs) studies indicated that 83% of the subjects improved in comparison to their pretest scores. These results are consistent with previous reviews of the treatment outcome literature on anger (Beck & Fernandez, 1998; Bowman-Edmondson & Cohen-Conger, 1996; Tafrate, 1995) and are reason for optimism.

The overall average magnitude of effect sizes in our review suggests moderate treatment gains in anger studies ( $d = 0.71$ ). Enthusiasm should be tempered in that the upward range of effect sizes for anger is less than the upward range of effect sizes reported in meta-analytic reviews for anxiety and depression. In comparing treated subjects to no-treatment controls, researchers have reported effect sizes more than 1.0 for subjects suffering from anxiety disorders across a variety of outcome measures and studies (Chambless & Gillis, 1993). Several meta-analytic reviews of treatments for depression, using the Beck Depression Inventory as a common outcome measure, have reported effect sizes well more than 2.0 (Dobson, 1989; Gaffan, Tsoulos, & Kemp-Wheeler, 1995). The lower effect sizes for anger may have resulted from several factors. First, much less work has been done on treating anger than on anxiety or depression. Thus, researchers have fewer previous results to falsify poor treatments and guide more effective hypotheses. Less is known about anger than about anxiety and depression, so there is less scientific knowledge on which to base the interventions or to know what mediators or moderators of anger to target in treatment. Also, the lack of diagnostic categories for anger disorders results in researchers' applying one intervention across all angry clients. This practice would not occur with the treatment of anxiety disorders, given our present state of knowledge. As Norcross and Kobayashi (1999) lamented, we cannot treat anger as successfully as we do other emotional problems.

Our review differs from previous reviews in that effect sizes were aggregated according to dependent variable cat-

egories used for each intervention. Significant heterogeneity of variance and significant differences among the effect sizes for different types of dependent variables were found. This suggests that anger researchers should identify carefully what they believe their anger interventions will affect. For example, anger treatments produced moderate to large improvements on anger self-reports, measures of aggressive behaviors, measures of positive nonangry behaviors, attitudes and cognitions, type A behaviors, and physiological measures. It appears that anger management interventions produce not just a reduction in the negative affect of anger, but also an equally high effect in increasing positive behaviors. It is unclear whether this occurs because the reduction in anger frees the research participants to behave more positively or because many treatment protocols stressed positive alternative thinking, problem solving, and new behaviors. This issue requires clarification before practitioners adhere too strongly to either an anger-reduction model or a model that focuses on building more adaptive behaviors.

Aggression had the highest effect size of any type of dependent measure. Several theorists (Baumeister, Smart, & Boden, 1996; Tedeschi & Nessler, 1993) have proposed that anger mediates much aggression. The fact that anger management programs result in substantial improvement in aggressive behavior still does not clarify the relationship between anger and aggression. Anger management programs include many interventions designed as treatments for aggression, and both anger and aggression would be targeted for change in these studies. However, correctional facilities, alternative correctional settings, or programs for domestic violence perpetrators that use anger management programs should focus on the interventions that have demonstrated a reduction in the aggressive behaviors that resulted in the referral to treatment.

The research to date says little about the cognitive mediation of anger. Measures of attitudes and cognitions believed to elicit anger had an effect size as high as and not significantly different from the measures of the core construct of anger. However, only seven interventions used this type of measure. This suggests that researchers have paid little attention to the cognitive mediation of anger. This may be a fruitful area for future research.

Small effect sizes occurred on measures of other emotions. Although some generalization appears to occur, anger treatment has less impact on symptoms of anxiety and depression than on anger or aggression. This indicates

that the impact of anger treatments is not the result of improvement in overall negative affectivity.

Anger treatment produced low effect sizes on measures of interpersonal relationships. Anger treatment in and of itself may not be sufficient to improve the quality of relationships, although it may be an important first step. Another variable that did not appear to improve from anger treatment was self-esteem. This may have occurred because self-esteem deficits may not occur in angry clients. Baumeister (1997) has proposed that angry and aggressive clients harbor high unstable self-esteem and are thus predisposed to respond with anger when confronted with unflattering evaluations from the outside world.

Our study failed to find a significant difference between types of treatments for different dependent measures. This may have occurred for several reasons. Many interventions have been used. However, many of these have been studied only a few times, resulting in empty cells, and many have low *ns* (Table 3). These factors contributed to weak statistical power. In addition, many cells had very large discrepancies between the minimum and maximum effect sizes, resulting in large error variances in many cells. This large discrepancy within cells raises the question of what variables may have accounted for so much variance within the same treatment on the same dependent measure. Several hypotheses come to mind.

First, little agreement exists among researchers or clinicians as to what constitutes an anger problem. Most studies in this analysis defined anger problems psychometrically. A score at or above the 75th percentile on Spielberger's measure (1988) was the most common psychometric definition. This definition may present too low of a floor of anger problems for sufficient power to detect differences in effective treatment. Some studies of prison inmates used a recent history of aggressive behaviors. In such studies, the degree of anger may not have been high, again presenting a floor effect for anger measures. No diagnostic categories exist for anger disorders. Researchers may have included participants who had minimal degrees of anger disturbance, or they may have included highly variable subgroups of angry people. The absence of guidelines for anger disorders or anger subtypes hinders research.

