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Reducing Relapse and Recurrence in Unipolar Depression: A Comparative Meta-Analysis of Cognitive–Behavioral Therapy's Effects

Jeffrey R. Vittengl,
Department of Psychology, Truman State University

Lee Anna Clark,
Department of Psychology, University of Iowa

Todd W. Dunn, and
Department of Psychiatry, University of Texas Southwestern Medical Center at Dallas

Robin B. Jarrett
Department of Psychiatry, University of Texas Southwestern Medical Center at Dallas

Abstract

Relapse and recurrence following response to acute-phase treatment for major depressive disorder (MDD) are prevalent and costly. In a meta-analysis of 28 studies including 1,880 adults, the authors reviewed the world's published literature on cognitive–behavioral therapies (CT) aimed at preventing relapse–recurrence in MDD. Results indicate that after discontinuation of acute-phase treatment, many responders to CT relapse–recur (29% within 1 year and 54% within 2 years). These rates appear comparable to those associated with other depression-specific psychotherapies but lower than those associated with pharmacotherapy. Among acute-phase treatment responders, continuation-phase CT reduced relapse–recurrence compared with assessment only at the end of continuation treatment (21% reduction) and at follow-up (29% reduction). Continuation-phase CT also reduced relapse–recurrence compared with other active continuation treatments at the end of continuation treatment (12% reduction) and at follow-up (14% reduction). The authors discuss implications for research and patient care and suggest directions, with methodological refinements, for future studies.

Keywords

depression; relapse and recurrence; cognitive–behavioral therapy; continuation and maintenance treatment; meta-analysis

High prevalence and frequent relapse and recurrence amplify the public health significance of major depressive disorder (MDD). Epidemiological estimates place the lifetime prevalence of MDD at more than 16% (Kessler, Berglund, Demler, Jin, & Walters, 2005), and 14% of primary-care patients meet criteria for a major depressive episode (MDE; Ansseau et al., 2004). The large majority of individuals with MDD experience more than one MDE (Judd,

Correspondence concerning this article should be addressed to Jeffrey R. Vittengl, Department of Psychology, Truman State University, 100 East Normal Street, Kirksville, MO 63501-4221, or Robin B. Jarrett, Department of Psychiatry, University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard, Dallas, TX 75390-9149. E-mail: vittengl@truman.edu or robin.jarrett@utsouthwestern.edu.

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1997; Mueller et al., 1999), and the probability of another MDE increases with each relapse–recurrence (Solomon et al., 2000; American Psychiatric Association, 2000a). For example, perhaps 85% of people who recover from an MDE will experience a second MDE within 15 years of naturalistic follow-up, and each additional episode increases the risk of relapse–recurrence by 18% (Mueller et al., 1999). Consequently, life interference (e.g., lost work productivity, mortality, lower quality of life) due to MDD rivals that of other chronic diseases such as cancer, diabetes, and heart disease (Murray & Lopez, 1996; Simon, 2003), and most people who commit suicide are depressed (Fawcett, 1993).

The risk of suicide and life interference can be reduced by shortening the duration of MDEs with effective acute-phase treatments, including pharmacotherapy, interpersonal psychotherapy, and cognitive– behavioral therapy (CT; Hollon, Jarrett, et al., 2005). We define *acute-phase treatments* as those applied during an MDE with the goal of reducing depressive symptoms and producing initial remission. Responders to some acute-phase treatments (e.g., CT) may receive some protection from relapse–recurrence (Hollon, Thase, & Markowitz, 2002), but prevalent relapse–recurrence after successful antidepressant treatments has long been recognized as a serious limitation of these interventions (American Psychiatric Association, 2000b; Elkin et al., 1989; Klerman, DiMascio, Weissman, Prusoff, & Paykel, 1974; Thase et al., 1992). Consequently, *continuation-phase treatments* (e.g., pharmacotherapy, interpersonal psychotherapy, CT) may be applied to sustain remission of an MDE and reduce the probability of relapse–recurrence (Hollon, Jarrett, et al., 2005). Continuation-phase treatments can match the "modality" used in the acute phase (e.g., acute-phase CT [A-CT], followed by continuation CT [C-CT]; Blackburn & Moore, 1997; Jarrett et al., 2001) or differ in modality compared with the acute-phase treatment (e.g., acute-phase pharmacotherapy followed by C-CT; Fava et al., 2004; Paykel et al., 2005).

Meta-analysis is needed to clarify the reliability and size of the potential preventive effects of CT on reducing relapse–recurrence. Meta-analysis involves systematically combining results from multiple clinical trials to produce quantitative estimates of relapse reduction in the context of both sampling error (e.g., random differences in patients treated) and systematic differences among studies (e.g., varying relapse–recurrence definitions and durations of follow-up; Kazdin, 2003; Lipsey & Wilson, 2001). For example, the literature contains studies finding that A-CT reduces relapse–recurrence significantly compared with acute pharmacotherapy (Evans et al., 1992; Hollon, DeRubeis, et al., 2005) and other studies reporting no significant difference (Segal et al., 2006; Shea et al., 1992). Qualitative reviews, although useful, lack standardized mechanisms for combining divergent results to estimate a treatment's benefits in a patient population.

Prior reviews suggest that A-CT may reduce relapse–recurrence and highlight the need for a comprehensive meta-analysis. Hollon, Stewart, and Strunk's (2006) qualitative review concluded that—among patients treated to remission—A-CT reduces relapse–recurrence by roughly 50% compared with pharmacotherapy. Beck (2005) reached a similar conclusion about A-CT based on an earlier review of eight studies (Gloaguen, Cottraux, Cucherat, & Blackburn, 1998). However, these and other prior reviews (e.g., Friedman et al., 2004; Hensley, Nadiga, & Uhlenhuth, 2004; J. Scott, 1996) did not use formal meta-analytic methods to quantify the risk of relapse–recurrence after A-CT and C-CT. (Note, moreover, that two previous meta-analyses differed in their foci: One focused on A-CT's immediate effect on depressive symptoms [Gloaguen et al., 1998] and the other on relapse–recurrence after psychotherapy [broadly defined] combined with pharmacotherapy [Friedman et al., 2004]).

Prior qualitative reviews suggest that C-CT may reduce relapse–recurrence. Beck (2005) cited clinical trials finding that C-CT reduces relapse–recurrence after acute treatment with pharmacotherapy (Fava et al., 2004; Paykel et al., 1999) and also among patients with recurrent

depression who respond to A-CT (Jarrett et al., 2001). Further, Hollon, Jarrett, et al. (2005) concluded that C-CT, interpersonal psychotherapy, and pharmacotherapy reduce relapse–recurrence similarly. On the other hand, one well-designed clinical trial found no significant benefit of C-CT added to pharmacotherapy compared with pharmacotherapy alone (Perlis et al., 2002), and other trials have found that C-CT evidences larger effects for patients at greater risk for relapse–recurrence (e.g., Bockting et al., 2005; Jarrett et al., 2001; Ma & Teasdale, 2004). Meta-analysis can clarify whether these differences among studies are systematic or random.

