

Review

Examining domains of psychological flexibility and inflexibility as treatment mechanisms in acceptance and commitment therapy: A comprehensive systematic and meta-analytic review

Jenna A. Macri, Ronald D. Rogge^{*}

Department of Psychology, University of Rochester, USA

ARTICLE INFO

Keywords:

Acceptance and commitment therapy
Mediation
Treatment process
meta-analysis
Psychological flexibility

ABSTRACT

The current systematic and meta-analytic review sought to integrate a growing number of studies examining dimensions of psychological flexibility as treatment mechanisms for Acceptance and Commitment Therapy (ACT). Analyses of 77 records (67 unique studies; $N_{\text{total}} = 9123$ participants) from comprehensive searches of multiple databases suggested that ACT interventions led to reduced inflexibility (i.e., lowered global inflexibility, lack of present moment awareness, cognitive fusion, experiential avoidance, self-as-content, & inaction) and increased flexibility (i.e., committed action/contact with values, global flexibility/acceptance, & defusion). Those changes remained significant when ACT was compared with waitlist or active treatments and were significantly linked to corresponding drops in psychological distress, supporting their roles as ACT treatment mechanisms. Moderation analyses revealed that the use of student samples, exclusion of clinically symptomatic individuals, and comparisons of ACT with other active treatments weakened these effects whereas offering ACT as an individual therapy and excluding individuals in extreme crisis (i.e., with suicidal ideation) strengthened them. The meta-analytic findings and systematic review suggested specific recommendations for future clinical work and research on ACT mechanisms: (1) Evaluate both psychological flexibility and inflexibility as distinct treatment mechanisms, (2) Evaluate specific dimensions of psychological flexibility/inflexibility as mechanisms with multidimensional scales (CompACT, MPFI), (3) Broaden treatment outcomes to include forms of wellbeing (peace of mind, vitality, connectedness), (4) Assess mechanisms and outcomes repeatedly throughout treatment to model the process of therapeutic change, (5) Investigate non-specific factors (therapeutic alliance, treatment adherence) as mechanisms, and (6) Explore treatment mechanisms in effectiveness studies.

With hundreds of published randomized clinical trials (for reviews see A-Tjak et al., 2015; Hayes et al., 2006; Murrell & Scherbarth, 2006), Acceptance and Commitment Therapy (ACT; Hayes et al., 1999, 2011) represents a third-wave cognitive behavioral therapy that has demonstrated reliable benefits across a wide range of disorders (Gloster et al., 2020). By means of a set of therapy exercises and metaphors grounded in the psychological flexibility model (Hayes et al., 2011; Luoma et al., 2007), ACT specifically targets 6 key dimensions of psychological inflexibility thought to promote maladjustment and distress, fostering instead the development of 6 corresponding psychologically flexible skills to promote wellbeing. Given the large body of work supporting ACT, a growing body of studies have begun to examine psychological flexibility and inflexibility as possible mechanisms of action, showing promising results (e.g., Bohlmeijer et al., 2011; Fledderus et al., 2013,

2010; Pots et al., 2016). The explosive growth of research in this area presents a challenge for researchers and clinicians as the dimensions of psychological flexibility and inflexibility examined as treatment mechanisms varied widely across this growing body of studies, as did the measures used to assess those mechanisms. This body of work also varies widely on the populations being treated, the presenting problems targeted, the specific ACT interventions offered, the format of delivery for those interventions (i.e., individual, group, online), and the statistics used to test mediation. The current study therefore sought to integrate this work with comprehensive systematic and meta-analytic reviews. Based on recent measurement work identifying common dimensions across a wide range of ACT and Mindfulness process measures (Rogge et al., 2019; Rogge & Daks, 2020; Rolffs et al., 2018), the current review was organized within the larger conceptual framework of the

^{*} Corresponding author at: University of Rochester, Psychology Department, 462 Meliora Hall, RC Box 270266; Rochester, NY 14627-0266, USA
E-mail address: ronald.rogge@rochester.edu (R.D. Rogge).

psychological flexibility model by delineating the effects for various forms of mindful flexibility.

