

## **Acceptance and Commitment Therapy versus Traditional Cognitive Behavioral Therapy: A Systematic Review and Meta-analysis of Current Empirical Evidence**

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### **ABSTRACT**

Controversy remains about the empirical status of acceptance and commitment therapy (ACT) and its presumably different characteristics relative to traditional cognitive behavioral therapy (CBT). The current study aims to shed some light in this respect by conducting a systematic review and meta-analysis of the studies that have empirically compared ACT versus CBT. Sixteen studies comparing differential outcomes ( $N= 954$ ) of ACT versus CBT in diverse problems were identified following several search strategies. The meta-analysis, which applied random and mixed effects models, showed that mean effect sizes on primary outcomes significantly favored ACT (Hedges's  $g= 0.40$ ). Mean effect sizes were not significant with anxiety symptoms whereas a positive trend for ACT was obtained in depression ( $g= 0.27$ ) and quality of life ( $g= 0.25$ ) at post-treatment. Likewise, ACT showed a greater impact on its putative processes of change ( $g= 0.38$ ) and no differences were found regarding CBT proposed processes ( $g= 0.05$ ). Nine of the sixteen studies conducted formal mediation analyses. Overall, ACT seemed to work through its proposed processes of change but CBT did not. Results are discussed highlighting the limitations of the current empirical evidence but also emphasizing the relevance of the current findings. *Key words:* Acceptance and Commitment Therapy, Cognitive Behavioral Therapy, systematic review, meta-analysis, mediation analysis.

Cognitive behavioral therapy (CBT) is widely considered as the approach to psychotherapy with more empirical support (e.g., Butler, Chapman, Forman, & Beck, 2006). However, as many authors have noted, it is not an easy task to define CBT because diverse theories, principles, models, and techniques can be categorized with this label (e.g., Craske, 2010; Hayes, 2008; Herbert & Forman, 2011; Levin & Hayes, 2011). In this sense, CBT can be better seen as a tradition based on a scientific approach to psychopathology and psychotherapy than a unified and coherent model.

Most authors recognize that CBT had its roots in the works conducted by Skinner (1953), Wolpe (1958) and Eysenck (1952). These authors used learning principles isolated in laboratory settings to develop a series of techniques (e.g., contingency management, systematic desensitization, exposure) to treat several psychological disorders. However, their theoretical postures were different and led to the development of two wings in behavior therapy (BT) (e.g., Dougher & Hayes, 2000): applied behavior analysis

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closely related to Skinner's radical behaviorism and behavior therapy associated with methodological behaviorism and SR learning theorists. These initial works that were extended between the 1950s and 1960s have been called the first generation of behavior therapy by Hayes (2004).

During the late 1960s, probably due to the dissatisfaction with SR theory to account for human cognition, behavior therapy began to embrace Ellis (1962) and Beck (1963) cognitive approaches. Behavioral and cognitive techniques commenced to be combined in packages of treatment that were then tested. This gradually led to the change from BT to CBT, and was termed by Hayes (2004) as the second generation of BT. However, a main difference from the first generation of BT is that cognitive interventions were developed separately from cognitive science (e.g., Craske, 2010; Hayes, 2004). In practice, some clinicians remained more behaviorally oriented and treated cognitions within a behavioral framework (i.e., applied behavior analysis). Other clinicians embraced an integrative approach and combined behavioral and cognitive techniques. Finally, others were more cognitively focused and considered the content of cognitions as the central factor for behavioral change (Craske, 2010). In spite of these differences, all these clinicians can be seen as CBT-oriented. In the context of this article, this broad view of CBT will be referred to as traditional CBT.

Almost one decade ago, Hayes (2004) proposed the existence of a third generation of CBT represented by therapies that have been developed during the last twenty years and that emphasize the role of acceptance and mindfulness to produce second-order changes instead of changes in cognitive content. One of such therapies, and probably the most representative one, is Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999, 2012; Wilson & Luciano, 2002). In fact, ACT has been the focus of most of the criticisms to the third generation therapies (see reviews in Gaudiano, 2011; Ruiz, 2010).

First, ACT was criticized because of its scarce empirical evidence (Corrigan, 2001). However, a considerable amount of research has been conducted during the last decade showing that ACT is an effective treatment for a wide range of problems (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Ruiz, 2010). Subsequent criticisms (Öst, 2008) focused on the methodological characteristics of ACT studies compared with CBT ones and on whether ACT fulfilled the criteria for being considered as an empirical validated treatment (see Gaudiano, 2009, for a reply). One more recent issue (Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009) has raised regarding whether ACT has more effect than established treatments (see Levin & Hayes, 2009 for a reply). Finally, ACT has been said to be no different from traditional CBT (e.g., Arch & Craske, 2008; Hofmann & Asmundson, 2008) or from other types of therapies (e.g., Hofmann, 2008).

However, ACT proponents consider that this therapy is part of CBT, but with very distinctive characteristics at the same time. First, ACT had its roots in the applied behavior analysis wing of BT. Specifically, ACT is philosophically rooted in Functional Contextualism (FC; Hayes, 1993), a pragmatic philosophy closely related to radical behaviorism. The goals of FC are the prediction and influence of events with precision, scope and depth. Because of these goals, FC understands that every behavior has to be explained in terms of contextual variables because, otherwise, it could not be influenced.

Like CBT, ACT emphasizes the relevance of language and cognition in psychopathology and psychotherapy; however, as rooted in FC, ACT considers that thoughts and beliefs do not directly cause other behaviors. Therefore, no attempt to change the content of cognitions would be necessary to promote behavior change. In this sense, as FC emphasize workability as a truth criterion, thoughts and beliefs are not seen as being correct or incorrect but as if they are or not useful to achieve a more valued life.

A second relevant difference from traditional CBT is that ACT is rooted in a functional contextual approach to human language and cognition: relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001). RFT is based on the principles that were established within the functional analysis of behavior, but it represents a qualitative leap because it integrates disparate areas of behavioral research such as equivalence relations and rule-following for conducting an experimental analysis of complex human behavior. The core RFT assumption is that what are known in nontechnical terms as language and cognition are constituted by generalized relational operants (i.e., relational frames) that are learned through multiple exemplar trainings. RFT is supported by over 100 studies conducted to date and has led to a number of applications in several areas of human behavior (e.g., Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2010; McHugh & Stewart, 2012; Rehfeldt & Barnes-Holmes, 2009). Indeed, ACT was developed taking into account the implications of RFT for the area of psychopathology and psychotherapy (e.g., Barnes-Holmes, Barnes-Holmes, McHugh, & Hayes, 2004; Hayes *et al.*, 1999; Luciano, Valdivia-Salas, & Ruiz, 2012; Törneke, 2010; Törneke, Luciano, & Valdivia-Salas, 2008; Wilson, Hayes, Gregg, & Zettle, 2001; Wilson & Luciano, 2002), and more recent RFT research has addressed applied areas such as the use of metaphors (e.g., Ruiz & Luciano, 2011; Stewart, Barnes-Holmes, Roche, & Smeets, 2002) and defusion techniques (e.g., Luciano, Ruiz, Vizcaíno Torres, Sánchez, Gutiérrez Martínez, López López, 2011).

ACT has its own model of psychopathology and behavioral ineffectiveness represented by psychological inflexibility (Hayes *et al.*, 2006) that emphasizes the maladaptive role of cognitive fusion and experiential avoidance. Cognitive fusion refers to the tendency to act according to the content of private events, such as thoughts, memories, sensations, etc., and it is relevant because it often leads to experiential avoidance when a person does not have the skills to distance him- or herself from the aversive/unwanted private events (Barnes-Holmes, Hayes, & Dymond, 2001; Luciano, Rodríguez, & Gutiérrez, 2004). Experiential avoidance refers to the occurrence of deliberate efforts to avoid and/or escape from private events that are experienced as aversive, even when doing so leads to actions that are inconsistent with one's values and goals (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). There is presently a huge amount of empirical evidence supporting the maladaptive role of psychological inflexibility/experiential avoidance in a wide range of psychological disorders, health conditions, and task performance (e.g., Boulanger, Hayes, & Pistorello, 2010; Farach, Mennin, Smith, & Mandelbaum, 2008; Hayes *et al.*, 2006; López *et al.*, 2010; Ruiz, 2010; Westin, Hayes, & Andersson, 2008).