This meta-analytic review addressed four key questions: (a) How common is relapse–recurrence among responders to A-CT? (b) Does A-CT reduce relapse–recurrence more than other acute-phase treatments? (c) Does C-CT reduce relapse–recurrence more than nonactive control conditions? (d) Does C-CT reduce relapse–recurrence more than other active treatments? To answer these questions, we reviewed the world's published clinical research and quantitatively combined their results using meta-analytic procedures (Lipsey & Wilson, 2001). In selecting studies, we applied consensus definitions of relapse–recurrence as increases in depressive symptoms in patients who first experience remission–recovery in acute-phase treatment (Frank et al., 1991; Rush et al., 2006). We present results in formats designed to help clinicians and consumers involved in treatment of MDD make informed decisions (e.g., what are the chances of a better outcome using CT vs. pharmacotherapy?; by routinely applying C-CT, how many patients' relapses–recurrences will be prevented during continuation treatment and at follow-up?; Kraemer & Kupfer, 2006). Finally, we comment on the depth and quality of the scientific literature in these areas to identify areas in need of additional research and methodological improvements.

Method

Identification of Studies

We identified published reports using electronic database searches, reference lists of published studies and reviews, and our familiarity with the major lines of research in the field. We conducted keyword searches (specifically, *depression*, *relapse*, *recurrence*, *cognitive*, *maintenance*, *continuation*, *psychosocial*, *therapy*, and *treatment*) in MEDLINE and PsycINFO databases from 1965 (MEDLINE) or 1887 (PsycINFO) through July 2006. We read all English-language abstracts, and we read the full articles of those that appeared relevant to our analyses. Bilingual psychologists read German- and Spanish-language articles for relevance to our analyses. In June 2006, we presented preliminary results at an international conference and invited suggestions from the audience for additional studies to consider (Jarrett, Vittengl, & Clark, 2006).

Inclusion criteria for studies were as follows: (a) included adult patients with MDD treated with CT in at least one study condition, (b) reported number of patients responding to acute-phase treatment, (c) conducted follow-up assessment after acute-phase treatment ended, (d) reported proportion (or number) of acute-phase responders experiencing relapse or recurrence of depression during longitudinal follow-up, (e) was published in a journal, and (f) used a study design addressing at least one of our four key questions. Exclusion criteria were as follows: (a) patients were younger than age 18, (b) patients were not treated with CT, (c) primary diagnosis was not unipolar depression, (d) acute-phase treatment responders were not identified categorically (e.g., only quantitative symptom scores were reported), (e) there was no longitudinal follow-up after acute-phase treatment ended, (f) relapse or recurrence was not identified categorically, (g) study did not report separate rates of relapse and/or recurrence for acute-phase treatment responders versus nonresponders (e.g., only a total proportion relapsing including acute-phase treatment nonresponders was reported), or (h) study was unpublished. All included studies described treatments as “cognitive therapy,” “cognitive behavior/al

therapy," or addressed cognition as a primary therapeutic technique and were published as journal articles. We excluded no studies based on a formal, restrictive definition of CT or because they were not written in English. The Appendix lists studies that initially appeared relevant but later were excluded.

Effect Size Coding

We computed effect sizes from the proportions of patients experiencing relapse or recurrence at the longest available follow-up. For analysis of estimates of relapse–recurrence within a treatment modality, we converted raw proportions p to logits, $\log_e(p/[1-p])$, before analysis. We weighted (w) the transformed proportions by their inverse variance, $w = np(1-p)$, where n = number of patients. We transformed the results of meta-analyses on logit effect sizes back to p for interpretation (Lipsey & Wilson, 2001).

We computed the area under the curve (AUC) as an effect size for the difference between two treatments (Kraemer et al., 2003): AUC = 0.5 ($p_1 - p_2 + 1$), where p_1 and p_2 are the proportions relapsing–recurring in two groups. Consequently, AUC = .50 marks no difference between groups. We coded p_2 as the target (CT) group; therefore, AUC > .50 indicates less relapse–recurrence with CT. The AUC may be viewed as the chance of a better outcome with target treatment. For example, if AUC = .60, then patients receiving CT would have a 60% chance of a better outcome (e.g., not relapsing) than patients in the comparison condition. We weighted AUC statistics in meta-analyses by their inverse variance, $w = 12/(1/m + 1/n + 1/nm)$, where m and n refer to the number of patients in the two groups (Grissom & Kim, 2001). The AUC statistics of .56, .64, and .71 approximate Cohen's d values of 0.2, 0.5, and 0.8, marking "small," "medium," and "large" effects (Kraemer & Kupfer, 2006).

To aid interpretation, we computed risk difference (RD; RD = 2AUC − 1) and number needed to treat (NNT; NNT = 1/RD) from AUC (Kraemer et al., 2003; Kraemer & Kupfer, 2006). The RD refers to the difference in proportions relapsing between groups. The NNT refers to the number of patients who would need to be treated with a target intervention instead of a comparison intervention to prevent 1 patient's relapse–recurrence. For example, if AUC = .60, then RD = .20 indicates that CT reduces relapse–recurrence (e.g., 20% of patients within 12 months) compared with another condition (e.g., 40% of patients within 12 months). Also NNT = 5, indicating that 5 patients would need to be treated with CT instead of the comparison condition to prevent 1 additional patient's relapse–recurrence.

Meta-Analyses

We implemented meta-analyses using the formulas and macros provided by Lipsey and Wilson (2001). To maintain statistical independence, we included only one effect size per study in each analysis. All meta-analyses were computed using random-effects models to increase the generalizability of findings. Random-effects models assume that the studies used in the meta-analysis are a sample (past and future) rather than the universe of studies (as is assumed with fixed-effects models). Random-effects models typically are more conservative (produce larger error estimates and wider confidence intervals) than fixed-effect models. We used an alpha level of .05 for hypothesis tests.

In addition to point estimates and confidence intervals, we report Q tests of the null hypothesis that sampling error accounts for observed differences among effect sizes (Lipsey & Wilson, 2001). A significant Q test suggests that some systematic factor (e.g., different patient population or response definitions) moderates the size of the effect. When the Q test yielded $p < .10$, we tested potential moderators using random-effects, weighted analysis of variance and regression models with maximum-likelihood estimation. A nonsignificant Q test does not necessarily mean that no moderators are operating. Small sample sizes can lead to a

nonsignificant *Q* test when less powerful moderators are present. However, the AUC effect size references differences in relapse–recurrence rates between treatments (e.g., CT vs. pharmacotherapy) within studies and so controls for some potential moderators. For example, definitions of relapse–recurrence are consistent for different treatments within a study, although the definitions may vary widely between studies.