1.1. Acceptance and commitment therapy

Conceptual Approach. To advance work on Cognitive Behavioral Therapy (CBT), third-wave treatments have developed theoretical structures to help guide and shape the course of CBT, thereby incorporating concepts such as mindfulness and acceptance as central targets and possible mechanisms (Hayes et al., 2011). In contrast to CBT, ACT does not aim to alter, change, or challenge thoughts, but instead it strives to help clients respond more flexibly to difficult or challenging thoughts and feelings. With over 300 published manuscripts presenting findings from randomized clinical trials since 1986 (see contextualscience.org), ACT has shown treatment benefits for depressive symptoms (Bohlmeijer et al., 2011; Pots et al., 2016), anxiety symptoms (Forman et al., 2007; Niles et al., 2014; Yadavaia et al., 2014), and stress/burnout (Frögeli et al., 2015).

Psychological Flexibility. Within the ACT conceptual framework, clinicians use a series of exercises and metaphors to specifically promote the development of six key dimensions of psychological flexibility (Hayes et al., 2011; Luoma et al., 2007): acceptance (making space for difficult or uncomfortable thoughts and feelings and allowing oneself to experience them), defusion (allowing difficult or uncomfortable feelings to flow through without clinging to them), present moment awareness (being attentive and aware of feelings from moment to moment; i.e., mindfulness), self-as-context (keeping a broader perspective in the face of difficult thoughts/feelings/experiences), contact with values (prioritizing what is truly important on a daily basis), and committed action (taking steps toward what is truly important regardless of setbacks). Correspondingly, ACT clinicians target six problematic dimensions of psychological inflexibility: experiential avoidance (distracting oneself from experiencing negative emotions and actively avoiding them), cognitive fusion (getting trapped in unwanted thoughts and feelings), inattention (drifting through life in a distracted fog and doing things mindlessly without much awareness), self-as-content (criticizing or shaming oneself for having negative emotions), lack of contact with values (losing touch with what is truly important in one's life), and inaction (being easily derailed or overwhelmed by negative feelings).

Measuring Flexibility. Despite the conceptual precision of the psychological flexibility model (and the corresponding exercises and metaphors used by ACT clinicians), some of the earliest measures of psychological flexibility/inflexibility (i.e., the 9-item Acceptance and Action Questionnaire or AAQ, Hayes et al., 2004; the 10-item Acceptance and Action Questionnaire-II or AAQ-II, Bond et al., 2011) reduced this construct down to a single global dimension of psychological inflexibility. More recent measure development work (e.g., the Cognitive Fusion Questionnaire or CFQ, Gillanders et al., 2014; the Valued Living Questionnaire or VLQ, Wilson et al., 2010; the Comprehensive assessment of ACT processes or CompACT; Francis et al., 2016) has sought to increase the precision of that measurement. This ultimately led to the development of the Multidimensional Psychological Flexibility Inventory (MPFI, Rolfs et al., 2018), a 60-item scale that assesses all 6 dimensions of psychological flexibility and 6 dimensions of psychological inflexibility using 12 separate 5-item subscales. Measurement work using the MPFI has further clarified the constructs being assessed by other ACT process measures like the AAQ-II and the CompACT (Rogge et al., 2019) as well as the forms of psychological flexibility assessed by mindfulness process measures (Rogge & Daks, 2020). The current study drew upon this body of measurement work as a Rosetta stone to clarify the specific dimensions of flexibility and inflexibility being examined across the diverse range of scales used in the studies reviewed.

ACT Treatment Mechanisms. The largest body of work on ACT has examined its benefits for psychological distress, consistently demonstrating reductions in anxiety symptoms, depressive symptoms, and stress in both clinical and non-clinical populations (for reviews see