ACT is usually described in terms of six interrelated middle-level processes that aim to promote psychological flexibility defined as the ability to be in contact with

the private experiences that surface in the present moment without needing to avoid and/or escape from them and to adjust one's behavior according to what the situation requires in order to pursue valued ends (Hayes *et al.*, 2006). These middle-level processes are acceptance, defusion, self as context, contact with the present moment, values, and committed action. However, it is worth noting that these processes are not entirely abstracted from RFT research and need to be more closely defined in terms of RFT formulations (e.g., Hayes, Levin, Plumb-Villardaga, Villatte, & Pistorello, in press; Luciano *et al.*, 2011, 2012; Törneke, 2010).

Briefly, therapeutic work in ACT can be summarized in two principles (e.g., Luciano *et al.*, 2004): (a) promoting values clarification and actions that are in accordance with such values, and (b) promoting defusion as a way to engage in the valued end when the feared private events are present. Although reductions of symptoms or cognitive change might occur across treatment with ACT, they are not the primary goal. Instead, ACT aims to alter their functions in order to allow the patients to behave in accordance with their values.

At a technical level, ACT is eclectic but always guiding the implementation of techniques to promote psychological flexibility. In this sense, ACT makes use of paradoxes, metaphors, and experiential exercises. For instance, experiential and exposure exercises are very important in ACT but they have a different rationale than in traditional CBT. Whereas exposure exercises are conducted in traditional CBT to promote the extinction of discomfort or to disconfirm maladaptive beliefs, exposure exercises in ACT are carried out to train the patients to be present with their feared private events and to choose to behave in a valued way. That is, little effort is put in ACT to reduce fear or to change cognitive content.

Despite the previous description of ACT characteristics, controversy still remains about its empirical status and presumably different characteristics relative to traditional CBT. As Levin and Hayes (2011) stated, the debate is somewhat sterile and, ultimately, it is an empirical question of whether ACT provides something new in relation to traditional CBT. There seems to be at least two ways in which ACT could be considered as a significant addition to CBT. First, and most obviously, ACT would contribute to the progress of CBT if proves to be more efficacious than traditional CBT more generally or with respect to some specific disorders. Second, ACT would be seen as something different from traditional CBT if it works through different processes of change. Accordingly, the aim of this study is to conduct a systematic review and meta-analysis of outcome and mediation/moderation studies that have empirically compared ACT with some kind of traditional CBT.

## METHOD

### *Search*

Studies comparing ACT versus traditional CBT were identified using four search strategies. First, the bibliographic databases PsycInfo and Scopus were searched at the

end of July 2012 using the following command: (acceptance and commitment therapy) AND (cognitive therapy OR behavior therapy). Second, reference lists were examined from articles that met inclusion criteria for the review. Third, the reference lists of reviews and meta-analyses of ACT were reviewed (i.e., Hayes *et al.*, 2006; Montgomery, Kim, & Franklin, 2011; Öst, 2008; Powers *et al.*, 2009; Pull, 2009; Ruiz, 2010; Woidneck, Pratt, Gundy, Nelson, & Twohig, 2012). Fourth, a request for unpublished studies comparing ACT versus CBT was posted in the ACT Listserv and the webpage [www.contextualpsychology.org](http://www.contextualpsychology.org) was explored.

#### *Inclusion criteria*

Studies were included in the review if they constituted an outcome or mediation/moderation study comparing full treatments of face-to-face ACT versus some kind of traditional CBT (i.e., component and self-help studies were not included). Due to limitations in the languages spoken by the author of this research, only studies written in English or Spanish were taken into consideration.

#### *Coding procedures*

Treatment, participant, methodological, and extrinsic variables were coded in order to analyze the characteristics of the studies that could be correlated with the effect size magnitude. The treatment characteristics coded were: (a) type of CBT intervention implemented distinguishing between interventions that did or did not contain cognitive techniques, (b) number of sessions and overall duration of the interventions in hours, and (c) treatment format (group or individual). The participant characteristics coded for the sample of each study were: (d) mean age in years, (e) percentage of females, and (f) type of disorder or problem. The methodological characteristics were coded as follows: (g) design type (randomized controlled versus quasi-experimental), (h) last follow-up in months, and (i) effect size at pretest. Finally, the extrinsic characteristics coded were: (j) year of publication, and (k) country and continent in which the study was conducted.

#### *Effect size calculation*

Controlled between-group effect sizes biases corrected for small samples (Hedges's *g*; Hedges, 1981) were computed with completer participants on all outcome and process measures at pre-treatment, post-treatment, and the last follow-up. When the study did not report means and standard deviations of the groups, the effect sizes were calculated from the results of *t* tests and ANOVAs following the procedures developed by Glass, McGraw, and Smith (1981). When the dependent variable was dichotomic, formulae were applied to obtain the effect size in terms of *g* (Haddock, Rindskopf, & Shasish, 1988). Finally, the first author of the study was requested to provide the necessary raw data to compute *g* when the article did not contain them.

Outcome measures were classified separately for each study into four categories: (a) primary outcome, (b) depression outcome (e.g., BDI, HRSD), (c) anxiety outcome

(e.g., BAI, STAI), and (d) quality-of-life outcome (e.g., QOLI). Only one primary outcome was computed for each study according to its characteristics. For instance, in a depression study, the BDI would be considered the primary and depression outcome measures, whereas in a chronic pain study, the BDI would be considered a secondary outcome measure and, thus, only categorized as a depression outcome. Process measures were classified into two categories: (e) ACT process measures (e.g., experiential avoidance, acceptance, defusion, mindfulness), and (f) CBT process measures (e.g., frequency of automatic thoughts, dysfunctional attitudes, anxiety sensitivity). When there were multiple outcomes per domain, they were combined according to Borenstein, Hedges, Higgins, and Rothstein (2009). Effect sizes were computed so that positive effects represent better results for ACT and negative effects represent better results for CBT. Hedges's  $g$  effect sizes were interpreted using Cohen's rule-of-thumb of small (0.2), medium (0.5), and large (0.8) effects.

### *Statistical analysis*

The meta-analyses were conducted with Comprehensive Meta-Analysis Version 2.2.064 (CMA; Biostat, 2010). Separate meta-analyses were conducted for each  $g$  index at the different phases of the study according to the outcome measure in order to avoid problems of statistical dependence. Effect sizes at post-treatment and follow-up were combined in order to yield an overall effect size; however, data distinguishing both phases are presented separately when they differ from each other.

As heterogeneity between the included studies was expected, the summary effect and 95% confidence intervals were calculated according to a random effects model, which assumed that studies differ from each other as a result both of random error within studies and systematically true variation in effect sizes between studies (Borenstein *et al.*, 2009). Importantly, the random effects model yields the same results as the fixed effects model when there is no heterogeneity (e.g., Cumming, 2012) so that random effects models were used even in the cases in which heterogeneity was nonsignificant. The  $Q$  statistic was used to test for heterogeneity, and the  $I^2$  index to assess the degree of the effect sizes heterogeneity around the mean effect (Cooper, Hedges, & Valentine, 2009). Following the suggestion of Higgins, Thompson, Deeks, and Altman (2003), values of 0%, 25%, 50%, and 75% in the  $I^2$  statistic were considered as indicative of no, low, moderate and high heterogeneity, respectively.