Results

Characteristics of Included Studies

Twenty-eight studies met all inclusion criteria. These studies provided relapse–recurrence data for a total of 1,880 patients, with an average sample size of 67 patients per study (range = 8 to 172). Patients were likely to be mostly White (94%), middle-aged (*M* = 42 years) women (67%). However, only 11 studies reported patients' ethnicity, and 10 of these studies reported only a White/non-White dichotomy. Many studies included MDEs in the definition of treatment response and relapse–recurrence, often in combination with quantitative symptom-severity scores (see Table 1). Reflecting potential weaknesses in the literature, many studies did not report evaluation of therapists' adherence (conducting treatment identifiable as CT and consistent with the cognitive model of depression; e.g., measured with the Collaborative Study Psychotherapy Rating Scale; Hollon et al., 1988) and competence (conducting CT skillfully; e.g., scores > 39 on the Cognitive Therapy Scale; J. Young & Beck, 1980), and some studies' follow-up strategies appeared to leave gaps in assessment time during which relapses–recurrences may have gone undetected.

How Common Is Relapse–Recurrence Among Responders to A-CT?

We estimated the proportion of patients who relapse or recur after response during A-CT. Thirteen studies contributed data (see Table 2), and the mean proportion of patients relapsing–recurring was 39% over a mean of 74 weeks (2.3% per month; see Table 3). Relapse–recurrence proportions varied significantly among studies, however, suggesting the presence of one or more moderators. We tested length of follow-up after A-CT, age of study (year of publication), and the variables in Table 1 as potential moderators of relapse–recurrence. Although other moderators are possible, we analyzed this set of variables because they represent important research design and implementation issues described frequently in published reports.

We identified seven possible moderators. Studies with higher relapse–recurrence had longer follow-up periods (e.g., estimated 29% and 54% relapse–recurrence at 1 and 2 years, respectively, $p < .01$), provided relapse–recurrence estimates from survival analyses instead of from simple proportions (51% vs. 32% relapse–recurrence, $p = .09$), reported assessment of CT therapists' competence (47% vs. 24% relapse–recurrence, $p = .02$), and used MDE diagnostic criteria in relapse–recurrence definitions (46% vs. 24% relapse–recurrence, $p = .04$). Studies with lower relapse–recurrence estimates reported assessment of CT therapists' adherence (25% vs. 48% relapse–recurrence, $p = .02$), left gaps in time in the follow-up assessment (10% vs. 44% relapse–recurrence, $p < .01$), and used an instrument cutpoint in their relapse–recurrence definitions (30% vs. 55% relapse–recurrence, $p < .01$). There was less evidence that the following variables moderated relapse–recurrence ($ps > .17$): MDD subtype (recurrent vs. other) at study entry, use of MDE diagnostic criteria and instrument cutpoints in treatment response definitions, strictness of response definitions (number of required components, instrument cutpoint and MDE diagnostic criteria), use of retreatment–hospitalization in relapse–recurrence definitions, strictness of relapse–recurrence definitions (number of required components, instrument cutpoint, MDE diagnostic criteria, and retreatment–hospitalization), and age of studies.

Interpretation of these seven potential moderators is complex because many are substantially intercorrelated ($|r|_{Mdn}$ = .41, range = .05–.76). For example, studies assessing CT therapists' competence had longer follow-up periods (r = .67), studies using instrument cutpoints in relapse–recurrence definitions had shorter follow-up periods (r = −.76), and studies using MDE criteria in relapse–recurrence definitions less often left gaps in follow-up assessment time (r = −.54). Reliably isolating the influence of each moderator is further complicated by the small number of studies. In a multivariate model, the seven potential moderators collectively accounted for 83% of the variance in relapse–recurrence rates among studies, and the residual variance was not greater than expected from sampling error alone, $Q(5) = 6.74$, p = .24. Only assessment of adherence and using instrument cutpoints in relapse–recurrence definitions were significant predictors (ps < .10) in the context of the other variables in the multivariate model.

Does A-CT Reduce Relapse–Recurrence More Than Other Acute-Phase Treatments?

A-CT versus acute-phase pharmacotherapy—Seven clinical trials provided data (see Table 2). A-CT reduced relapse–recurrence significantly compared with pharmacotherapy (see Table 3), and effect sizes did not vary significantly among studies. The mean AUC indicates that a patient treated with A-CT has a 61% chance of a better outcome (not relapsing–recurring) than a patient treated with pharmacotherapy. Expressed as RD, A-CT reduces the chance of relapse–recurrence 22% compared with pharmacotherapy. Expressed as NNT, 5 patients would need to be treated with A-CT instead of pharmacotherapy to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 39% (2.5% per month; A-CT) and 61% (3.9% per month; pharmacotherapy) over a mean of 68 weeks.

A-CT plus pharmacotherapy versus acute-phase pharmacotherapy alone—Six studies contributed data (see Table 2). The addition of A-CT to pharmacotherapy reduced relapse–recurrence significantly compared with pharmacotherapy alone (see Table 3), and effect sizes did not vary significantly among studies. Patients treated with A-CT plus pharmacotherapy had a 61% chance of a better outcome (not relapsing–recurring) than those treated with pharmacotherapy alone, and A-CT reduced the chance of relapse–recurrence 23%. Four patients would need to be treated with pharmacotherapy plus A-CT instead of pharmacotherapy alone to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 38% (2.9% per month; pharmacotherapy plus A-CT) and 65% (5.0% per month; pharmacotherapy alone) over a mean of 56 weeks.[1]

A-CT plus pharmacotherapy versus A-CT alone—Three studies contributed data (see Table 2). The addition of pharmacotherapy to A-CT did not reduce relapse–recurrence significantly compared with A-CT alone (see Table 3), and effect sizes did not vary significantly among studies. Averaging separately by treatment type yielded relapse–recurrence rates of 33% (2.4% per month; A-CT alone) and 39% (2.8% per month; A-CT plus pharmacotherapy) over a mean of 61 weeks. Given the small number of studies available, this null finding should be viewed with caution.

A-CT versus other acute-phase depression-specific psychotherapies—Four studies contributed data (see Table 2). Relapse–recurrence rates did not differ significantly between A-CT and other depression-specific psychotherapies (see Table 3), and effect sizes did not vary significantly among studies. Averaging separately by treatment type yielded relapse–recurrence rates of 25% (1.2% per month; A-CT) and 29% (1.3% per month; other

[1]Because of variations in computational strategies, RD estimated from mean AUC will not always equal the difference in mean proportions derived separately.

psychotherapies) over a mean of 92 weeks. Given the small number of studies available, this null finding should be viewed with caution. Moreover, two of the four studies compared CT with conceptually similar behavioral interventions (Gortner, Gollan, Dobson, & Jacobson, 1998;Jacobson, Fruzzetti, Dobson, Whisman, & Hops, 1993), one study compared CT with interpersonal therapy (Shea et al., 1992), and the only study to report a significant difference (lower relapse–recurrence with CT) had a psychodynamic–interpersonal therapy comparison condition (Shapiro et al., 1995).

Does C-CT Reduce Relapse–Recurrence Compared With Outcome in Nonactive Controls?

