

# Homework Assignments in Cognitive and Behavioral Therapy: A Meta-Analysis

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**This meta-analysis (27 studies,  $N = 1702$ ) examined (a) the effects of homework assignments on treatment outcome and (b) the relationship between homework compliance and therapy outcome. Results of the primary meta-analyses indicated a weighted mean effect size ( $r$ ) of .36 for homework effects and .22 for homework compliance. A moderator analysis (chosen on a priori grounds) was also conducted by partitioning the sample of effect size estimations first according to the sample problem type, according to the type of homework activity administered, and according to the source and time of homework compliance assessment. We hope that the focus of future research will now be diverted from general questions of the benefit of including homework in therapy, to more specific questions regarding the relative effectiveness of different types of homework assignments for different client problems.**

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Therapeutic homework emerged as an integral component of therapy with the advent of Kelly's (1955) fixed role therapy. The regular use of homework in behavioral, cognitive, and rational-emotive therapy formulations further increased homework's role in therapy (e.g., Beck, Rush, Shaw, & Emery, 1979; Ellis, 1962; Kanfer & Phillips, 1966; Shelton & Ackerman, 1974). By the late 1970s,

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a number of descriptive articles had attested to the efficacy of homework assignments designed to change client behavior in the absence of therapist supervision (e.g., Shelton & Levy, 1979). This growing acceptance was mirrored in empirical reports where, according to one survey, 68% of outcome studies from 1973 to 1980 reported the use of homework to promote treatment gains (Shelton & Levy, 1981a). Interest in the role of homework assignments in therapy has continued to be the focus of empirical investigations, as well as in contemporary formulations of therapy.

Homework assignments have been incorporated into manual-based treatments for a diverse range of clinical conditions including, but not limited to, relapse prevention for alcohol abuse and dependence (Annis & Davis, 1989; Dimeff & Marlatt, 1995), body image problems (Dworkin & Kerr, 1987), borderline personality disorder (Kush, 1995; Linehan, 1993), childhood problems (Ronan & Deane, 1998), delusions and hallucinations (Chadwick, Birchwood, & Trower, 1996; Glaister, 1985), dental anxiety (Ning & Liddell, 1991), generalized anxiety disorder (Barlow, Esler, & Vitali, 1998), loneliness (Adams, Openshaw, Bennion, Mills, & Noble, 1988), obsessive-compulsive disorder (de Araujo, Ito, Marks, & Deale, 1995), panic disorder (Barlow et al., 1998; Clark et al., 1994), posttraumatic stress disorder (Vaughan & Tarrrier, 1992), social phobia (Marks, 1995), social skills training for adults (Bellack, Hersen, & Himmelhoch, 1996; Graves, Openshaw & Adams, 1992; Pettibon, Van Hasselt, & Hersen, 1996), therapy for rape victims (Resick & Schnicke, 1993), therapy for specific phobias (Wanderer & Ingram, 1991), Tourette syndrome (Carr & Bailey, 1996), and vaginal penetration phobia (Vonk & Thyer, 1995). Given that treatment manual-based therapy formulations are evolving into one of the primary mecha-

nisms for disseminating empirically supported treatments (Addis, 1997), it is not surprising that most practicing psychologists also report the use of homework assignments in practice (Kazantzis & Deane, 1999), and consider them to be one of the primary growth areas of psychotherapy (Norcross, Alford, & DeMichele, 1992).

Although there have been several reviews regarding the administration of homework assignments in therapy (Burns & Auerbach, 1992; Macaskill, 1996; Openshaw, 1998; Primakoff, Epstein, & Covi, 1986; Shelton & Levy, 1981b), no study to date has quantitatively assessed the role of homework assignments in therapy as a function of the moderating effects of different variables. Prior reviews have not considered the source of homework compliance assessment as a moderating variable, which may be particularly problematic given the unreliability of client self-report here (see Hoelscher, Lichstein, & Rosenthal, 1984, 1986; Kazantzis, Deane, & Ronan, 2000). Similarly, prior reviews have not considered the type of homework activity recommended or the nature of the client's presenting problem. For example, the role of homework is different for a client with depression instructed to engage in Beck's "activation" activities as opposed to a client with sexual dysfunction engaging in Masters and Johnson's pleasuring exercises. Prior qualitative reviews, however, have typically failed to consider such factors in evaluating the empirical evidence supporting the use of homework in therapy.

An additional factor that has not been considered in previous reviews of the homework literature is the reliance on significance testing and a failure to consider statistical power. A recent power survey was conducted to determine the average level of power available to homework researchers (Kazantzis, 2000). The survey only included those reports that quantitatively assessed homework in relation to therapy outcome measured at termination. Briefly, the analysis found that the median power for small, medium, and large effects across all controlled studies was 0.09, 0.32, 0.58, respectively. In other words, statistical power in homework research was poor for each of Cohen's (1988) effect sizes. Researchers looking for medium effects, on average, only had a 32% chance of detecting them. The implication was that researchers examining homework have generally had a low probability of detecting homework effects even when they have existed. Given the problem of low statistical power in the homework research, a further qualitative review of the

homework literature would be likely lead to the conclusion that further research is required to resolve the "conflicting results" evident among studies of homework effects on therapy outcome. Since meta-analysis is accepted as a more accurate, objective, and credible approach to reviewing research that does not rely on significance testing (Cook & Leviton, 1980; Glass, McGaw, & Smith, 1981; Lipsey & Wilson, 1993), the present study used meta-analytic techniques to evaluate the role of homework assignments in therapy.