Once confirmed that the effect sizes were heterogeneous, moderator analyses were conducted using CMA. Subgroup analyses were applied to categorical variables using ANOVAs and assuming a random effects model within subgroups and tests for significant differences between subgroups with a fixed effects model assuming a common among-study variance component across subgroups (Borenstein *et al.*, 2009). Meta-regression analyses were applied to continuous variables using a mixed effects model with unrestricted maximum likelihood.

Publication bias was assessed using the classical and Orwin's fail-safe  $N$ , Egger's regression intercept, Begg and Mazumdar's rank correlation, and Duval and Tweedie's trim and fill. Finally, because the  $g$  values at post-treatment and follow-up may provide



a biased estimate of the effects if both groups are not equated in the pre-intervention, the results of the meta-analyses were controlled for the  $g$  index in the pre-treatment. This was done by analyzing whether the  $g$  index at pre-treatment significantly differed from zero and whether the  $g$  index at pre-treatment significantly predicted the effect sizes in subsequent relevant evaluations.

## RESULTS

The search in the bibliographic databases yielded 352 and 332 documents for PsycInfo and Scopus, respectively. Three unpublished studies were sent through the ACT listserve (Karekla, 2004; Larsson, Hooper, Osborne, Bennett, & McHugh, under review; Salgado, 2011) and an unpublished dissertation was identified within the reference lists of ACT reviews and meta-analyses (Block, 2002). Component analyses were excluded from this review (e.g., Gutiérrez, Luciano, Rodríguez, & Fink, 2004; Hofmann, Heering, Sawyer, & Asnaani, 2009; Larsson *et al.*, under review; Moffitt, Brinkworth, Noakes, & Mohr, in press). One unpublished dissertation (Karekla, 2004) focusing on panic disorder compared panic control treatment (PCT; Barlow & Craske, 2000) to a modified version of PCT incorporating an acceptance rationale. Both versions of PCT led to significant and equal improvements; however, this study was not included in this review because ACT as a full treatment was not tested. Another unpublished dissertation (Salgado, 2011) showed that ACT was more efficacious than a mindfulness training using mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) and mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002) for patients suffering from severe mental illness. However, as both MBSR and MBCT were not categorized as traditional CBT, this study was also excluded from this review.

A total of 23 documents described empirical comparison of full packages of ACT versus traditional CBT. However, two of them were excluded from the current review because they compared self-help treatments of ACT and CBT (Hesser *et al.*, 2012 compared ACT versus CBT for tinnitus and found that both treatments were equally effective compared to a control group; Thorsell *et al.*, 2011 compared ACT versus applied relaxation for chronic pain and found better outcomes for ACT). Another five studies (Arch, Wolitzky-Taylor, Eifert, & Craske, 2012; Forman, Chapman, Herbert, Goetter, Yuen, & Moitra, 2012; Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Juarascio, Forman, & Herbert, 2010; Wolitzky-Taylor, Arch, Rosenfield, & Craske, in press) reported outcome and/or mediation/moderation data from main outcome studies (Arch, Eifert, Davies, Plumb-Villardaga, Rose, & Craske, in press; Forman, Shaw, Goetter, Herbert, Park, & Yuen, in press) and, thus, they were not included in the meta-analysis.

In conclusion, sixteen studies met the inclusion criteria for the meta-analyses of outcome and process measures. Five additional articles were included in the review of mediation and moderation studies.

Tables 1 and 2 summarize, respectively, the main characteristics and outcome and mediational results of the studies. Three studies incorporated control conditions

(Block, 2002; Bond & Bunce, 2000; Flaxman & Bond, 2010), but they were not taken into consideration because our primary goal was to compare outcomes and processes of change of ACT versus CBT interventions. Excluding the control conditions, the total number of participants at the beginning was 954. All but one study were randomized controlled trials (RCTs). Eleven studies were focused on depression and/or anxiety-related problems: two on depression, two on mixed symptoms, one on mixed anxiety disorders, one on obsessive-compulsive disorder, one on social anxiety, two on test anxiety, and two on worksite stress. Of the remaining studies, two analyzed addictive behaviors, one was focused on chronic pain, and two on cancer. Thirteen studies compared ACT versus multicomponent CBT packages including cognitive techniques, whereas the remaining three studies used progressive relaxation training, problem solving and systematic desensitization, respectively. Finally, thirteen studies analyzed the maintenance of therapeutic gains at follow-ups, ranging from 1 to 18 months.

Two small RCTs examined the differential effect of an initial ACT protocol versus cognitive therapy (CT) in *depression*. Zettle and Hayes (1986) applied both treatments in 12 individual sessions ( $N= 18$ ) and found that ACT showed greater reductions in depressive symptoms at post-treatment and at the 2-month follow-up as measured by the BDI (Beck Depression Inventory, selected here as primary outcome for meta-analytic purposes) and HRS-D (Hamilton's Depression Scale). Hayes *et al.* (2006) reanalyzed this study showing that mid-treatment changes in cognitive defusion as measured by the ATQ-B (Automatic Thoughts Believability Questionnaire) mediated outcomes in the BDI and HRS-D at post-treatment and follow-up according to the four steps of the mediational model proposed by MacKinnon (2003). Importantly, the two conditions did not differ significantly in depressive symptomatology at mid-treatment, but they did differ in the ATQ-B scores; thus, this study shows an appropriate timeline for testing mediation (Kazdin, 2007).

In a subsequent study, Zettle and Rains (1989) applied ACT and CT in 12 group sessions ( $N= 25$ ). A recent reanalysis conducted by Zettle, Rains, and Hayes (2011) showed that ACT produced greater reductions in the BDI (primary outcome) at post-treatment and at the 2-month follow-up than CT using an intent-to-treat analysis. Post-treatment changes in cognitive defusion mediated this effect at follow-up for ACT. However, in this case, an appropriate timeline could not be established because, as previously stated, there were statistically significant differences in the BDI between both groups at post-treatment.

A couple of RCTs have analyzed the effectiveness of ACT compared to CBT or CT in the treatment of diverse symptoms mostly related to *depression and/or anxiety*. In both cases, the treatments were conducted by novice-level therapists. Lappalainen, Lehtonen, Skarp, Taubert, Ojanen, and Hayes (2007) compared ACT versus CBT applied in 10 individual sessions ( $N= 28$ ). Participants treated with ACT showed better symptom improvement than the CBT participants as measured by the SCL-90 GSI (Global Severity Index of the SCL-90; primary outcome for meta-analytic purposes) at post-treatment and at the 6-month follow-up. No formal mediation analysis was conducted, but improvements in the ACT condition correlated with the decrease of experiential avoidance more consistently than in the CBT condition.



Table 1. Overview of the studies included in the meta-analysis.