Relapse–recurrence rates at the end of C-CT—Four studies contributed data (see Table 4). C-CT reduced relapse–recurrence significantly compared with the outcome in nonactive controls (assessment only), and effect sizes did not vary significantly among studies (see Table 3). Patients receiving C-CT had a 61% chance of a better outcome (not relapsing–recurring) by the end of the continuation-phase treatment than those who were only assessed, and C-CT reduced the chance of relapse–recurrence 21%. Five patients would need to be treated with C-CT instead of only being assessed to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 12% (1.2% per month; C-CT) and 38% (4.0% per month; nonactive controls) over a mean of 41 weeks. One included study, Klein et al. (2004), tested a form of maintenance CT by excluding patients who relapsed during a continuation phase of the same treatment. The other included studies (Jarrett et al., 1998,2000,2001) evaluated C-CT implemented immediately after A-CT. Removing Klein et al. from the analysis, however, did not change the result substantively (mean AUC = .61, 95% confidence interval = .52–.71).

Relapse–recurrence rates after discontinuing C-CT—Five studies contributed data (see Table 4). As shown in Table 3, C-CT reduced relapse–recurrence significantly compared with the outcome in nonactive controls (assessment only or clinical management) and effect sizes did not vary significantly among studies. Patients treated with C-CT had a 64% chance of a better outcome (not relapsing–recurring) than control patients, and C-CT reduced the chance of relapse–recurrence 29% including the time after C-CT was discontinued. Four patients would need to be treated with C-CT instead of only being assessed to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 40% (1.1% per month; C-CT) and 73% (2.1% per month; nonactive controls) over a mean of 153 weeks. Among included studies, Jarrett et al. (2001) reported that C-CT reduced relapse–recurrence more for patients with unstable (vs. stable) remission during A-CT and for patients with early (vs. late) onset of MDD.

Does C-CT Reduce Relapse–Recurrence Compared With Outcome in Active Controls?

Relapse–recurrence rates at the end of continuation-phase treatment—Five studies contributed data (see Table 4). Effect sizes did not vary significantly among studies, and C-CT did not reduce relapse–recurrence significantly compared with the outcome in active controls at the a priori $p < .05$ level (see Table 3). However, the effect was in the expected direction at $p < .06$, two-tailed. We note the relatively small sample sizes and interpret this result to encourage additional research. Patients treated with C-CT had a 56% chance of a better outcome (not relapsing–recurring) than active control patients, and C-CT reduced the chance of relapse–recurrence 12%. Nine patients would need to be treated with C-CT instead of an active control to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 10% (1.6% per month; C-CT) and 22% (3.5% per month; active controls) over a mean of 27 weeks.

Relapse–recurrence rates after continuation-phase treatment is discontinued—Eight studies[2] contributed data (see Table 4). Compared with the outcome in active controls,

C-CT reduced relapse–recurrence significantly (see Table 3) and effect sizes did not vary significantly among studies. Patients treated with C-CT had a 57% chance of a better outcome (not relapsing–recurring) than control patients, and C-CT reduced the chance of relapse–recurrence by 14%. Seven patients would need to be treated with C-CT instead of receiving another active treatment to prevent 1 additional patient's relapse–recurrence. Averaging separately by treatment type yielded relapse–recurrence rates of 42% (1.6% per month; C-CT) and 61% (2.3% per month; active controls) over a mean of 114 weeks. Some trials reported that patients with a history of three (Ma & Teasdale, 2004;Teasdale et al., 2000) to five (Bockting et al., 2005) MDEs responded better to C-CT than patients with fewer past episodes.

Discussion

This meta-analytic review of the world's published literature provides current answers to four questions about preventing relapse–recurrence in MDD. First, we found that relapse–recurrence is quite common among responders to A-CT. We estimate that about half of responders to A-CT (54%) will relapse–recur within 2 years if they do not receive continuation-phase treatment. Second, we nonetheless found that A-CT reduces relapse–recurrence significantly compared with acute-phase pharmacotherapy discontinued, whether A-CT is combined with acute-phase pharmacotherapy (22% reduction) or not (23% reduction). This is important because whereas prescribers continue pharmacotherapy, patients frequently do not (Olfson, Marcus, Tedeschi, & Wan, 2006). We recommend that patients, clinicians, and authors of treatment guidelines consider the preventive effect of A-CT compared with pharmacotherapy in their acute-phase treatment selection.

Expressing our findings as NNT informs expectations about the impact of CT on a patient population. NNT specifies the average number of patients that clinicians would need to treat with the more effective treatment (e.g., A-CT) instead of with the less effective treatment (e.g., pharmacotherapy alone) to realize a savings of 1 patient's relapse–recurrence. We found that for every 4 to 5 patients treated with A-CT, instead of or in addition to acute-phase pharmacotherapy, 1 additional patient's relapse–recurrence would be prevented. The potential public health significance of this effect becomes apparent when considering the incidence of depression. For example, if we assume, using current epidemiological data, that (a) ~35,000,000 people have MDD each year in the United States (Kessler et al., 2003), (b) ~16% (5,600,000) of persons with depression receive adequate pharmacotherapy (A. S. Young, Klap, Sherbourne, & Wells, 2001), (c) ~50% (2,800,000) of patients with depression respond to acute-phase treatment (Hollon, Jarrett, et al., 2005), and (d) ~72% (2,016,000) of patients discontinue pharmacotherapy within 90 days (Olfson et al., 2006), then the potential savings achieved by treating these patients with A-CT is roughly 448,000 relapses–recurrences annually.

Although A-CT prevents some relapse–recurrence compared with acute-phase pharmacotherapy, the high rate of relapse–recurrence after acute treatments supports the need for continuation-phase treatments. Third, we found that C-CT reduces relapse–recurrence significantly compared with nonactive comparison conditions (i.e., assessment-only) over the period that the continuation-phase treatment is in effect (21% reduction) and after continuation-phase discontinuation at later follow-ups (29% reduction). Finally, we found that C-CT reduces relapse–recurrence compared with other active continuation-phase treatments (e.g., pharmacotherapy) at similar levels at the end of continuation-phase treatment (12% reduction)

[2]Kuehner (2005) published an uncontrolled follow-up of patients ($N = 44$) remitted from MDD (no current MDE, but some had residual symptoms) who were then treated with C-CT in a group format. The patient sample was partly overlapping with a controlled study included in our meta-analyses, Kühner, Angermayer, and Veiel (1996). Consequently, we excluded Kuehner from our computations, although the study is conceptually relevant and provides data on 23 additional patients. Similar to the findings in this meta-analysis, Kuehner reported a cumulative relapse–recurrence (MDE) rate of 45% at 84 weeks after the end of C-CT.

and at later follow-up (14% reduction). We recommend that patients and clinicians consider C-CT after remission during acute treatments to reduce risk for relapse, and perhaps recurrence. For every 4 to 5 patients treated with C-CT instead of discontinuing acute treatment, and for every 8 to 9 patients treated with C-CT instead of other continuation-phase treatments (treatment as usual and/or pharmacotherapy), 1 additional patient's relapse–recurrence would be prevented. Future research is necessary before recommendations can be made regarding the effects of maintenance-phase CT in delaying or preventing recurrence.