Previous reviews of the homework literature have also been confounded by a basic confusion regarding whether the variable of interest is either the assignment of homework, or the extent to which clients complete homework. In theory, if a homework assignment is administered then the extent to which it is effective depends on whether the client attempts to complete the assignment (i.e., the client's level of compliance). However, experimental studies have manipulated the use of homework assignments compared to control conditions (using compliance as a test of integrity or as a dependent measure), while correlational studies have related homework compliance to therapy outcome. For example, Neimeyer and Feixas (1990) describe an experimental study where homework assignments are manipulated, whereas Startup and Edmonds (1994) describe a correlational analysis between homework compliance and therapy outcome. Clearly these two methodologies examine two distinct research questions: the first, an examination of the effects of homework assignments in therapy; the second, an investigation of the relationship between homework compliance and therapy outcome.

The purpose of the present study was to meta-analytically aggregate and analyze the research findings pertaining to (a) the examination of homework effects in therapy and (b) the relationship between homework compliance and therapy outcome. On the basis of conceptual foundations of behavioral (Kanfer & Phillips, 1966) and cognitive formulations of therapy (Beck et al., 1979; Ellis, 1962), as well as existing empirical evidence, we hypothesize that there would be an overall positive effect for the use of homework assignments in therapy (Hypothesis 1) and that there would be a positive relationship between homework compliance and therapy outcome (Hypothesis 2) as represented by a positive weighted mean effect size calculated across all available studies. We also predict that presenting problem, type of homework, source of com-

pliance assessment, and the time of compliance assessment would each moderate homework effects and the relationship between homework compliance and therapy outcome in a positive direction (Hypothesis 3).<sup>1</sup>

## METHOD

### Sample

Studies examining homework in therapy were identified using two methods: (a) computer search of PsycLIT and PsycINFO databases 1980 through 1998 using the key terms *behavioral practice*, *extratherapy*, *extratreatment*, *home practice*, *homework*, and *self help assignments*; and (b) a manual search of the reference sections of previous reviews and of the reference sections of studies examining the relationship between homework (or homework compliance) and therapy outcome. The vast majority (95%) of treatment outcome studies involving homework assignments published prior to 1980 did not report the assessment of homework compliance and thus did not validate the integrity of treatment conditions (Shelton & Levy, 1981a). This may have been due, at least in part, to a lack of emphasis on assessing homework compliance in popular behavioral treatment formulations of the time (e.g., Kanfer & Phillips, 1966; Shelton & Ackerman, 1974). Given this methodological oversight of studies published prior to 1980, and that systematic administration and assessment of homework compliance was a key feature of Beck et al.'s (1979) cognitive therapy for depression, the present study limited the search for homework-related research to studies published after 1980. As a result of the two searches described, a total of 719 studies were initially selected and considered for inclusion in the meta-analysis.

Studies were included in the meta-analysis if they met the following criteria: (a) published in English, (b) reported the assessment of homework compliance, and (c) either examined the effects of homework assignments on therapy outcome assessed at termination (i.e., using experimental or quasi-experimental methodology) or examined the relationship between homework compliance and outcome assessed at termination. Thus, a large number of the 719 studies were excluded as they only included homework as part of the treatment protocol and were not specifically designed to examine homework in relation to therapy outcome. In addition, many of the abstracts represented nonempirical articles that were inappropriate for inclusion (e.g., case studies, theoretical articles). Of the 719 homework-related studies identified

in the search, 31 studies met the inclusion criteria for the meta-analysis.

### Classification and Coding Systems

Coding was conducted by two independent judges on all variables; discrepancies in coding were resolved by discussion. Studies were categorized based on whether they examined homework effects or whether they assessed the relationship between homework compliance and therapy outcome. Studies were then coded on the following dimensions: sample characteristics, homework type, source of homework compliance assessment, and time of homework compliance assessment. The nature of the homework assignment in the study was coded into one of six categories: exposure, relaxation practice, social skills task, thermal biofeedback, video homework (client views videotape of last therapy session), or no single type of homework assignment specified. The source of homework compliance assessment was categorized as either client self-report, therapist-rated, or as objective assessment of compliance (i.e., electronic marker). The time of homework compliance assessment was coded as either occurring at regular intervals throughout therapy, or as occurring at the completion of therapy.

### Calculation of Effect Sizes

Effect sizes were not computed for those studies where sufficient statistical information was not reported (Kornblith, Rehm, O'Hara, & Lamparski, 1983; Michelson, Mavissakalian, Marchione, Dancu, & Greenwald, 1986) or where nonparametric techniques (Fennel & Teasdale, 1987) or Tobit analyses (Persons, Burns, & Perloff, 1988) were used to examine homework effects. These reports did not provide sufficient data to calculate effect size. Thus, effect sizes were calculated for the remaining 27 articles examining either the effects of homework assignments in therapy or the relationship between homework compliance and therapy outcome.