Twohig & Levin, 2017; French et al., 2017). Consistent with this, a growing number of studies have begun examining dimensions of psychological flexibility and inflexibility as possible mechanisms of action to explain the benefits of ACT for reducing psychological distress. For example, when 93 adults with mild to moderate psychological distress were randomly assigned to either a 6-session ACT-based group therapy or a waitlist, pre-post treatment drops in psychological inflexibility observed for individuals in the ACT group were linked to corresponding pre-post treatment drops in psychological distress (Fledderus et al., 2010). Similarly, when 234 college undergraduate students were randomly assigned to participate in either a 3-week ACT-based web program or a mental health education-based web program, pre-post treatment drops in global inflexibility and inattention / distraction (i.e., lack of present moment awareness) as well as pre-post treatment increases in defusion observed for individuals in the ACT group were linked to corresponding pre-post treatment drops in depressive symptoms (Levin et al., 2016). As exemplified by these two examples, studies examining psychological flexibility and inflexibility as treatment mechanisms vary widely on: (1) the dimensions of flexibility/inflexibility examined, (2) the populations treated, (3) the presenting problems targeted, (4) the ACT interventions used, (5) the format of those interventions, (6) the comparison conditions included, and (7) the specific measures used to assess the treatment mechanisms and outcomes. The current study therefore sought to integrate this rapidly growing body of work on treatment mechanisms underlying the benefits of ACT for reducing psychological distress, conceptually linking that diverse body of work back to the specific dimensions of psychological flexibility and inflexibility targeted within ACT.

1.2. Previous reviews

The current comprehensive literature search (described below) uncovered 15 published reviews that either mentioned mediation (without necessarily meta-analyzing mediation effects) or at least partially meta-analyzed mediation effects (primarily on the A path: ACT → Δ flexibility; see Table 1). As a set, the original articles covered by these reviews had little overlap with the studies reviewed in the current review (often because treatment mechanisms were not the primary focus of the review). Notably, only 7 of the reviews generated meta-analytic estimates for the impact of ACT on flexibility (Path A of mediation) and only one of those 7 (Ren et al., 2019) also meta-analyzed links between changes in flexibility and changes in outcomes (Path B of mediation). Specifically, in a review of 50 ACT RCTs, Ren et al. (2019) examined 6 dimensions of flexibility as treatment mechanisms for a wide range of outcomes (e.g., pain disorder, personality disorders, depression, anxiety, substance use). Those meta-analytic results uncovered significant mediation effects for global inflexibility, lack of present moment awareness, contact with values, and acceptance. Only 17 studies overlapped between those 50 studies and the 77 studies in the current review as the current review built on that work by: (1) focusing exclusively on psychological distress as an outcome (to reduce heterogeneity), (2) expanding to 14 possible dimensions of psychological flexibility and inflexibility, (3) including a broader range of studies (i.e., single-arm treatment studies), and (4) examining possible moderators of treatment mechanisms. The remaining reviews generally provided brief narrative summaries of mediation findings in the context of broader reviews of ACT. Thus, the current review offers a unique quantitative contribution to the current literature.

1.3. Present comprehensive review

Given the large body of work examining the benefits of ACT for reducing various forms of psychological distress (e.g., depressive symptoms, anxiety symptoms, burnout, stress), the current review focused on studies providing quantitative results on treatment mechanisms from that literature. More specifically, the review used the 12

Table 1

A Summary of Previous Reviews on ACT Treatment Studies.

Type of review authors	year	# of ACT tx studies	# overlapping with current review	focus of review	mediation discussed	Meta on ACT → Δ FLEX (Path A)	Meta on Δ FLEX to Δ OUTCOME (Path B)
Narrative reviews							
Hayes et al., 2006	2006	17	2	ACT model, processes, outcomes	YES	NO	NO
Ruiz	2010	66	7	ACT vs CBT RCTs	YES	NO	NO
Systematic reviews							
Shah	2015	20	8	ACT for social anxiety	YES	NO	NO
Twohig and Levin, 2017	2017	36	8	ACT for dep/anx	YES	NO	NO
Griffiths et al	2018	6	1	ACT for body image	YES	NO	NO
Stockton et al., 2019	2019	12	8	ACT Mediation studies	YES	NO	NO
Coto-Lesmes et al.	2020	15	1	group ACT for Depr/Anx	YES	NO	NO
Meta-analytic reviews							
Mowrey	2015	25	3	Feminist Multiculturalism in ACT	YES	NO	NO
Levin et al.	2012	66	2	Laboratory-based components of ACT	NO	YES	NO
Han and Kim	2022	34	8	Internet-Based ACT on Process Measures	NO	YES	NO
Murillo et al.	2022	13	2	ACT for chronic pain mediators	YES	YES	NO
Ruiz	2012	16	7	ACT vs CBT RCTs	YES	YES	NO
Bluett et al.	2014	63	3	ACT for anxiety	YES	YES	NO
French et al.	2017	13	3	Self-help ACT interventions	YES	YES	NO*
Ren et al.	2019	50	17	Mechanisms of ACT	YES	YES	YES