Second, variations in treatment integrity, clinical acumen, or experience with angry clients may also account for the variability within similar treatments. Authors who had one foray into anger outcome research conducted most of the studies. Overall, the lack of programmatic research on

anger treatments has resulted in few treatment manuals, limited clinical experience among supervisors, and greater variability in clinical skill.

Symptom-and-treatment-modality matching, the notion that treatments will have the greatest impact on their corresponding outcome measure, was not widely supported in our review. Table 3 reveals that self-instructional training (SIT) and cognitive restructuring produced large effect sizes on measures of attitudes and cognitions. However, cognitive restructuring had an equal or greater impact on measures of aggression and positive behaviors. Behavioral skills training did produce large effects on measures of aggressive behaviors, and nonangry positive behaviors and biofeedback yielded one large effect size on a physiological measure. However, relaxation-based interventions yielded low effect sizes on physiological measures (see relaxation, anger management training [AMT], and systematic desensitization [SD] in Table 3). This means that practitioners can expect clients to report that relaxation treatments have a greater impact on subjective feelings of anger, reduction of aggressive behaviors, and increases in positive behaviors than on symptoms related to physical activation. Given the present state of science in the anger area, practitioners should not choose interventions that have face validity for a client's presenting anger symptoms. However, they may wish to choose interventions that have the greatest empirical support for given symptom categories.

Concerning the impact of additional moderator variables, the use of a treatment manual and an integrity check significantly predicted higher effect sizes on measures of aggression. However, few researchers used integrity checks or treatment manuals. The use of integrity checks and manuals seemed to decrease the standard deviations and was associated with higher minimum values than studies that did not employ these methods. We have found no other studies that support the finding that integrity checks or manuals were associated with higher effect sizes. Therefore, we were suspicious of this finding and explored the possibility that researchers that used manuals or integrity checks excluded therapists that failed to follow the manual or failed the integrity check. None of the articles reported such. Therapists who participate in research studies may be committed to manuals and integrity checks and have a high compliance with these aspects of therapy. Therapists in clinical settings may have greater variability of adherence to manuals and a higher likelihood to fail integrity checks. Further research is needed to explore the relationship of these variables to

treatment outcomes of aggression, but the possibility of finding an effect may have the highest power in studying therapy as it is practiced and not in a research setting.

The use of individual sessions (versus group) significantly predicted higher effect sizes on measures of non-angry positive behaviors. Although session format (group versus individual) was not significant for measures of aggression, treatments administered in a group format ( $SD = 1.04$ ) had much greater observed variability compared to those delivered in an individual format ( $SD = 0.37$ ). Individual treatment appears more effective for increasing positive behaviors and is associated with more consistent results on aggressive behaviors. Practitioners working with aggressive clients should choose structured interventions, delivered in an individual format, and employ safeguards to ensure that the treatment is delivered consistent with the manual. Unfortunately, we believe that those who work in correctional settings with aggressive clients tend not to adhere to structured interventions.

Although nonsignificant heterogeneity of variance was found for those studies that employed a pre- to posttest single-group design, an important methodological issue emerged from the present review. Several researchers (Beck & Fernandez, 1998; Stage & Quiroz, 1997) have pooled the between and within effect sizes in the same meta-analysis without any consideration whether or not these two statistics measure the same thing. Our analysis of studies that provided both sets of information indicated that these two measures of effect sizes are highly correlated. However, within-group effect size values were larger, and there was a cubic function between these two variables. Future research should include replication to determine whether the within-group effect sizes are always larger than the between-group effect sizes. We recommend against pooling the within and between effect sizes in the same analysis.

Follow-up data are encouraging and indicate moderately sustained improvement across outcome measures. Anger treatment appears to have a more lasting effect on decreasing aggressive behaviors and increasing positive behaviors than on the subjective experience of anger (anger self-reports, physiological measures, and attitudes and cognitions) and on measures of behavior. For studies that included both posttest and follow-up data, no significant differences occurred between the times of measurement for any of the dependent variables. Such data are encouraging but more research is needed on the long-term out-

comes of such treatments. Lack of variability at follow-up may be because most of the treatment protocols were short and averaged only 12 sessions.

Finally, most of the empirical literature on anger treatment investigated behavioral, cognitive, or cognitive-behavioral interventions. We found no psychodynamic, family systems, gestalt, or client-centered research studies to include in the present analysis. Adherents of other theoretical orientations have abstained from empirical corroboration of their effectiveness with anger. The lack of research results supporting these different types of therapies cannot be taken to mean that these treatment approaches are not efficacious. It means only that they have not been tested.

Prochaska and DiClemente (1986) have noted that therapies have differential effectiveness based on a client's stage of change. The empirically supported treatment strategies examined in this review are all primarily action-stage interventions. Because we believe that many angry clients who obtain treatment in outpatient, community mental health, or correctional settings arrive in therapy in the precontemplative stage of change (DiGiuseppe, Tafrate, & Eckhardt, 1994), there is the possibility for more effective interventions. The anger literature would be enriched by outcome studies examining other treatment approaches.

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#### NOTE

1. An obvious exception to this trend is Jerry Deffenbacher.

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