Effect sizes were calculated in the present study using the coefficient  $r$  because it is readily understood and the statistical procedures for aggregating  $r$  values are well documented (Hedges & Olkin, 1985; Rosenthal, 1991). Formulas for converting study statistics ( $F$ ,  $t$ , significance levels) were drawn from Hunter and Schmidt (1990) (see review in Cornwell and Ladd [1993] for support of Hunter and Schmidt's formulas). The correlation coefficient,  $r$  was calculated for each study from the most direct

data available, taken in the following order: statistical analyses that control for pretreatment scores, statistical analyses based on change scores, means and standard deviations, and statistical tests with no control for pretreatment scores. "Nonsignificant" findings were assigned an  $r$  value of 0 for three studies (Edelman & Chambless, 1993; Janoun, Munby, Catalan, & Gelder, 1980; Marks et al., 1988). "Significant" findings were taken conservatively as  $p = .05$  for one study (Solyom, Solyom, LaPierre, Pecknold, & Morton, 1981), and where  $p$  values were reported as  $< .05$  without additional information.

Multiple effect sizes from a single study were entered into the analysis as independent statistics where they came from study characteristics hypothesized to be moderators (Hunter & Schmidt, 1990). Where a study contained multiple effect sizes that did not come from hypothesized moderators, a weighted mean (without Fisher's  $z$  transformation) of all relevant effect sizes was computed. Effect sizes were weighted by sample size, a procedure recommended by Hunter and Schmidt to give greater weight to those studies that have larger sample sizes since larger samples more adequately sample the population (i.e., larger samples have less sampling error variance). It should be noted, however, that using this weighted mean method produces an underestimate of the effect size value that would have been obtained from an overall composite variable if one could be formed (Rosenthal & Rubin, 1982). Nonetheless, the present study corrected for small sample bias in estimating effect size as suggested by Hedges and Olkin (1985).

As discussed above, the present study identified sample characteristics, homework type, source of homework compliance assessment, and time of homework compliance assessment as moderator variables of both homework effects, and the relationship between homework compliance and therapy outcome. Hunter and Schmidt's (1990) moderator meta-analytic procedure involves forming subsets of effect sizes according to the hypothesized moderators, and performing subanalyses on each subset. In this way, the data was partitioned into subsets according to these hypothesized moderators. As a test of significance in both homework effects and homework compliance-outcome meta-analyses, a 95% confidence interval was drawn around each mean effect size estimate. These intervals are included along with mean effect size in the description of primary meta-analyses and in moderator meta-analyses. All meta-analytic variables were significant

using the confidence interval significance testing procedure (Hunter, Schmidt, & Jackson, 1982; Schmidt, 1996), a procedure whose use is increasing among meta-analytic reviewers (see Heinrichs & Zakzanis, 1998; Whittington & Podd, in press; Zakzanis, 1998).

The present study followed Hunter and Schmidt's (1990) procedures to correct the observed variance of the mean effect size for sampling error in order to produce an estimate of the population variance. Both observed and corrected variances of mean effect size are included with mean effect sizes and 95% confidence intervals in moderator meta-analyses tables. The present study also calculated Hunter and Schmidt's test for homogeneity in the meta-analyses. With a simple computation, this test indicates whether the mean effect size represents a single parameter by subtracting the variation due to sampling error from the observed variation. This was done in Tables 2 and 3 and entered as the test of homogeneity for moderator analysis to aid in interpretation of the data. Accordingly, if the sampling error removed 75% of the overall variation, then the effect sizes were considered to be homogeneous, and the mean effect size is the best estimate for the data (see Schmidt, 1996).

## RESULTS

### Characteristics of Studies

Twenty-seven studies were included in the meta-analysis, 11 studies examined the effects of homework assignments in therapy, and 16 studies examined the relationship between homework compliance and therapy outcome. Major characteristics of the homework studies are presented in Table 1. Overall, the number of participants in these studies ranged from 8 to 175, with a mean of 19 participants. Ten studies examined homework for clients with depression, nine studies examined homework within the treatment for anxiety-related disorders, and the remaining eight studies examined homework for a range of other client problems. While the previously described searches were not deliberately restricted to studies of cognitive and behavioral therapy, all 27 studies examined the role of homework within these treatment approaches. Similarly, all studies defined and measured outcome in therapy as symptomatic improvement.<sup>2</sup>

The type of homework assignment activities could only be determined for a small proportion of studies. Four studies reported the exclusive use of relaxation practice (Blanchard et al., 1991b; Hoelscher et al., 1984, 1986;

Table 1. Empirical studies examining homework effects and homework compliance in therapy