Study	Problem	N	Mean Age	% Fem.	NS	Format	CBT package	Measures
Zettle & Zeile (1986)	Depression	18	NI	100	12	Individual	Cognitive Therapy	Prim.: BDI; Depression: BDI and HRSD; ACT pr.: ATQ-CBT pr.: ATQ-F
Rains (1989)	Depression	21	NI	100	12	Group	Cognitive Therapy	Prim.: BDI; Depression: BDI and HRSD; ACT pr.: ATQ-CBT pr.: ATQ-F, DAS
Lappalainen <i>et al.</i> (2007)	Depression/Anxiety	28	41.80	89.29	10	Individual	Exposure, self-monitoring, behavioral activation, problem solving, relaxation, social skills	Prim.: SCL-90 GSI; Depression: BDI, mood visual scale, SASS; Q. of life: VSL; ACT pr.: AAQ, CBT pr.: CSVC
Forman <i>et al.</i> (in press)	Depression/Anxiety	132	26.70	79.50	17	Individual	Cognitive Therapy	Prim.: OQ; Depression: BDI; Anxiety: BAI; Q. of life: Q
Twining <i>et al.</i> (2010)	OCD	79	37.00	61.00	8	Individual	PRT	Prim.: Y-BOCS; Depression: BDI-II; Anxiety: Y-BOCS; life: QOLIS; ACT pr.: AAQ, TAF
Block (2002)	Social Anxiety	26	21.00	66.67	3	Group	Cogn. restructuring, exposure	Prim.: BPT; Anxiety: SIAS, SPS, FQ, FNE, WILL, SUD of life: QOL; ACT pr.: AAQ, CBT pr.: SISST
Arch <i>et al.</i> (in press)	Anxiety Disorders	128	37.93	52.30	12	Individual	Self-monitoring, breathing retraining, cog. restructuring, exposure	Prim.: CSR; Anxiety: CSR, PSWQ, FQ; Q. of life: QOLI; pr.: AAQ; CBT pr.: ASI
Zeile (2003)	Test Anxiety	24	30.50	83.33	6	Individual	Systematic desensitization	Prim.: WRAT3; Anxiety: MARS, TAL, STAI; ACT pr.: /
Brown <i>et al.</i> (2011)	Test Anxiety	16	20.20	68.80	1	Group	Cognitive Therapy	Prim.: Test performance; Anxiety: TAL, STAIS, STAIT; pr.: DDS, PHLMS, AAQ
Smout <i>et al.</i> (2012)	Methamphetamine	104	30.90	40.00	12	Individual	Motivational interviewing, relaxation, self-monitoring, self-talk	Prim.: Hair analysis; Depression: BDI-II; Q. of life: SF;
Hernandez <i>et al.</i> (2009)	Smoking	81	42.43	64.00	7	Group	Response cost, self-monitoring, nicotine fading, cog. restructuring, problem solving	Prim.: smoking abstinence (expired carbon monoxide)
Wetherell <i>et al.</i> (2011)	Chronic Pain	104	54.90	50.90	8	Group	Pain monitoring, pacing, behavioral activation, PRT, cog. restructuring, problem solving	Prim.: BPT; Interference; Depression: BDI-II; Anxiety: P2 Q. of life: SF-36; ACT pr.: CPAQ
Páez <i>et al.</i> (2007)	Cancer	12	46.58	100	8	Group	Cog. restructuring, progressive relaxation, breath retraining	Prim.: VLOQ (interference of cancer); Depression: HDS; Anxiety: HAS; Q. of life: FACT-B
Rosti <i>et al.</i> (in press)	Cancer	47	56.00	100	12	Individual	Cognitive restructuring, relaxation training, problem solving	Prim.: ROMS-distress; Depression: BDI-II; Anxiety: BAI of life: FACT-G; ACT pr.: COPE, disengagement and acceptance
Bond & Bunce (2000)	Worksite Stress	60	36.43	50.00	3	Group	Innovation Promotion Program: problem solving	Prim.: GHQ, Depression: BDI; ACT pr.: AAQ; CBT pr.:
Flaxman & Bond (2010)	Worksite Stress	74	39.00	72.00	2	Group	Stress Inoculation Training: relaxation training and cognitive restructuring	Prim.: GHQ; ACT pr.: AAQ; CBT pr.: DAS

Table 2. General results and mediation analyses. Studies with mediation studies favoring ACT are overshadowed in a more intense gray, those with mixed results are overshadowed in medium intense gray, and those with negative results in light gray.

Study	Problem	General Results	Mediational test	ACT processes	CBT processes	Timeline
Zettle & Hayes (1986)	Depression	ACT > CBT	MacKinnon's four steps	YES: S6 changes in defusion mediated outcomes at posttest and FU.	NO: Changes in ATQ and DAS did not mediate CBT outcomes	YES
Rost <i>et al.</i> (in press)	Cancer	ACT > CBT	Non-parametric bootstrapping	YES: changes in EA at S8 mediated outcomes in distress at posttest	Not reported	YES
Zettle & Rains (1989)	Depression	ACT > CBT	Non-parametric bootstrapping	YES: Posttest changes in defusion mediated outcomes at FU	NO: Changes in ATQ and DAS did not mediate CBT outcomes	NO
Twohig <i>et al.</i> (2010)	OCD	ACT > CBT	Non-parametric bootstrapping	YES: Posttest changes in EA mediated outcomes in OCD symptoms at follow-up	Not reported	NO
Bond & Bunce (2000)	Worksite Stress	ACT > CBT	MacKinnon's four steps	YES: posttest changes in EA mediated outcomes at FU	NO: attempts to modify stressors or DAS did not mediate outcomes	NO
Flaxman & Bond (2010)	Worksite Stress	ACT = CBT	Non-parametric bootstrapping	YES: posttest changes in EA mediated outcomes at posttest	NO: posttest changes in DAS did not mediate outcomes at posttest but EA changes partly did	NO
Arch <i>et al.</i> (in press)	Anxiety Disorders	ACT ≥ CBT	Multilevel mediation analyses	YES for ACT and CBT: Initial changes in defusion mediated worry (more in CBT), depression, and behavioral avoidance reductions as well as quality of life increase. Anxiety sensitivity only mediated worry		NO
Forman <i>et al.</i> (in press)	Depression/Anxiety	ACT ≤ CBT	Mixed-effects regression models	YES for ACT and CBT: Decreases in dysfunctional thinking, defusion, and increases in willingness to engage in behavioral activity despite unpleasant psychological events were equivalent mediators for both treatments.		NO
Wetherell <i>et al.</i> (2011)	Chronic Pain	ACT = CBT	Non-parametric bootstrapping	Specific ACT: Use of psychological acceptance strategies Specific CBT: Use of cognitive change strategies		--
Lappalainen <i>et al.</i> (2007)	Depression/Anxiety	ACT > CBT	NO	NO: Pain acceptance did not mediate pain interference	NO: Pain control did not mediate changes in pain interference	--
Block (2002)	Social Anxiety	ACT > CBT	NO	--	--	--
Brown <i>et al.</i> (2011)	Test Anxiety	ACT > CBT	NO	--	--	--
Hernández López <i>et al.</i> (2009)	Smoking	ACT > CBT	NO	--	--	--
Páez <i>et al.</i> (2007)	Cancer	ACT > CBT	NO	--	--	--
Smout <i>et al.</i> (2010)	Methamphetamine	ACT = CBT	NO	--	--	--
Zettle (2003)	Test Anxiety	ACT ≤ CBT	NO	--	--	--

Notes: ATQ= Automatic Thoughts Questionnaire; DAS= Dysfunctional Attitudes Scale; EA= experiential avoidance; FU= follow-up; OCD= obsessive compulsive disorder.

Forman *et al.* (in press) presented the long-term effectiveness of CT and ACT among anxious and depressed outpatients ( $N= 132$ ) treated with a mean of 17 individual sessions. Preliminary results at post-treatment with a lower number of participants (Forman *et al.*, 2007) showed that ACT and CT did not differ in any outcome measure, and that changes in patients treated with ACT were correlated with the decrease in experiential avoidance and the increase in acceptance without judgment and acting with awareness of the KIMS (Kentucky Inventory of Mindfulness Skills) whereas changes in the CT condition were correlated with increases in the observation and description subscales of the KIMS. However, Forman *et al.* (in press) reported that treatment gains in depression, functioning, and quality of life were better maintained at follow-up in the CT condition with a small-to-moderate effect size. The OQ (Outcome Questionnaire) was selected as primary outcome measure for meta-analytic purposes in the current study because (a) participants were assigned to ACT or CT via stratified block randomization determined by total score on the OQ, and (b) the OQ is a more general measure than the other specific measures used in the study evaluating depression and anxiety (BDI and BAI).