The quantity and quality of data available for meta-analysis temper our recommendations and suggest improvements needed in future clinical trials. Of importance, the number of studies available for some contrasts was small (e.g., three to five studies). Consequently, some conclusions about CT's effects on relapse–recurrence may shift substantially (e.g., relapse–recurrence after A-CT vs. other depression-specific psychotherapies) as future research becomes available. Moreover, studies included in our analyses treated mostly White patients, leaving open questions of the generalizability of our findings to other ethnic groups. Additional clinical trials investigating the effects of CT on relapse and recurrence compared with other treatments, and including ethnically diverse samples, would be clear and important contributions to the field.

Several variables moderated estimates of relapse–recurrence after A-CT in our meta-analysis. As more studies become available, researchers may be able to clarify the unique effects of these design and analysis issues on relapse–recurrence estimates. In the meantime, we report moderators of relapse–recurrence estimates for consideration in the design and interpretation of clinical trials. For example, studies that provided relapse–recurrence estimates using categorical proportions rather than longitudinal survival estimates, and studies with assessment strategies leaving gaps rather than completing covering the follow-up period, had lower relapse–recurrence rates. Clearly, studies with longer follow-up periods had higher relapse–recurrence rates.

Because the concepts of relapse and recurrence are inherently longitudinal, assessment and statistical methods also must be longitudinal. We recommend that researchers use instruments such as the Longitudinal Interval Follow-up Evaluation (Keller et al., 1987) to capture relapse–recurrence events more completely than do static assessments (e.g., an assessment at 12 months post acute-phase treatment focusing on symptoms during the past month) that may miss patients who relapse–recur but then remit. Similarly, we recommend that researchers consider time-to-event (“survival”) analyses (e.g., Kaplan–Meier product-limit and Cox proportional hazard models) to estimate relapse–recurrence rates and remain vigilant to improved or supplemental methodologies for longitudinal analysis. Survival analyses provide more accurate estimates of relapse–recurrence than do simple proportions when data sets contain patients who do not relapse–recur by the end of the follow-up period or attrit (“censored” cases; Cohen, Cohen, West, & Aiken, 2003; Keller, Shapiro, Lavori, & Wolfe, 1982). Different rates of attrition between conditions, especially, have the potential to bias comparisons of CT with other treatments and increase the need for survival analyses.

Only about half of the studies in our review documented adherence and/or competence in CT, and we recommend that future researchers use standard instruments (e.g., Hollon et al., 1988; Liese, Barber, & Beck, 1995; J. Young & Beck, 1980) to do so. Moreover, some otherwise excellent studies did not meet our inclusion criteria because they reported data inconsistently with consensus definitions of relapse and recurrence (Frank et al., 1991; Rush et al., 2006). Consistent with our analyses, we recommend that the term *relapse* (e.g., meeting MDE criteria) be applied only to patients who have first achieved some level of *remission* (e.g., several weeks with minimal depressive symptoms and no MDE) and that *recurrence* (e.g., meeting MDE criteria) be applied only to patients who have first achieved *recovery* (e.g.,

several months without meeting criteria for MDE). Idiosyncratic strategies for reporting depressive symptom data may limit the accumulation of knowledge across studies.

Several studies reported internal moderators that clinicians and researchers should consider. Not surprisingly, C-CT may be more necessary for patients at higher risk for relapse–recurrence, including those with a history of more MDEs (Bockting et al., 2005; Ma & Teasdale, 2004; Teasdale et al., 2000), an earlier onset of MDD (Jarrett et al., 2001), and unstable remission during A-CT (Jarrett et al., 2001). Developing knowledge of moderators is useful clinically because A-CT appears to have an enduring, albeit likely finite, effect for about half of the A-CT responders. For example, clinicians can advise responders finishing a course of A-CT about their chances of relapse–recurrence with and without C-CT given their level of residual symptoms (Jarrett, Vittengl, & Clark, 2005, in preparation). Certainly, attention to documenting the number of MDEs patients have experienced previously is essential in studying relapse and recurrence.

A number of studies excluded details about the amount of treatment received by patients, including CT sessions completed and extraprotocol treatment. These variables have the potential to influence interpretation of CT's benefits significantly. Our reading of the literature suggests that research reports often include the number of CT sessions offered to patients (i.e., sessions in the protocol), but less often include the number of sessions actually received by patients—usually a smaller number and arguably the more important variable (e.g., Hollon et al., 1992; Jarrett et al., 2001). Similarly, research reports often omit the amount and types of extraprotocol treatment that patients receive (e.g., after the end of acute-phase treatment). Moreover, strategies for handling extraprotocol treatment vary from viewing any extraprotocol treatment as part of naturalistic follow-up (e.g., Simons, Murphy, Levine, & Wetzel, 1986), to censoring from analyses patients receiving extraprotocol treatment without a documented relapse–recurrence (e.g., Hollon, DeRubeis, et al., 2005), to including extraprotocol treatment referral and seeking in relapse–recurrence definitions (e.g., Blackburn, Eunson, & Bishop, 1986). We recommend that researchers measure and report receipt of CT and extraprotocol treatment, test the associations of these variables with relapse–recurrence within and between treatment conditions (e.g., as covariates in survival analyses), and describe the criteria applied when censoring outcomes during survival analyses.

Our meta-analyses do not clarify mechanisms of A-CT's and C-CT's reduction of relapse–recurrence. We speculate that CT teaches compensatory skills (e.g., managing cognition and social relationships) that some patients implement successfully to reduce internal and external risks for relapse–recurrence (Barber & DeRubeis, 2001; Jarrett, 1989; Jarrett & Kraft, 1997). Comparable learning may not take place with pharmacotherapy alone, and A-CT responders may further increase compensatory skills when they receive C-CT. Future research might profitably address questions of optimal “dosing” with CT (i.e., number of sessions completed over variable intervals plus duration and focus of treatment phase) for distinct subgroups, as well as mediation of outcomes through development of specific compensatory skills or other hypothesized active therapeutic ingredients. Methodologically rigorous and consistent investigation of relapse and recurrence in MDD will facilitate acquisition of knowledge about their prevention through A-CT, C-CT, and other effective treatments.