Source	N	Sample	Selection Criteria	Homework	
				Time	Source
<b>Homework effects</b>					
Blanchard et al. (1991a)	27	Outpatient	Headache classification	Regular	—
Blanchard et al. (1991b)	46	Outpatient	Headache classification	Regular	CI
Gasman (1992)	76	Outpatient	—	Post	C
Harmon et al. (1980)	8	Depression	DSI > 61; MMPI = 72–92 Depression > Psychasthenia and Hysteria score	Regular	T
Hawton et al. (1992)	36	Outpatient	Therapist and client assessment	Session 3	T
Jannoun et al. (1980)	26	Anxiety	—	Regular	C
Jannoun et al. (1982)	16	Anxiety	LSAD; STAI	Regular	C
Kazdin & Mascitelli (1982)	64	Outpatient	—	—	CI
Marks et al. (1988)	24	Anxiety	DSM-III; ICD-9; OCD > 12 months	Regular	CI
Solyom et al. (1981)	40	Anxiety	Referred for treatment	Regular	CI
Zettle and Hayes (1987)	12	Depression	BDI > 19; HRSD > 13; MMPI T-score > 69	—	—
<b>Homework compliance</b>					
Addis and Jacobson (in press)	150	Depression	BDI > 19; DSM-III-R; HRSD > 13	Regular	T
Barlow et al. (1984)	28	Anxiety	Agoraphobic scale > 3; DSM-III	Regular	C
Bryant et al. (1999)	14	Depression	DSM-III; HRSD > 14	Regular	T
Burns and Nolen-Hoeksema (1992)	175	Depression	BDI > 9; DSM-III	Post	CI
Burns and Nolen-Hoeksema (1991)	159	Depression	BDI > 9; DSM-III-R	Post	CI
Edelman and Chambless (1993)	48	Anxiety	DSM-III; DSM-III-R	Regular	—
Edelman and Chambless (1995)	52	Anxiety	DSM-III-R	—	T
Hoelscher et al. (1984)	20	Anxiety	DSM-III	Regular	CI
Hoelscher et al. (1986)	34	Outpatient	SDS; STAI; TCS	Regular	CI
Holtzworth-Munroe et al. (1989)	32	Outpatient	DAS	Regular	T
Ingram and Salzberg (1990)	15	Outpatient	BAT; GRAI	—	CI
Leung and Heimberg (1996)	67	Anxiety	ADIS-R rating > 3; DSM-III	Regular	T
Neimeyer and Feixas (1990)	59	Depression	BDI > 15	—	T
Startup and Edmonds (1994)	20	Depression	BDI > 15; DSM-III	Regular	T
Taylor et al. (1983)	23	Outpatient	—	Regular	CI
Thompson and Gallagher (1984)	40	Depression	> 60; BDI > 16; HRSD > 14; MMSE > 24	Post	—

Notes. ADIS-R = Clinician's Severity Rating Scale (DiNardo & Barlow, 1988); BAT = Behavioral Assertiveness Test (Hersen, Eisler, Miller, Johnson, & Pinkston, 1973); BDI = Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961); C = client ratings; CI = combined ratings; DAS = Dyadic Adjustment Scale (Spanier, 1976); DSI = Depression Status Inventory (Zung, 1972); DSM = Diagnostic Statistical Manual of Mental Disorders (American Psychiatric Association, 1980, 1987); FQ = Fear Questionnaire (Marks & Mathews, 1979); GRAI = Gambrill-Richey Assertiveness Inventory (Gambrill & Richey, 1975); HRSD = Hamilton Rating Scale for Depression (Hamilton, 1960); ICD = Ninth Revision to the International Classification of Diseases (World Health Organization, 1978); LSAD = Leeds Scales for Depression and Anxiety (Snaith, Bridge, & Hamilton, 1976); MMPI = Minnesota Multiphasic Personality Inventory (Hathaway & McKinley, 1942); MMSE = Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975); OCD = diagnosis of obsessive-compulsive disorder; SDS = Social Desirability Scale (Crowne & Marlowe, 1964); STAI = State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970); T = therapist ratings; TCS = Treatment Credibility Scale (Borkovec & Nau, 1972). Post = Homework compliance assessment occurred posttreatment or at follow-up. Regular = Homework compliance assessment occurred at regular intervals during treatment.

Taylor, Agras, Schneider, & Allen, 1983), three studies reported the exclusive use of self-graduated exposure and written recording of exposure frequency (Jannoun et al., 1980; Marks et al., 1988; Solyom et al., 1981), two studies reported the exclusive use of assertiveness training tasks (Ingram & Salzberg, 1990; Kazdin & Mascitelli, 1982), one study reported the exclusive use of thermal biofeedback (Blanchard et al., 1991a), and one study reported the exclusive use of video homework (Gasman, 1992). Homework type was not coded for the remaining studies, as they reported the use of a wide variety of different homework assignments as a part of the treatment protocol ( $n = 11$ ) or did not report sufficient information on the type of homework ( $n = 5$ ).

Homework compliance was assessed by therapists in 10

studies, but the same number augmented therapist ratings with client ratings, with only four studies relying exclusively on client ratings. Objective assessments of homework compliance were used in three studies, where some form of electronic marker was surreptitiously incorporated into audiotape equipment.

Homework compliance assessment was conducted at regular intervals throughout treatment in 17 studies, and at posttreatment in four studies (retrospective ratings). As one study (Hawton, Catalan, & Fagg, 1992) conducted retrospective compliance assessment at the end of the third therapy session, this study was included separately in the moderator meta-analysis. The remaining four studies did not provide sufficient information to determine the time of compliance assessment.