A mediation analysis of the previous study using hierarchical modeling of session-by-session data has been reported by Forman, Chapman, *et al.* (2012). Data revealed that changes in dysfunctional thinking, cognitive defusion, and willingness to engage in behavioral activity despite unpleasant psychological events were equivalent mediators across treatments of symptom reduction and progress toward goals in the same assessed sessions. Nevertheless, increased utilization of psychological acceptance strategies relative to cognitive and affective change strategies mediated outcome for ACT, whereas for CT the mediation was in the opposite direction. Therefore, data showed that ACT and CT seem to have common mediator pathways but also different ones. Finally, a moderator study conducted by Juarascio *et al.* (2010) indicated that ACT outperformed CT among participants with a comorbid eating pathology.

Five RCTs have been conducted in relation to *anxiety* problems. Twohig *et al.* (2010) compared 8 individual sessions of ACT and progressive relaxation training ( $N= 79$ ) in the treatment of obsessive-compulsive disorder (OCD). For methodological purposes, the ACT protocol did not contain in-session exposure. ACT produced greater changes at post-treatment and at the 3-month follow-up on OCD severity as measured by the Y-BOCS (Yale-Brown Obsessive Compulsive Scale; selected as primary outcome measure for the meta-analysis). A preliminary mediation analysis (Twohig, 2007) suggested that post-treatment changes in experiential avoidance mediated follow-up outcomes in the Y-BOCS for the ACT condition.

Block (2002) compared 6 group sessions of ACT and CBT in participants with subclinical social anxiety ( $N= 39$ ). The ACT group performed better than the CBT group in a behavioral measure of public speaking (primary outcome for meta-analytic purposes). Results in self-report measures of social anxiety were equivalent in both conditions at post-treatment and at the one-month follow-up.

Arch *et al.* (in press) conducted an RCT comparing ACT versus traditional CBT applied in 12 individual sessions for heterogeneous anxiety disorders ( $N= 128$ ). No significant differences were found at post-treatment across all outcome measures. However, ACT showed steeper linear improvements than CBT in blind clinical interviews

using the principal disorder Clinical Severity Ratings (CSRs; primary outcome) during the 12-month follow-up, with a very large effect size ( $d= 1.26$ ) using Feingold's (2009) proposal for computing effect sizes in growth-modeling analyses. At that time point, ACT participants also showed lower levels of experiential avoidance whereas CBT participants showed higher quality of life.

Arch *et al.* (2012) conducted multilevel mediation analyses to assess the relationship of session-by-session changes in anxiety sensitivity and cognitive defusion with outcome measures at post-treatment. ACT showed borderline greater improvements than CBT in cognitive defusion whereas anxiety sensitivity was reduced in an equivalent degree in both conditions. Cognitive defusion significantly mediated worry, quality of life, behavioral avoidance and depression outcomes across both ACT and CBT. Anxiety sensitivity only had a mediating role in worry in both treatments. Interestingly, cognitive defusion more strongly predicted worry reductions in CBT than in ACT. Overall, the data showed that ACT and CBT worked through similar mediation pathways. Finally, a moderation study (Wolitzky-Taylor *et al.*, in press) found, on the one hand, that CBT outperformed ACT among participants with moderate levels of baseline anxiety sensitivity and among participants with no comorbid mood disorder. On the other hand, ACT outperformed CBT among participants with comorbid mood disorders.

Two small RCTs have been conducted on test anxiety. Zettle (2003) compared ACT versus systematic desensitization applied in 6 individual sessions for the treatment of mathematic anxiety ( $N= 24$ ). Overall, results were slightly better for systematic desensitization at post-treatment, but the differences were reduced at follow-up. Participants did not show improvement on a mathematic test at post-treatment. This objective measure was selected for meta-analytic purposes ( $g= .31$  favoring systematic desensitization). In a related study, Brown, Forman, Herbert, Hoffman, Yuen, and Goetter (2011) compared a protocol heavily based on ACT versus CT for text anxiety ( $N= 16$ ). Both interventions were applied in a 2-hour group workshop. ACT produced improvements in performance (primary outcome), whereas CT participants exhibited a reduced performance.

Two RCTs compared ACT versus CBT in *worksite stress*. Bond and Bunce (2000) compared the effect of three 3-hour group session of ACT versus Innovation Promotion Program (IPP), a CBT package focused on problem solving that encourages people to identify and change stressors in their workplace. ACT showed better effects at post-treatment and at the 3-month follow-up in improving general mental health as measured by the GHQ (General Health Questionnaire; primary outcome for meta-analytic purposes). A mediation analysis presented in Hayes *et al.* (2006) indicated that decreases in experiential avoidance at post-treatment mediated the outcome results at the 3-month follow-up in ACT. Attempts to modify stressors and changes in dysfunctional attitudes did not mediate outcome results in IPP. Flaxman and Bond (2010) compared ACT versus a stress inoculation training (SIT) in working individuals with above average levels of distress ( $N= 74$ ). The interventions consisted of two 3-hour group sessions. ACT and SIT reduced psychological distress to an equivalent degree across a 3-month assessment period. Mediation analyses indicated that the reduction of experiential avoidance mediated the outcome on the GHQ. However, reductions in dysfunctional attitudes did not mediate change in the SIT condition.

Two studies have compared ACT versus CBT in *addictive behaviors*. On the one hand, Smout, Longo, Harrison, Minniti, Wickes, and White (2010) conducted an RCT comparing ACT versus CBT in increasing treatment attendance and reducing methamphetamine use and related harms ( $N= 104$ ). Treatments were implemented in 12 individual sessions. Attrition was high and equivalent in both conditions: 70% at 12 weeks and 86% at 24 weeks postentry. ACT and CBT showed equivalent outcomes. The primary outcome considered in the meta-analysis was the objective measure of methamphetamine use (hair samples analyses). On the other hand, in a quasi-experimental study ( $N= 81$ ), Hernández López, Luciano, Bricker, Roales-Nieto, and Montesinos (2009) compared ACT and CBT interventions applied in 7 group sessions for smoking cessation. ACT showed greater abstinence rates at the 12-month follow-up than the CBT intervention (30.2% versus 13.2% in intent-to-treat participants; 48.1% versus 17.2% among completers).

Wetherell *et al.* (2011) compared ACT versus CBT in individuals suffering from *chronic pain* ( $N= 114$ ). Interventions consisted of 8 group sessions applied after a 4-6 week pretreatment period. There were no significant differences in improvement between both conditions on any outcome variables (the primary outcome selected for the meta-analyses was pain interference, which was also the primary outcome in the original study); however, ACT participants who completed treatment reported significantly higher levels of satisfaction than CBT participants did. Mediation analyses failed to find mediators of change in ACT and CBT.

Finally, two small RCTs have been conducted in *cancer* comparing ACT versus CBT interventions. Páez, Luciano, and Gutiérrez (2007) applied both treatments in 3 individual and 5 group sessions ( $N= 12$ ). Statistically significant differences emerged at the 12-month follow-up favoring ACT in regard to the interference of cancer in participants' valued areas (primary outcome for meta-analytic purposes). Also, participants in the ACT condition showed significant reductions in depression and anxiety and a significant increase in quality of life, whereas CBT participants showed significant reductions of depression and interference of cancer in valued areas. Rost, Wilson, Buchanan, Hildebrandt, and Mutch (in press) compared 12 individual sessions of ACT versus a CBT intervention in the treatment of emotional distress among women with late-stage ovarian cancer ( $N= 47$ ). It is worth noting that, although the comparison intervention was termed as Treatment as Usual (TAU), the inspection of its components reveals that it was a CBT package consisting of cognitive restructuring, relaxation training and problem solving. The ACT group showed significantly greater improvements in distress, as measured by the POMS (Profile of Mood States, primary outcome), and quality of life compared to the CBT group. Mediation analyses indicated that changes in cognitive avoidance in session 8 mediated the post-treatment effects on POMS. Importantly, the two conditions did not differ significantly in POMS scores at session 8, but they differed in cognitive avoidance. Thus, like Zettle and Hayes (1986), this study also showed an appropriate timeline for claiming mediation.