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Appendix: Examples of Studies Excluded From Meta-Analyses

Study	Type	Reasons excluded
Baker and Wilson (1985)	Continuation phase	Did not separate responders from nonresponders in presentation of relapse data.
Beck et al. (1985)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data.
Bowers (1990)	Acute phase	No relapse data.
Collet et al. (1987)	Acute phase	No relapse data; no formal definition of response.
Cooper et al. (2003)	Acute phase	No relapse data.
Covi and Lipman (1987)	Acute phase	No relapse data.
Fennell and Teasdale (1982)	Acute phase	No relapse data; no formal definition of response.
Gallagher and Thompson (1982)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data.
Gallagher-Thompson et al. (1990)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data for CT. Present relapse data for responders collapsed across behavioral, CT, and psychodynamic treatment cells.
Gonzales et al. (1985)	Acute phase	Provide recovery and relapse data for a sample exposed to CT, but unclear whether patients recovered during or several months after completing CT.
Kavanagh and Wilson (1989)	Continuation phase	Reported relapse only for collapsed continuation and no continuation treatment groups.
Kovacs et al. (1981)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data.
López (1982)	Acute phase	No relapse data; no formal definition of response.
McLean and Hakstian (1990)	Acute phase	No relapse data; no formal definition of response.
Neimeyer and Feixas (1990)	Acute phase	No relapse data; no formal definition of response.
O'Leary and Beach (1990)	Acute phase	No relapse data; no formal definition of response.
Ross and Scott (1985)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data.
M. J. Scott and Stradling (1990)	Acute phase	No relapse data; no formal definition of response.
C. Scott et al. (1997)	Acute phase	Compared TAU in primary care to TAU plus brief CT. TAU included pharmacotherapy for most patients. Unclear for which patients pharmacotherapy was continued or discontinued during follow-up.
Teasdale et al. (1984)	Acute phase	Did not separate responders from nonresponders in presentation of relapse data.

Note. CT = cognitive-behavioral therapy; TAU = treatment as usual.

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Table 1
Characteristics of Studies Included in the Meta-Analyses

Characteristic	No. of studies	% of studies
Unipolar major depression diagnosis of study sample		
Recurrent subtype only	7	25
Single episode subtype only	0	0
Other, various, or unspecified subtypes	21	75
Measured therapists' adherence to CT with study patients		
Yes	12	43
No	16	57
Measured therapists' competence in CT with study patients		
Yes	13	46
No	15	54
Definition of response to acute-phase treatment		
Instrument cutpoint only	15	54
Absence of major depressive episode only	4	14
Both	9	32
Definition of relapse–recurrence		
Diagnosis of major depressive episode only	12	43
Instrument cutpoint only	6	21
Retreatment or rehospitalization only	0	0
Combination of the above	10	36
Data collection used to detect relapse–recurrence		
Covers follow-up time continuously without gaps	19	68
Appears to leave gaps in follow-up time	5	18
Unclear whether gaps exist in follow-up time	4	14
Statistic used to quantify rate of relapse–recurrence		
Survival analysis	7	25
Simple proportions[a]	21	75

Note. For each study characteristic, categories are mutually exclusive.

[a] Includes nine studies that used survival analysis to generate figures and/or probability values for hypothesis tests but quantified relapse-recurrence rates as simple proportions.

Table 2

Studies Included in the Meta-Analyses of Acute-Phase Cognitive–Behavioral Therapy (CT)

Study	Patient characteristics	Relevant treatment conditions	Acute-phase treatment response definition	Relapse–recurrence definition	Weeks after end of acute treatment	No. of responders per treatment cell	Percentage relapse–recurrence
de Jong-Meyer et al. (1996)	Inpatients and outpatients with endogenous MDD; BDI ≥ 21 and HRSD ≥ 21	a. A-MED b. A-MED + A-CT	HRSD ≤ 8 and BDI ≤ 8	IDSC ≥ 21 for ≥ 2 months	52	a. 36 b. 35	a. 61.0[a] b. 57.0[a]
Evans et al. (1992)	Outpatients with MDD	a. A-CT b. A-MED c. A-CT + A-MED	BDI ≤ 15	BDI ≥ 16 for ≥ 2 weeks	104	a. 10 b. 10 c. 13	a. 21.0[b, c, d] b. 50.0[a,c] c. 15.0[a,d]
Gortner et al. (1998)	Outpatients with MDD, BDI ≥ 20, and HRSD ≥ 14	a. A-CT b. Reduced A-CT	No MDE (LIFE PSRs of 1–2) for 8 consecutive weeks following acute treatment	MDE	104	a. 28 b. 47	a. 46.4[b,e] b. 42.6[e]
Hautzinger and Welz (2004)	Outpatients with MDD, older adults (> 60 years), IDSC ≥ 21	a. A-TAU + group A-CT b. A-TAU	GDS ≤ 12 and IDSC ≤ 9	IDSC ≥ 21	52	a. 36 b. 24	a. 31.0[a] b. 78.0[a]
Hautzinger et al. (1996)	Inpatients and outpatients with nonmelancholic depressive diagnoses (*DSM-IV* MDD or dysthymia; and *IDC-9* neurotic depression); BDI ≥ 21 and HRSD ≥ 21	a. A-CT b. A-MED c. A-CT + A-MED	HRSD ≤ 8 and BDI ≤ 8	IDSC ≥ 21 for ≥ 2 months	52	a. 41 b. 34 c. 48	a. 51.0[b, c, d] b. 67.0[a, c] c. 51.0[a, d]
Hollon, DeRubeis, et al. (2005)	Outpatients with MDD; HRSD ≥ 20 for ≥ 2 weeks	a. A-CT[f] b. A-MED →C-PLA	HRSD ≤ 12 at end of acute phase	MDE or HRSD ≥ 14 for ≥ 2 weeks	52	a. 35 b. 35	a. 30.8[b, c] b. 76.2[c]
Jacobson et al. (1993)	Married female outpatients with MDD; BDI ≥ 20; HRSD ≥ 14; partners willing to attend couples therapy	a. A-CT b. A-BCT	No MDD and BDI ≤ 9	BDI ≥ 16	52	a. 13 b. 10	a. 15.4[b, e] b. 10.0[e]
Jarrett et al. (1998)	Outpatients with MDD, HRSD ≥ 12	a. A-CT	HRSD ≤ 10	MDE	104	a. 37	a. 74.0[b]
Jarrett et al. (2001)	Outpatients with recurrent MDD; HRSD ≥ 16	a. A-CT	No MDD and HRSD ≤ 9	MDE	104	a. 43	a. 50.4[b, g]
Jarrett et al. (2000)	Outpatients with atypical MDD; HRSD ≥ 14	a. A-CT b. A-MED	No MDD and HRSD ≤ 9	MDE or retreatment for depression	104	a. 7 b. 5	a. 83.0[b, c] b. 75.0[c]
Miller et al. (1989)	Inpatients with MDD; BDI > 17; HRSD > 17	a. A-CT[h] + A-TAU b. A-TAU	All of HRSD < 7, BDI < 9, and SSI < 7	Any of HRSD > 17, BDI > 16, SSI > 7, or psychiatric rehospitalization	52	a. 20 b. 6	a. 20.0[a] b. 50.0[a]