### Primary Meta-Analyses

**Homework Effects.** The mean effect size indicated that homework assignments produced significant positive effects on therapy outcome ( $r = 0.36$ ; 95% CI = 0.23–0.48;  $N = 375$ ). Thus, across all sample characteristics and types of homework assignments combined, groups receiving homework assignments benefited from their involvement with homework assignments. The homogeneity test indicated that the ratio of variance expected from sampling error to actual (observed variance) was  $0.023/0.027 = 0.85$  and that sampling error alone accounted for an estimated 85% of the observed variance in effect size estimation. Given that sampling error is above the 75% threshold, the best estimate of the homework effect size value is the weighted mean effect size of 0.36. This result supported Hypothesis 1.

**Homework Compliance and Therapy Outcome.** The weighted average correlation indicated that homework compliance is a significant predictor of therapy outcome ( $r = 0.22$ ; 95% CI = 0.22–0.22;  $N = 1327$ ). Similar to the homework effects meta-analysis, across all sample characteristics and types of homework assignments combined, groups demonstrating high levels of homework compliance demonstrated increased improvement in therapy. The homogeneity test revealed that the ratio of variance expected from sampling error to actual (observed variance) was  $0.014/0.012 = 1.00$  and that sampling error alone accounted for an estimated 100% of the observed variance in effect size estimation. Consequently, the best estimate of the effect size value for the relationship between homework compliance and therapy outcome is 0.22, the sample mean of the twenty effect sizes. This result supported Hypothesis 2.

### Moderator Meta-Analyses

**Homework Effects.** Mean effect sizes for the three moderator variables in the homework effects meta-analysis, along with 95% confidence intervals, observed variance ( $S^2_o$ ), and residual variance ( $S^2_{res}$ ) are presented in Table 2. The moderating effect of sample problem type was the first factor examined in the analysis. The magnitude of effect sizes differed among the sample problem type categories, the mean effect size for the depression and other outpatient samples was considerably greater than that obtained for the anxiety samples, with homework pro-

**Table 2.** Mean effect size ( $M_i$ ) for homework effects moderator meta-analysis

Moderator Variable	$n_i$	$N$	$M_i$	95% CI	$S^2_o$	$S^2_{res}$
<b>Problem type</b>						
Anxiety	4	106	0.27	0.27–0.27	0.008	0.000 <sup>a</sup>
Depression	2	20	0.38	0.38–0.38	0.020	0.000 <sup>a</sup>
Other outpatient	5	249	0.40	0.13–0.65	0.032	0.017
<b>Homework type</b>						
Exposure	3	90	0.23	0.23–0.23	0.000	0.000 <sup>a</sup>
No single type	4	72	0.35	0.35–0.35	0.011	0.000 <sup>a</sup>
Relaxation	1	27	0.29	0.29–0.29	0.000	0.000 <sup>a</sup>
Social skills	1	64	0.50	0.50–0.50	0.000	0.000 <sup>a</sup>
Thermal biofeedback	1	46	0.10	0.10–0.10	0.000	0.000 <sup>a</sup>
Videotape	1	76	0.57	0.57–0.57	0.000	0.000 <sup>a</sup>
<b>Source of homework compliance assessment</b>						
Client	5	166	0.43	0.32–0.54	0.024	0.003 <sup>a</sup>
Therapist	3	124	0.38	0.38–0.38	0.017	0.000 <sup>a</sup>
Objective measure	1	27	0.29	0.29–0.29	0.000	0.000 <sup>a</sup>
<b>Time of homework compliance assessment</b>						
Regular intervals	7	187	0.24	0.24–0.24	0.013	0.000 <sup>a</sup>
Posttreatment	7	76	0.57	0.57–0.57	0.000	0.000 <sup>a</sup>
At third session	1	36	0.28	0.28–0.28	0.000	0.000 <sup>a</sup>

Notes.  $n_i$  = number of effect sizes within each subcategory;  $N$  = total sample size;  $M_i$  = mean effect size index ( $r$ ); CI = confidence interval of effect size;  $S^2_o$  = variance of effect sizes;  $S^2_{res}$  = residual variance ( $S^2_o$  corrected for sampling error).

<sup>a</sup>Homogeneity in effect size.

ducing significantly different effects for anxiety and depression samples (see Table 2). However, the test of homogeneity of individual moderator subcategories indicated heterogeneity for other outpatient samples. That is, the ratio of variance expected from sampling error to actual (observed variance) was  $0.015/0.032 = 0.47$ , with sampling error only accounting for an estimated 47% of the observed variance. Further analysis did not produce clear explanation for this heterogeneity (i.e., partitioning of the “other outpatient” subgroup did not produce further moderators). Thus, this effect size for the other outpatient group can not be taken as the best estimate of effect size for studies examining homework effects with other outpatient samples as over half of the observed variance is unaccounted for with the present data.

Homework type was the second moderating factor examined in the analysis. As Table 2 shows, homework produces different effects depending upon the type of activity that is prescribed since all effect sizes within homework type categories were significantly different and homogeneous. In particular, social skills, videotape, and groups receiving no single type of homework yielded greater effects than exposure, relaxation, and thermal biofeedback assignments. However, a degree of caution

should be exercised in interpretation of the effect size estimates obtained in the homework type moderator analysis as they are largely based on single findings.