As expected, there was significant heterogeneity in primary outcome, depression, anxiety, quality of life, and ACT process measures (see the  $Q$  and  $I^2$  values in Table 3). No significant degree of heterogeneity was found, however, in the CBT process measures. Table 3 presents the mean effect size indexes resulting from applying random

Table 3. Summary results for the effect size as a function of the outcome or process measure.

Outcome or process measure	<i>k</i>	<i>g</i> <sub>+</sub> (95% C.I.)	<i>Z</i>	<i>Q</i>	<i>I</i> <sup>2</sup>
<i>PRIMARY OUTCOME</i>					
Time points combined	16	0.396 (0.156; 0.635)	3.23***	33.01**	54.56
Post-treatment	16	0.373 (0.116; 0.629)	2.84**	39.30***	61.83
Follow-up	11	0.419 (0.145; 0.694)	2.99**	21.50*	53.48
<i>DEPRESSION OUTCOME</i>					
Time points combined	10	0.271 (-0.072; 0.615)	1.55	26.94***	66.59
Post-treatment	10	0.258 (-0.087; 0.602)	1.47	27.60***	67.39
Follow-up	9	0.117 (-0.158; 0.393)	0.84	14.30	44.06
<i>ANXIETY OUTCOME</i>					
Time points combined	9	0.140 (-0.184; 0.454)	0.85	20.36**	60.70
Post-treatment	9	0.110 (-0.242; 0.461)	0.61	24.98**	67.98
Follow-up	7	-0.004 (-0.268; 0.260)	-0.03	9.42	36.31
<i>QUALITY OF LIFE OUTCOME</i>					
Time points combined	11	0.221 (-0.071; 0.513)	1.49	27.54**	63.68
Post-treatment	11	0.254 (-0.024; 0.532)	1.79 <sup>a</sup>	25.89**	61.37
Follow-up	9	0.097 (-0.206; 0.401)	0.63	19.80*	59.61
<i>ACT PROCESSES</i>					
Time points combined	11	0.381 (0.032; 0.733)	2.14*	31.25***	67.99
Post-treatment	11	0.449 (0.107; 0.792)	2.57*	30.56***	67.28
Follow-up	8	0.098 (-0.128; 0.325)	0.85	7.85	10.81
<i>CBT PROCESSES</i>					
Time points combined	6	0.053 (-0.217; 0.324)	0.39	4.76	0.00
Post-treatment	6	0.058 (-0.227; 0.344)	0.40	5.63	11.23
Follow-up	5	0.042 (-0.334; 0.418)	0.22	5.42	26.26

Notes: *k*= number of studies; *g*<sub>+</sub>= weighted mean effect size; 95% C.I.= 95 per cent confidence interval around the mean effect size; *Q*= heterogeneity *Q* statistic; *I*<sup>2</sup>= *I*<sup>2</sup> heterogeneity index (%); \**p*<.05; \*\**p*<.01; \*\*\**p*≤.001; <sup>a</sup> *p* = .073.

effects models to the above-mentioned measures combining post-treatment and follow-up evaluations as well as each of them separately.

With regard to the primary outcome measure, ACT outperformed CBT interventions in all cases. Specifically, Figure 1 shows that the mean effect size with time points combined was of small-to-medium magnitude: *g*<sub>+</sub> = 0.40 (95% CI: 0.16, 0.64; *Z* = 3.23, *p* = .001). Similarly, post-treatment and follow-up mean effect sizes were, respectively, *g*<sub>+</sub> = 0.37 and *g*<sub>+</sub> = 0.42. There were no statistically significant differences in the depression and anxiety outcome measures. The mean effect sizes for depression were of small magnitude and favorable to ACT with time points combined (*g*<sub>+</sub> = 0.27, *p* = .12) and post-treatment (*g*<sub>+</sub> = 0.26, *p* = .14), but they were lower at follow-up (*g*<sub>+</sub> = 0.12). The mean effect sizes for anxiety fell below the small level (time points combined: *g*<sub>+</sub> = 0.14; post-treatment: *g*<sub>+</sub> = 0.11; follow-up: *g*<sub>+</sub> = -0.00).

Quality of life outcome measures also favored ACT, but they did not reach statistical significance at *p* < .05. Specifically, the mean effect sizes were small: *g*<sub>+</sub> = 0.22 (*p* = .14) with time points combined and *g*<sub>+</sub> = 0.25 (*p* = .073) at post-treatment, with the latter being marginally significant. Quality-of-life differences between ACT and CBT seemed to dilute across time, as the mean effect size at the follow-up was *g*<sub>+</sub> = 0.10.

With respect to the process measures, ACT impacted more on its putative processes of change compared to CBT, but with an interesting pattern. The mean effect



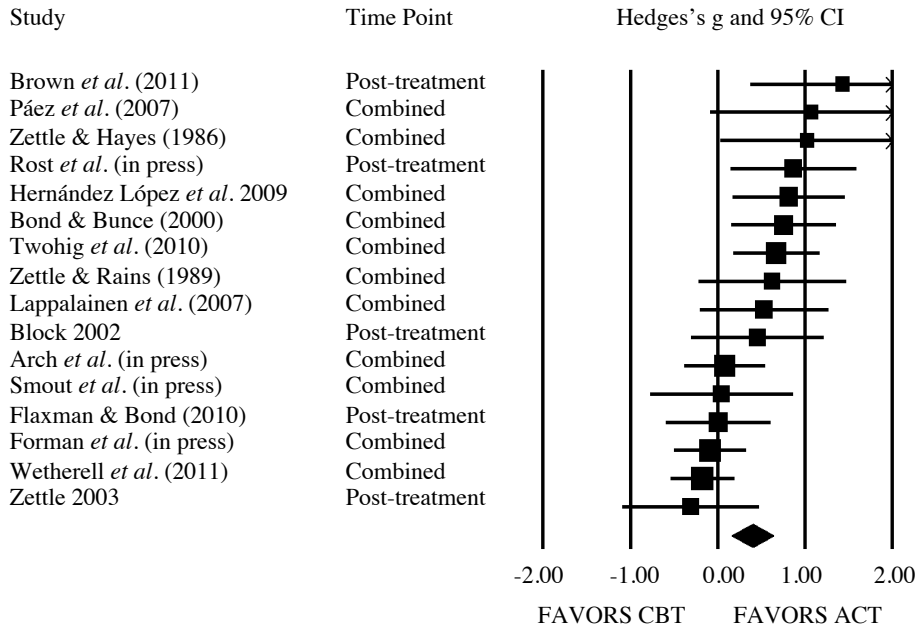


Figure 1. Forest plot of the mean effect sizes on primary outcomes.

size at post-treatment was medium ( $g_+ = 0.45, p = .01$ ), but it significantly decreased at the follow-up ( $g_+ = 0.10$ ). When comparing time points combined, the mean effect size was statistically significant ( $g_+ = 0.38, p = .034$ ). Finally, CBT and ACT did not impact differently in the CBT putative processes of change (time points combined:  $g_+ = 0.05$ ; post-treatment:  $g_+ = 0.06$ ; follow-up:  $g_+ = 0.04$ ).

The effect sizes at pre-treatment were explored to analyze whether ACT and CBT differed at pre-treatment. If that were the case, the above-mentioned effect size values would provide a biased estimate of the differential treatment effects. Table 4 shows that ACT and CBT were equated at pre-treatment in the primary outcome, anxiety, and quality of life outcome measures as well as in the ACT and CBT process measures.

Table 4. Summary results for the effect size at pre-treatment as a function of the outcome or process measure.