Study	Patient characteristics	Relevant treatment conditions	Acute-phase treatment response definition	Relapse–recurrence definition	Weeks after end of acute treatment	No. of responders per treatment cell	Percentage relapse–recurrence
Segal et al. (2006)	Outpatients with MDD; HRSD ≥ 12	a. A-CT b. A-MED	No MDE and HRSD ≤10 for≥ 12 weeks	MDE, and BDI ≥ 15 or HRSD ≥ 16	78	a. 59 b. 40	a. 39.0[b, c] b. 47.5[c]
Shapiro et al. (1995)	White-collar workers seeking treatment for depression; BDI ≥ 16; MDE for past 3 months	a. A-CT[i] b. A-PIT	BDI ≤ 8	BDI ≥ 16, or BDI ≥ 9 and retreatment for depression	52	a. 29 b. 24	a. 6.9[b, e] b. 16.7[e]
Shea et al. (1992)	Outpatients with MDD; HRSD ≥ 14	a. A-CT b. A-IPT c. A-MED + A-CM	No MDE (LIFE MDE PSRs of 1–2) for 8 consecutive weeks following acute treatment	MDE	78	a. 22 b. 21 c. 18	a. 36.4[b, c, e] b. 33.3[e] c. 50.0[c]
Simons et al. (1986)	Outpatients with MDD; BDI ≥ 20; HRSD ≥ 14	a. A-CT b. A-CT + A-MED c. A-MED	BDI < 10	Retreatment for depression or BDI ≥ 16	52	a. 10 b. 14 c. 9	a. 20.0[b, c, d] b. 42.9[a, d] c. 66.7[a, c]
Thase et al. (1992)	Outpatients with primary MDD duration of ≤ 18 months; HSRD ≥ 15	a. A-CT	HRSD ≤ 10 for ≥ 2 weeks and ≥ 50% reduction in intake HRSD	MDE and HRSD ≥ 15	52	a. 50	a. 32.0[b]

Note. All studies with more than one treatment cell in the table used random assignment. MDD = major depressive disorder; BDI = Beck Depression Inventory (Beck et al., 1961); HRSD = Hamilton Rating Scale for Depression (Hamilton, 1960); A- = acute treatment phase; MED = pharmacotherapy; + = combination of treatments in the same treatment phase; IDSC = Inventory for Depressive Symptomatology—Clinician version (Rush et al., 1986); Reduced A-CT = pooled acute behavior activation (BA) and BA plus automatic thought modification groups; LIFE = Longitudinal Follow-up Evaluation (Keller et al., 1987); PSR = Psychiatric Status Rating; MDE = major depressive episode; TAU = treatment as usual; GDS = Geriatric Depression Scale (Yesavage et al., 1983); → = responders to a treatment phase entered the next treatment phase; C- = continuation treatment phase; PLA = pill placebo; BCT = behavioral couples therapy; SSI = Scale for Suicidal Ideation (Miller et al., 1986); PIT = psychodynamic-interpersonal psychotherapy (pooled 8-and 16-session groups); IPT = interpersonal psychotherapy; CM = clinical management.

[a] Used in meta-analysis of relapse after response to A-CT + A-MED versus after A-MED alone.

[b] Used in meta-analysis of relapse after response to A-CT.

[c] Used in meta-analysis of relapse after response to A-CT versus after A-MED.

[d] Used in meta-analysis of relapse after response to A-CT + A-MED versus after A-CT alone.

[e] Used in meta-analysis of relapse after response to A-CT versus other depression-specific psychotherapies alone.

[f] Included up to three booster CT sessions after the acute phase.

[g] Group total estimated from interaction data presented in article.

[h] Pooled CT and social skills training groups.

[i] Pooled 8- and 16-session groups.

Table 3

Summary of Meta-Analyses Comparing Relapse-recurrence Rates Among Acute Phase Treatment Responders

Focus treatment	Comparison treatment	*k*	*N*	*Q* (*k* − 1)	Time frame	Mean effect (CI_{95})	Risk difference (%)	No. needed to treat
Acute phase treatment analyses								
Acute CT discontinued	—	13	364	40.40**	52–104 weeks after end of acute-phase treatment	Relapse proportion = .39** (.29–.50)	—	—
Acute CT discontinued	Acute pharmacotherapy discontinued	7	335	6.14	52–104 weeks after end of acute-phase treatment	AUC = .61** (.54–.67)	22	4.6
Acute CT plus pharmacotherapy discontinued	Pharmacotherapy discontinued	6	285	4.93	52–104 weeks after end of acute-phase treatment	AUC = .61** (.54–.68)	23	4.4
Acute CT discontinued	Acute CT plus pharmacotherapy discontinued	3	136	0.86	52–104 weeks after end of acute-phase treatment	AUC = .51 (.42–.61)	3	34.3
Acute CT discontinued	Other depression-specific psychotherapies discontinued	4	194	0.52	52–104 weeks after end of acute-phase treatment	AUC = .50 (.42–.58)	0	—
Continuation phase treatment analyses								
Continuation CT	Nonactive control	4	234	0.18	At end of 35–52 weeks of continuation-phase treatment	AUC = .61** (.53–.68)	21	4.7
Continuation CT	Nonactive control	5	232	3.44	69–312 weeks after end of continuation-phase treatment	AUC = .64** (.57–.72)	29	3.5
Continuation CT	Active control	5	359	1.94	At end of 20–52 weeks of continuation-phase treatment	AUC = .56* (.50–.62)	12	8.5
Continuation CT	Active control	8	626	7.58	10–255 weeks after end of continuation-phase treatment	AUC = .57** (.52–.61)	14	7.8

Note. *k* = number of studies; *N* = total number of patients; *Q* = homogeneity test statistic; CI_{95} = 95% confidence interval; CT = cognitive-behavioral therapy; AUC = area under the curve. Mean effect size was derived from random-effects meta-analysis. In each row, AUC > .50 indicates that the focus treatment produced less relapse than the comparison treatment. Risk difference was derived from AUC to estimate the difference in relapse proportions between treatments. Number needed to treat was derived from AUC to estimate how many eligible patients would have to be treated with the focus treatment, instead of with the comparison treatment, to save 1 additional patient from relapse.

* $p < .10$.

** $p < .05$.

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Table 4

Studies Included in Meta-Analysis of Continuation-Phase Cognitive–Behavioral Therapy (CT)