Source of homework compliance assessment was the third factor examined in the moderator meta-analysis. The results showed that homework produced different effects as a function of the source of homework compliance assessment. Interestingly, client and therapist ratings both produced significantly higher effect sizes than objective measures, but did not differ significantly from each other. While all mean effect sizes within each compliance source moderator category indicated homogeneity, caution should be exercised in interpreting the objective measure effect size since only one study is represented.

Time of homework compliance assessment was the final factor examined in the moderator meta-analysis. With the three effect size estimations homogeneous and significantly different from each other, compliance assessed at posttreatment produced an effect size twice the magnitude of that produced when assessed at regular intervals. The single study that used retrospective assessment at session three produced a larger effect size than studies incorporating assessment at regular intervals, but less than studies incorporating assessment at post-treatment.

*Homework Compliance and Therapy Outcome.* Mean effect sizes for the three moderator variables in the homework compliance-outcome meta-analysis along with 95% confidence intervals, observed variance ( $S^2$ ), and residual variance ( $S^2_{res}$ ) are presented in Table 3. Using sample problem type as the first moderator variable, the results showed that the mean effect size for the anxiety and depression samples was considerably greater than that obtained for the other outpatient samples, with homework producing significantly different effects for depression and other outpatient samples (see Table 3). The mean effect size produced by the anxiety subgroup was not significantly different to other samples and did not achieve homogeneity. That is, the ratio of variance expected from sampling error to actual (observed) variance was  $0.021/0.030 = 0.70$ . In other words, sampling error only accounted for an estimated 70% of the observed variance. This estimate is close to the 75% criterion recommended by Hunter and Schmidt (1990) and is likely to reflect the mean effect size for the studies examining the relationship

Table 3. Mean effect size ( $M_i$ ) for homework compliance moderator meta-analysis

Moderator Variable	$n_i$	$N$	$M_i$	95% CI	$S^2$	$S^2_{res}$
Problem type						
Anxiety	5	215	0.24	0.05–0.42	0.030	0.009
Depression	9	951	0.22	0.22–0.22	0.008	0.000 <sup>a</sup>
Other outpatient	6	161	0.17	0.17–0.17	0.007	0.000 <sup>a</sup>
Homework type						
No single type	14	1178	0.22	0.17–0.26	0.012	0.001 <sup>a</sup>
Relaxation	6	154	0.17	0.17–0.17	0.026	0.000 <sup>a</sup>
Social skills	1	15	0.13	0.13–0.13	0.000	0.000 <sup>a</sup>
Source of homework compliance assessment						
Client	5	402	0.22	0.22–0.22	0.010	0.000 <sup>a</sup>
Therapist	9	771	0.22	0.22–0.22	0.009	0.000 <sup>a</sup>
Objective measure	5	106	0.26	0.26–0.26	0.021	0.000 <sup>a</sup>
Time of homework compliance assessment						
Regular intervals	13	864	0.22	0.13–0.30	0.025	0.002 <sup>a</sup>
Posttreatment	5	708	0.22	0.22–0.22	0.005	0.000 <sup>a</sup>

Notes.  $n_i$  = number of effect sizes within each subcategory;  $N$  = total sample size;  $M_i$  = mean effect size index ( $r$ ); CI = confidence interval of effect size;  $S^2$  = variance of effect sizes;  $S^2_{res}$  = residual variance ( $S^2$  corrected for sampling error).

<sup>a</sup>Homogeneity in effect size.

between homework and therapy outcome with samples of anxious participants. However, it should be mentioned that the remaining 30% of the variance in the relationship were not accounted for with the present data. Thus, some caution is warranted in drawing firm conclusions about the size of the compliance-outcome relationship for anxious samples.

The moderating effect of homework type was the second factor examined in the moderator meta-analysis for the compliance-outcome studies. As Table 3 shows, the relationship between homework compliance and therapy outcome was similar for groups receiving no single type of homework and relaxation homework, with both subcategories attaining homogeneity. Given that the low effect size obtained for social skills assignment is based on a single finding, and the mean effect sizes for other subcategories groups did not differ from each other, it is concluded that there is insufficient evidence to suggest that homework type moderates the homework compliance-outcome relationship.

The moderating effect of source of homework compliance assessment was the third factor examined in the moderator meta-analysis for the compliance-outcome studies. As can be seen from Table 3, the finding obtained in the homework effects moderator analysis was replicated. Specifically, client and therapist ratings did not differ signifi-

cantly from each other, but differed significantly from objective measures of homework compliance with all mean effect sizes achieving homogeneity. However, unlike the homework effects moderator meta-analysis, the mean effect size for those studies using an objective measure of homework compliance was slightly greater than that obtained with client and therapist ratings.

The moderating effect of time of homework compliance assessment was the third factor examined in the moderator meta-analysis for the compliance-outcome studies. Contrary to the findings of the homework effects moderator meta-analysis, there was no significant difference between studies incorporating retrospective assessment at regular intervals and those studies incorporating assessment at posttreatment. Given the disparity between results of the moderator analyses for homework effects and homework compliance studies, only partial support was provided for Hypothesis 3.