Outcome or process measure	<i>k</i>	$g_+$ (95% C.I.)	<i>Z</i>	<i>Q</i>	<i>I</i> <sup>2</sup>
Primary outcome	15	0.003 (-0.186; 0.193)	0.04	23.39	40.14
Depression outcome	9	-0.148 (-0.320; 0.024)	-1.69 <sup>a</sup>	2.86	0.00
Anxiety outcome	8	0.006 (-0.169; 0.182)	0.07	3.94	0.00
Quality of life outcome	10	-0.066 (-0.216; 0.085)	-0.86	6.21	0.00
ACT processes	9	0.037 (-0.145; 0.220)	0.40	6.78	0.00
CBT processes	5	-0.099 (-0.509; 0.311)	-0.47	7.28	45.08

Notes: *k*= number of studies;  $g_+$ = weighted mean effect size; 95% C.I.: 95 per cent confidence interval around the mean effect size; *Q*= heterogeneity *Q* statistic; *I*<sup>2</sup>= *I*<sup>2</sup> heterogeneity index (%); \**p* <.05; \*\**p* <.01; \*\*\**p* <.001; <sup>a</sup>*p*= .091.

Regarding the depression outcome measures, a marginally significant difference favoring CBT emerged ( $g_+ = -0.15$ ,  $p = .091$ ). In other words, participants who received CBT seemed to be less depressed at pre-treatment.

The presence of significant heterogeneity between the effect sizes reported above suggests the analysis of the effect of potential moderator variables. Accordingly, the analysis of moderator variables was conducted on the effect sizes obtained with the primary outcome, with post-treatment and follow-up evaluations combined. Table 5 shows the mixed effects ANOVAs applied to categorical moderator variables.

One relevant potential moderator variable is the presence of cognitive techniques in the CBT packages (e.g., cognitive restructuring). However, the effect sizes did not differ significantly for the CBT interventions with cognitive techniques ( $g_+ = 0.39$ ) and the CBT without them ( $g_+ = 0.44$ ;  $Q_B = .034$ ,  $p = .85$ ). The mean effect sizes were also equivalent for anxiety/depression problems ( $g_+ = 0.40$ ) and other addiction and health problems merged ( $g_+ = 0.42$ ). Treatment format did not show significant differential effects although the mean effect sizes were greater with group ( $g_+ = 0.50$ ) than with individual interventions ( $g_+ = 0.31$ ). Likewise, the studies conducted in North America ( $g_+ = 0.31$ ) did not differ significantly from the studies conducted in Europe ( $g_+ = 0.58$ ), although the latter showed greater effect sizes. Finally, it is worth noting that, in some cases, the differential effect sizes for ACT versus CBT did not reach statistical significance, which seems to be related to the lower number of studies considered in the subgroups (i.e., CBT without cognitive techniques, treatment of addiction and health problems, and individual treatments).

Table 6 shows the meta-regression analyses conducted with potential continuous moderators. None of the moderator variables reached a statistical significant level of prediction (number of sessions:  $B = -0.024$ ,  $p = .30$ ; total number of hours:  $B = -0.026$ ,  $p = .31$ ; percentage of females:  $B = 0.008$ ,  $p = .18$ ; mean age in years:  $B = -0.000$ ,  $p = .99$ ; publication year:  $B = -0.024$ ,  $p = .13$ ;  $g$  index at pre-treatment:  $B = 0.335$ ,  $p = .39$ ).

Table 5. Analysis of the influence of categorical moderator variables in the weighted primary outcome with post-treatment and follow-up combined.

Moderator variable	$k$	$g_+$	95% C.I.		ANOVA results
			$g_l$	$g_u$	
<i>COGNITIVE TECHNIQUES</i>					
Yes	13	0.385	0.114	0.657	$Q_B(1) = .034$ , $p = .854$
No	3	0.442	-0.091	0.974	$Q_W(14) = 30.997$ , $p = .006$
<i>TYPE OF PROBLEM</i>					
Anxiety/Depression	11	0.396	0.095	0.696	$Q_B(1) = .006$ , $p = .937$
Other problems	5	0.417	-0.036	0.871	$Q_W(14) = 32.718$ , $p = .003$
<i>TREATMENT FORMAT</i>					
Individual	8	0.314	-0.033	0.661	$Q_B(1) = .516$ , $p = .472$
Group	8	0.498	0.136	0.859	$Q_W(14) = 32.841$ , $p = .003$
<i>CONTINENT</i>					
North America	11	0.313	0.034	0.593	$Q_B(1) = 1.021$ , $p = .312$
Europe	5	0.578	0.148	1.008	$Q_W(14) = 29.22$ , $p = .010$

Notes:  $k$  = number of studies;  $g_+$  = weighted mean effect size; 95% C.I. = 95 per cent confidence interval around the mean effect size;  $g_l$  and  $g_u$  = lower and upper confidence limits;  $Q_B$  = between-categories  $Q$  statistic;  $Q_W$  = within-categories  $Q$  statistic.

Table 6. Simple weighted regression analyses of each continuous moderator variable on the *g* index for primary outcome measures with post-treatment and follow-up combined.

Moderator variable	<i>K</i>	<i>B</i>	<i>Z</i>	<i>p</i>	<i>Q<sub>E</sub></i>
Number of sessions	16	-0.024	-1.518	.304	2.305
Total number of hours	16	-0.026	-1.027	.310	1.056
Gender (% female)	16	0.008	1.348	.178	1.818
Mean age (in years)	14	-0.000	-0.016	.987	0.000
Publication year	16	-0.024	-1.519	.129	2.305
<i>g</i> index in the pre-treatment	15	0.335	0.866	.386	0.750

Notes: *k*= number of studies; *B*= unstandardized regression coefficient; *Z*= statistical test for the regression coefficient; *p*= *p* value associated to *Z*; *Q<sub>E</sub>* = statistical test to assess the model misspecification.

Publication bias was examined only for the primary outcome with time points combined. A funnel plot was conducted with the effect size on the horizontal axis and the precision of the estimate on the vertical axis. The inspection of this plot indicated a possible publication bias, which was further investigated using statistical tests.

Egger's regression intercept test (Egger, Smith, Schneider, & Mindler, 1997) indicated the presence of publication bias (intercept= 2.92, 95% *CI* of 0.96 to 4.88,  $t(14)= 3.20$ , one-tailed  $p= .003$ ), whereas Begg and Mazumdar's rank correlation (Begg & Mazumdar, 1994) was marginally significant (Kendall's *tau-b* corrected for ties= .29, one-tailed  $p= .058$ ). Rosenthal's fail-safe *N* indicated that 78 additional studies with no differential effect between ACT and CBT were needed to yield a nonsignificant effect. Orwin's fail-safe *N* indicated that 8 studies would be needed with mean Hedges's *g* of 0 to bring the combined *g* under the threshold of a small effect (i.e.,  $g= 0.20$ ). Finally, Duval and Tweedie's trim and fill (Duval & Tweedie, 2000) under a random effects model imputed 3 missing studies. However, these three studies would not reduce the mean effect size to a nonsignificant level ( $g_+ = 0.30$ , 95% *CI* of 0.06 to 0.54). This indicates that, if there was a publication bias, the effect on the mean effect size would not be substantial.

## DISCUSSION

The aim of the current study was to conduct a systematic review and meta-analysis of the studies that have empirically compared ACT and CBT interventions. Sixteen studies comparing differential outcomes and five additional studies analyzing potential mediator or moderators of previous RCTs were identified following several search strategies. The initial number of participants studied was 954. Eleven studies were focused on anxiety and/or depression-related problems, two on addictive behaviors, two on cancer and one on chronic pain. Most of the studies compared ACT to CBT packages including cognitive techniques.