Study	Patient characteristics	Relevant treatment conditions	Treatment response definition	Relapsed– recurrence definition	Weeks after end of treatment: Acute	Weeks after end of treatment: Continuation	No. of responders per treatment cell	Percentage relapse–recurrence
lackburn ad oore 997)	Outpatients with recurrent MDD; HRSD ≥ 16	a. A-CT → C-CT b. A-MED → C-MED	HRSD ≤ 14	HRSD ≥ 15	52	0	a. 17 b. 13	a. 23.5[a] b. 30.8[a]
lackburn al. 986)	Outpatients with MDD; BDI ≥ 14	a. A-CT → C-CT b. A-MED → C-MED	BDI ≤ 8 and/or HRSD ≤ 9	BDI ≥ 10 and HRSD ≥ 9	26	0	a. 15 b. 10	a. 6.7[a] b. 30.0[a]
lackburn al. 986)	Outpatients with MDD; BDI ≥ 14	a. A-CT → C-CT b. A-MED → C-MED	BDI ≤ 8 and/or HRSD ≤ 9	BDI ≥ 10 and HRSD ≥ 9; or retreatment	104	78	a. 13 b. 9	a. 23.1[b] b. 77.7[b]
ocking al. 006)	Outpatients with recurrent MDD; in remission for 2–104 weeks; current HRSD ≥ 9	a. C-TAU + group C-CT b. C-TAU	—	MDE	—	96	a. 88 b. 84	a. 56.8[b] b. 61.9[b]
ava et al. 998)	Outpatients with MDD	a. A-MED → C-CM b. A-MED → C-CT	Rated clinically as "better" or "much better" and in full remission; no evidence of depressed mood on the CID	MDE	332	312	a. 20 b. 20	a. 75.0[c] b. 50.0[c]
ava et al. 004)	Outpatients with recurrent MDD	a. A-MED → C-CM b. A-MED → C-CT	Rated clinically as "better" or "much better" and in full remission; no evidence of depressed mood on the CID	MDE	332	312	a. 20 b. 20	a. 90.0[c] b. 40.0[c]
ava et al. 002)	Outpatients with recurrent MDD who had responded then relapsed (MDE) while on A-MED	a. C-MEDI + C-CM b. C-MED + C-CM + C-CT	≥ 50% score reduction on CID; rated clinically as "better" or "much better"	MDE	—	52	a. 4 b. 4	a. 100[b] b. 25.0[b]
rrett et (1998)	Outpatients with MDD; HRSD ≥ 12	a. A-CT b. A-CT → C-CT	HRSD ≤ 10	MDE	35	0	a. 37 b. 17	a. 45.0[d] b. 20.0[d]
rrett et (1998)	Outpatients with MDD; HRSD ≥ 12	a. A-CT b. A-CT → C-CT	HRSD ≤ 10	MDE	104	69	a. 37 b. 17	a. 74.0[c] b. 36.0[c]
rrett et (2000)	Outpatients with atypical MDD; HRSD ≥ 14	a. A-CT b. A-MED → c. A-CT → C-CTC-MED	No MDD and HRSD ≤ 9	MDE or retreatment for depression	35	0	a. 7 b. 7	a. 50.0[d] b. 36.0[a] c. 20.0[a, d]
rrett et (2000)	Outpatients with atypical MDD; HRSD ≥ 14	a. A-CT b. A-MED → c. A-CT → C-CTC-MED	No MDD and HRSD ≤ 9	MDE or retreatment for depression	104	69	a. 7 b. 7 c. 7	a. 83.0[c] b. 57.0[b] c. 40.0[b, c]
rrett et (2001)	Outpatients with recurrent MDD; HRSD ≥ 16	a. A-CT b. A-CT → C-CT	No MDD and HRSD ≤ 9	MDE	35	0	a. 43 b. 41	a. 30.9[d] b. 10.3[d]
rrett et (2001)	Outpatients with recurrent MDD; HRSD ≥ 16	a. A-CT b. A-CT → C-CT	No MDD and HRSD ≤ 9	MDE	104	69	a. 43 b. 41	a. 50.4[c, e] b. 37.6[c, e]
lein et (2004)	Outpatients with MDD for 2+ years (chronic, recurrent, or double	a. A-CBASP → C-CBASP → M-CBASP b. A-CBASP → C-CBASP	HRSD decreased ≥ 50% in CBASP and stayed ≤ 15 during C-CBASP	MDD and HRSD ≥ 16 for ≥ 2 visits	52	0	a. 42 b. 40	a. 2.6[d] b. 20.9[d]

Study	Patient characteristics	Relevant treatment conditions	Treatment response definition	Relapsed– recurrence definition	Weeks after end of treatment: Acute	Weeks after end of treatment: Continuation	No. of responders per treatment cell	Percentage relapse–recurrence
	depression); HRSD ≥ 20							
Kühner et al. (1996)	Outpatients and discharged inpatients with MDD	a. A-TAU → C-TAU (but no individual psychotherapy) + group C-CT b. A-TAU → C-TAU (but no individual psychotherapy)	No MDD	MDE	26	10	a. 21 b. 21	a. 14.3[b] b. 42.9[b]
Ma and Teasdale (2004)	Outpatients with recurrent MDD in recovery for ≥ 12 weeks; previously treated with MED but not in ≥ 12 weeks; current HRSD ≤ 9	a. C-TAU b. C-TAU + C-MBCT	—	MDE	—	52	a. 37 b. 36	a. 62.2[b, e] b. 38.9[b, e]
Paykel et al. (2005)	Outpatients with MDD	a. A-MED → C-MED b. A-MED → C-MED + C-CT	No MDD but residual symptoms (HRSD ≥ 8 and BDI ≥ 9)	MDE for ≥ 1 month	20	0	a. 78 b. 80	a. 24.0[a] b. 5.0[a]
Paykel et al. (2005)	Outpatients with MDD	a. A-MED → C-MED b. A-MED → C-MED + C-CT	No MDD but residual symptoms (HRSD ≥ 8 and BDI ≥ 9)	MDE for ≥ 1 month	275	255	a. 78 b. 80	a. 65.0[b] b. 60.0[b]
Perlis et al. (2002)	Outpatients with chronic MDD and HRSD ≥ 16	a. A-MED → C-MEDI b. A-MED → C-MEDI + CT	HRSD ≤ 7	MDE or HRSD ≥ 15 at 2 consecutive visits	28	0	a. 66 b. 66	a. 7.6[a] b. 6.1[a]
Teasdale et al. (2000)	Outpatients with recurrent MDD in recovery for ≥ 12 weeks; previously treated with MED but not in ≥ 12 weeks; current HRSD ≤ 9	a. C-TAU b. C-TAU + C-MBCT	—	MDE	—	52	a. 66 b. 71	a. 57.6[b, e] b. 43.7[b, e]

Note. All studies used random assignment, except Jarrett et al. (1998) and Kühner et al. (1996), who used sequential cohorts and matched control groups, respectively. MDD = major depressive disorder; HRSD = Hamilton Rating Scale for Depression (Hamilton, 1960); A- = acute treatment phase; C- = continuation treatment phase; MED = pharmacotherapy; → = responders to a treatment phase entered the next treatment phase; BDI = Beck Depression Inventory (Beck et al., 1961)); TAU = treatment as usual; + = combination of treatments in the same treatment phase; MDE = major depressive episode; CM = clinical management; CID = Clinical Interview for Depression (Paykel, 1985); MEDI = increase in pharmacotherapy; CBASP = cognitive behavioral analysis system of psychotherapy; M- = maintenance treatment phase; MBCT = mindfulness-based cognitive therapy.

[a] Used in meta-analysis of relapse after C-CT versus active control, at end of C-CT.

[b] Used in meta-analysis of relapse after C-CT versus active control, at follow-up after end of C-CT.

[c] Used in meta-analysis of relapse after C-CT versus nonactive control, at follow-up after end of C-CT.

[d] Used in meta-analysis of relapse after C-CT versus nonactive control, at end of C-CT.

[e] Group total estimated from interaction data presented in the published report.

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