**Sample Problem Type by Homework Type.** A further moderator meta-analysis was conducted post hoc to examine the independent effects of a specific type of homework on sample problem type. Mean effect sizes for the three problem types crossed by homework type meta-analysis along with 95% confidence intervals, observed variance ( $S^2_r$ ), and residual variance ( $S^2_{res}$ ) are presented in Table 4. For both homework effects and compliance-outcome studies, anxiety and depression groups who received no single type of homework assignment produced larger effect sizes than samples receiving a specific type of homework. However, the effect size estimations produced by "other outpatient" subcategories should be interpreted with caution and be considered preliminary given the small number of effects sizes within each subcategory (see Table 4).

## DISCUSSION

The main aim of this study was to provide a meta-analytic review of the effects of homework assignments on therapy outcome, and the relationship between homework compliance and therapy outcome. By synthesizing the results of the empirical studies over the past two decades, we intended to answer three major questions: (a) What was the overall magnitude of the effect of homework assignments in therapy? (b) What was the overall magnitude of the relationship between homework compliance and therapy outcome? (c) Did sample problem type, type of

**Table 4.** Mean effect size ( $M_r$ ) for problem type by homework type moderator meta-analysis

Moderator Variable	$n_r$	$N$	$M_r$	95% CI	$S^2_r$	$S^2_{res}$
Homework effects						
Anxiety						
Exposure	3	90	0.23	0.23–0.23	0.000	0.000 <sup>a</sup>
No single type	1	16	0.49	0.49–0.49	0.000	0.000 <sup>a</sup>
Depression						
No single type	2	20	0.38	0.38–0.38	0.020	0.000 <sup>a</sup>
Other outpatient						
No single type	1	36	0.28	0.28–0.28	0.000	0.000 <sup>a</sup>
Relaxation	1	27	0.29	0.29–0.29	0.000	0.000 <sup>a</sup>
Social skills	1	64	0.50	0.50–0.50	0.000	0.000 <sup>a</sup>
Thermal biofeedback	1	46	0.10	0.10–0.10	0.000	0.000 <sup>a</sup>
Videotape	1	76	0.57	0.57–0.57	0.000	0.000 <sup>a</sup>
Homework compliance						
Anxiety						
No single type	4	195	0.22	0.01–0.43	0.030	0.012
Relaxation	2	40	0.13	–0.15–0.40	0.070	0.020
Depression						
No single type	9	951	0.22	0.22–0.22	0.008	0.000 <sup>a</sup>
Other outpatient						
No single type	1	32	0.14	0.14–0.14	0.000	0.000 <sup>a</sup>
Relaxation	4	114	0.18	0.18–0.18	0.009	0.000 <sup>a</sup>
Social skills	1	15	0.13	0.13–0.13	0.000	0.000 <sup>a</sup>

Notes.  $n_r$  = number of effect sizes within each subcategory;  $N$  = total sample size;  $M_r$  = mean effect size index ( $r$ ); CI = confidence interval of effect size;  $S^2_r$  = variance of effect sizes;  $S^2_{res}$  = residual variance ( $S^2_r$  corrected for sampling error).

<sup>a</sup>Homogeneity in effect size.

homework activity, source of homework compliance assessment, or time of homework compliance assessment systematically moderate the relationship between homework effects (and homework compliance) and therapy outcome? We answered these questions in primary and moderator meta-analyses.

Regarding the overall magnitude of the effects of homework assignments on therapy outcome, the results of the primary meta-analysis indicated a significant weighted average effect size (adjusted for sample size) of 0.36. By comparison, the results of the primary meta-analysis of the relationship between homework compliance and therapy outcome indicated a significant weighted average effect size (also adjusted for sample size) of 0.22. To this point, these average effect sizes represent the first time that an indicator of the overall relationship between homework assignments and therapy outcome has been meta-analytically derived and analyzed. The findings directly support the theoretical assertions made by proponents of homework assignments (e.g., Beck et al., 1979; Levy & Shelton, 1990) in showing that homework assignments facilitate improvement in therapy, and that homework compliance is confirmed as a significant

predictor of therapy outcome. Therefore, the findings from the present study support the use of homework in contemporary cognitive and behavioral therapy formulations.

Results from the moderator meta-analyses provided partial support for our hypothesis that sample problem type, type of homework activity, source of homework compliance assessment, and time of homework compliance assessment moderate the relationship between homework assignments (and compliance) and therapy outcome. The magnitude of homework effects on therapy outcome was greater for "other outpatient" and depression samples than anxiety samples. Homogeneity was achieved among the significantly different effect size estimations for depression and anxiety samples, suggesting that homework effects are indeed different for depressed and anxious clients. However, it should be noted that the mean effect size estimate for the depression subcategory was calculated from only two effect sizes, and taken together with the heterogeneity and large confidence interval in the "other outpatient" mean effect size estimate, some caution should be exercised in emphasizing the reliability of the sample problem type moderator analysis. Similarly, the findings for compliance-outcome moderator analysis did not provide clear support for the hypothesis that sample problem type would moderate the relationship between homework compliance and therapy outcome. Although homogeneity was attained for depression and other outpatient subcategories, the mean effect size estimate for the anxiety subcategory was heterogeneous and did not achieve significance. It can be concluded that there does not appear to be clear, systematic evidence to indicate that the nature of the sample problem type moderates the relationship between homework compliance and therapy outcome. Further research is required to examine whether homework is more useful for specific types of client problems.