A qualitative analysis of the results on the selected primary outcomes revealed that ACT seemed to outperform CBT to some degree in eleven studies. Both treatments

obtained equivalent results in two studies. Finally, CBT seemed to outperform ACT to some degree in two studies. The meta-analyses conducted reached similar conclusions. Mean effect sizes on primary outcomes significantly favored ACT in a small-to-medium magnitude (with time points combined:  $g_+ = 0.40$ , 95% CI of 0.16 to 0.64). This advantage for ACT was not due to between-group differences at pre-treatment because studies successfully equated both treatments at that point ( $g_+ = 0.00$ ). Potential moderator variables (e.g., treatment format, type of problem, number of sessions, age, gender, or publication year) did not account for significant variance. Importantly, ACT also outperformed CBT packages using cognitive techniques ( $g_+ = 0.39$ , 95% CI of 0.11 to 0.66).

There were no statistically significant differences in depression ( $g_+ = 0.27$ ) and anxiety outcomes ( $g_+ = 0.14$ ) between ACT and CBT. However, it is worth noting that baseline levels on depression measures were lower at  $p = .09$  in CBT ( $g_+ = -0.15$ ). Thus, there seems to be a positive trend for ACT in depression outcomes. The mean effect size was marginally statistically significant favoring ACT at post-treatment in quality-of-life outcome ( $g_+ = 0.25$ ,  $p = .07$ ), but this advantage decreased at follow-up ( $g_+ = 0.10$ , 95% CI of -0.21 to 0.40). Further studies should address whether ACT leads to greater reductions of depression symptoms and increases of quality of life than CBT.

Nine of the 16 reviewed studies conducted formal mediation analyses exploring potential processes of change. Six studies (Bond & Bunce, 2000; Flaxman & Bond, 2010; Rost *et al.*, in press; Twohig, 2007; Zettle & Hayes, 1986; Zettle, Rains, & Hayes, 2011) suggest that ACT worked through some of its proposed processes of change (e.g., increases in cognitive defusion and decreases in experiential avoidance) whereas four of these studies failed to find that CBT worked through its hypothesized processes of change (e.g., reduction of the frequency of automatic thoughts and change in dysfunctional attitudes). Importantly, two studies fulfilled the most strict criteria for claiming mediation because the timeline was appropriately assessed (Kazdin, 2007). That is, differences across conditions in processes of change were found while there was no difference in the outcome measure.

Two studies (Arch, Wolitzky-Taylor, *et al.*, 2012; Forman, Chapman, *et al.*, 2012) showed mixed results: although ACT was found to work through its putative processes of change (e.g., cognitive defusion, use of acceptance strategies, and willingness to engage in behavioral activity despite unpleasant psychological events), CBT seemed to work through similar paths, with especial relevance for cognitive defusion. Finally, one study (Wetherell *et al.*, 2011) failed to find mediators for either ACT or CBT.

As expected, ACT showed a greater impact on its putative processes of change at post-treatment ( $g_+ = 0.45$ ), but the differences at follow-up were nonsignificant ( $g_+ = 0.10$ ). This is consistent with the ACT model and with the above-mentioned mediational studies. Ultimately, several types of treatments can impact on ACT processes, but the fact that ACT seems to show a more rapid effect points to the possibility that these might be the mediators for ACT outcomes. No differences were found, however, in the effects on CBT proposed processes of change ( $g_+ = 0.05$  with time points combined).

Only two moderation analyses have been conducted to date analyzing what kind of patients would respond better to ACT or CBT. This preliminary evidence shows, on the one hand, that ACT might be better suited to patients suffering comorbid depression

in addition to an anxiety disorder (Wolitzky-Taylor *et al.*, in press) or a comorbid eating pathology in addition to emotional disorders (Juarascio *et al.*, 2010). On the other hand, traditional CBT might be a better option than ACT among anxious participants without comorbid depression and medium levels of anxiety sensitivity (Wolitzky-Taylor *et al.*, in press).

Several limitations of this review related to the characteristics of the conducted studies are worth mentioning. First, in line with Öst (2008), most of the studies have a relatively small number of participants and some methodological characteristics could be improved. Second, most of this research was organized by researchers interested in ACT, although this seems to be changing in recent years. Collaborative research between ACT and traditional CBT laboratories is needed to confirm or disconfirm the results yielded in the current review (Hayes *et al.*, 2006; Gaudiano, 2011). Third, the meta-analysis contains a relatively reduced number of studies conducted in a broad range of problems. It seems likely that differences in efficacy between ACT and CBT would emerge when comparing specific disorders more tightly. Fourth, because several authors emphasize that CBT interventions especially developed for specific disorders might show greater efficacy than other more general CBT packages (e.g. Hofmann, Asmundson, & Beck, in press; Hofmann, Glombiewski, Asnaani, & Sawyer, 2011), further studies should analyze the efficacy of ACT compared to the first-line CBT choice for specific problems. Fifth, some degree of potential publication bias was detected in the meta-analysis. However, the main results of the meta-analysis remained basically the same when using Duval and Tweedie's trim and fill statistical procedure for imputing missing studies. Furthermore, Rosenthal's fail-safe indicated that 78 additional studies with no differential effect between ACT and CBT would be needed to yield a nonsignificant effect, and Orwin's fail-safe *N* indicated that 8 studies would be needed to bring the effect size under the threshold of a small effect (i.e., 0.2). These analyses suggest that the conclusions of the meta-analysis are relatively robust. Sixth, ACT and traditional CBT have been mostly compared in relation to the reduction of symptoms or CBT-related measures. However, this seems somehow like playing in the CBT field because the direct reduction of symptoms is not an objective of ACT. This state of affairs might be related to the absence of validated measures on values-goals consistency until recently (e.g., Gaudiano, 2011; Lundgren, Luoma, Dahl, Strosahl, & Melin, in press; Wilson, Sandoz, Kitchens, & Roberts, 2010). In this sense, it is notable that the current evidence shows that ACT leads to at least the same degree of symptom reduction at posttreatment and follow-up. Further studies should add measures on outcomes more in accordance with ACT primary goals, which might differ from those chosen by traditional CBT interventions. Seventh, although the mediation analyses conducted seem to yield coherent findings for ACT, more sophisticated analyses are needed in which the timeline issue should be addressed and alternative mediators would be tested (Kazdin, 2007).

In spite of the aforementioned limitations, the preliminary evidence points to some relevant conclusions. First, ACT seems to obtain generally better results than CBT when comparing primary outcomes. Second, ACT reduces anxiety symptoms to the same degree as CBT, and possibly produces greater reductions of depression symptoms. Third, ACT might show better immediate improvements on quality of life than CBT.

Fourth, although more research is needed, the current evidence supports the hypothesized mediators suggested in the ACT model, which significantly contrasts with the confusion about the CBT processes of change (e.g., Longmore & Worrell, 2007). In fact, several studies suggest that CBT might partly work through ACT-related mediators on some occasions, with a special relevance for cognitive defusion.

The knowledge of how therapeutic changes occur is especially important because it opens the door to the development and refinement of interventions that target these processes, which in turn might improve the effects obtained. In our view, this development should be linked to efforts in analyzing the verbal processes involved in these mid-level terms. ACT seems especially well-suited to conduct such an analysis because it is rooted in a functional-contextual approach of human language and cognition. Although this kind of research is in its beginnings (e.g., Barnes-Holmes *et al.*, 2004; Luciano *et al.*, 2011, 2012), it has a strong potential to contribute to the improvement of therapy outcomes.

In conclusion, ACT seems to represent a new approach within cognitive behavior therapy that significantly differs from other approaches in that it rests on explicit philosophical assumptions (Hayes, 1993), a contextual theory of human language and cognition represented by RFT (Hayes *et al.*, 2001), and a model of psychopathology and behavioral ineffectiveness characterized by psychological inflexibility that points to interventions focused on processes that attempt to promote psychological flexibility. This study adds preliminary evidence that ACT produces better outcomes and works through different processes than traditional CBT.

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