By contrast, the remaining moderator meta-analyses did provide support for the third hypothesis. In addition, they did so while achieving full homogeneity among individual subcategories. Results here indicated that homework type, source of homework compliance assessment, and time of homework compliance assessment are strong moderators of (a) homework effects and (b) the relationship between homework compliance and therapy outcome. In both sets of moderator meta-analyses, the additional examination of homework type crossed by

problem type showed that groups receiving a range of homework activities produced larger effect sizes than groups receiving specific types of homework. Although the effect size estimate produced for different homework activities were significantly different and homogenous, these estimates were based on a small number of findings and only represent a level of reliability that would be attained in making qualitative comparisons. Thus, while "homework type" met the meta-analytic criteria as a moderator of homework effects and the compliance-outcome relationship, more research is required to examine the differential effects of various types of homework activities.

While some studies have questioned the utility of client self-reports of homework compliance compared to objective measures of compliance (e.g., Hoelscher et al., 1984), our findings indicate that source of compliance assessment is a strong moderator of the relationship between homework and therapy outcome. In fact, the results of the moderator analysis showed that client ratings and therapist source both moderated homework effects and the relationship between compliance and outcome, and they did so to the same extent. Objective measures of homework compliance did moderate homework effects and the compliance-outcome relationship to a different extent, but the small number of effect sizes involved in computations here limit strong conclusions.

The results of the moderator meta-analysis indicated larger homework effects were obtained in the controlled studies when compliance was assessed at posttreatment. As noted in many of these empirical reports, retrospective ratings obtained at posttreatment are decidedly problematic. Clients who have experienced improvement in symptoms may inadvertently inflate the extent to which they complied with homework, and therapists who have observed improvement in the client's presenting problems may assume that improvement is due to homework completion. Although no significant difference was obtained times of compliance assessment for the compliance-outcome studies, the larger effect size observed in post-treatment ratings among homework effects studies reflects the bias inherent in retrospective ratings (see Burns & Nolen-Hoeksema, 1991; Kazantzis et al., 2000). Researchers interested in conducting quantitative evaluation of the role of homework in therapy should incorporate compliance assessment at regular intervals throughout therapy, particularly given recent evidence that the rate of

homework compliance may exhibit a nonlinear function with number of therapy sessions (Addis & Jacobson, in press).

The finding that type of homework activity and source of homework compliance assessment are moderators in therapy raises two important issues yet to be addressed. Since practicing psychologists report using more varied homework assignments (Kazantzis & Deane, in press) than those described in empirical investigations of homework, the type of homework assignments that exert the greatest influence on the relationship between homework and therapy outcome requires clarification. Such comparisons may be assessed using meta-analytic techniques (when adequate empirical data are available) as the effect of each homework assignment can be compared across studies while taking into account methodological differences between studies. Of course, directly comparing techniques using experimental methods is another alternative.

#### CONCLUSION

Although there have been numerous qualitative reviews of the homework literature, meta-analytic reviews assessing the relationship between homework assignments and therapy outcome have been lacking. The present study identified all available studies of homework since 1980 and meta-analyzed the results within primary and a priori determined moderator analyses. Since the results pertain to homework assignments administered in treatment outcome studies that employed manualized treatments for use with homogeneous samples, the results cannot be generalized to many aspects of clinical practice, where client problem types, types of homework activities, and orientations of therapy practice are far more varied. Homework assignments have been incorporated into formulations of therapy for a wide variety of clinical conditions, such as borderline personality disorder (Kush, 1995), delusions and hallucinations (Chadwick et al., 1996), obsessive-compulsive disorder (de Araujo et al., 1995), and panic disorder (Barlow et al., 1998). While homework has continued to be included as an integral component of contemporary manual-based therapies for cognitive and behavioral approaches to therapy (Alford & Beck, 1994; Hollon & Beck, 1994; Thase, 1996), the use of homework has also been endorsed by systemic and family approaches (Carr, 1997; Nelson, 1994), and solution-focused therapy

(Beyebach, Morejon, Palenzuela, Rodriguez-Arias, 1996). However, empirical support for the efficacy of homework in these nonbehavioral and cognitive modes of therapy is currently unavailable.

Finally, we hope that this meta-analytic review has changed the focus from the general question of whether homework compliance is related to therapy outcome, to more specific questions such as which types of homework assignments facilitate improvement in therapy for which client problems, and which therapist behaviors can enhance the effects of homework assignments in therapy. These are avenues of effectiveness-based research that can best clarify the size of the contribution of homework assignments to client improvement in therapy.

#### NOTES

1. We express our appreciation to Michael E. Addis for suggesting the inclusion of time of homework compliance assessment in the moderator analyses.

2. Some studies in this meta-analysis also included outcome variables not necessarily expected to change over the course of treatment (e.g., personality pathology). However, in all instances, the relationship of homework effects, or homework compliance, was evaluated in relation to symptomatic measures of outcome.

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