NOTE: * Rather than extracting estimates of path b (change in flexibility predicting change in outcome) from each study and then meta-analyzing them, these authors developed an indirect estimate of that across 9 studies by correlating the extracted ACT treatment effects on outcomes (i.e., path c estimates) with extracted ACT effects on flexibility (i.e., path a estimates) within their meta-analytic dataset.

dimensions of psychological flexibility and inflexibility targeted within ACT as a conceptual framework. Correspondingly, the review used recent measurement work with the MPFI to identify common dimensions of flexibility and inflexibility assessed across a wide range of ACT and mindfulness-based process measures as a corresponding operational framework to code effects. This allowed us to meta-analyze effects for specific dimensions of flexibility and inflexibility separately from one another.

Hypotheses. Aligning with the prevailing statistical approaches used to test treatment mechanisms in the ACT literature, our review examined mediation as diagrammed in Fig. 1. Thus, we hypothesized that ACT would lead to significant pre- to post-treatment decreases in psychological distress (supporting path C in the model). We further hypothesized that ACT would lead to pre- to post-treatment decreases in dimensions of psychological inflexibility and significant increases in dimensions of psychological flexibility (supporting path A in the model). We further hypothesized that pre- to post-treatment changes in flexibility/inflexibility would be linked to corresponding decreases in psychological distress (supporting path B), thereby helping to explain the benefits of ACT for reducing psychological distress.

Moderators. To further build on this body of work, the current review used weighted meta-regression analyses to examine sets of possible moderators that could influence the strength of the mediation effects examined. This included sets of moderators representing: (1) sample

characteristics (proportion male, proportion non-white, and the use of a clinical population in contrast to the use of non-clinical community adults and the use of students), (2) exclusion criteria (no suicidal ideation, no other treatment, no clinical or severe symptoms), (3) intervention formats (length of intervention, group therapy contrasted with online interventions, workbooks, and individual treatment), and (4) comparison groups employed (single-arm treatment studies contrasted with studies using waitlist or active treatment controls).

2. Method

2.1. Selection of Studies

In accordance with PRIMSA guidelines (Moher, Liberati, Tetzlaff, Altman, & Prisma, 2010), systematic literature searches were conducted in the WebOfScience and APA/ProQuest databases (PsycINFO, PsycArticles, PsychBooks, PsychTests, ProQ psychology, ProQ social science, ProQ dissertations & theses, ProQ one psychology) on 11-1-2023. Our searches specified that the titles, abstracts, and/or keywords of records should include the phrase “acceptance and commitment therapy” to focus the search on ACT interventions. To narrow the focus to intervention studies, we also specified that at least one of the following terms appeared at any point in the records: *treatment study*, *clinical trial*, *therapy study*, *effectiveness study*, or *efficacy study*. Finally, to narrow the focus further to studies presenting mediation results, we specified that at least one of the following terms appeared at any point in the records: *mediat**, *mechanism*, or *therapy process*. We also downloaded records from the ACBS website (contextualscience.org) and identified additional records from the introductions of relevant articles and focused google scholar searches. As shown in Fig. 2, this generated a total of 1136 possible records, yielding 77 records meeting our inclusion criteria.

2.2. Inclusion / exclusion criteria

Studies were considered to meet eligibility criteria if they: (a) were

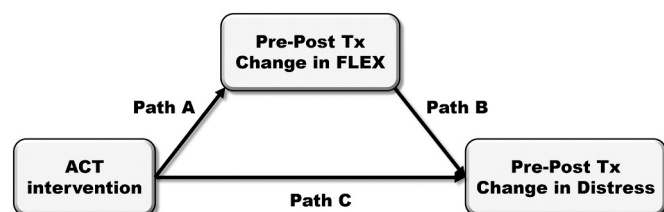


Fig. 1. Conceptual Mediation Model to be Evaluated.

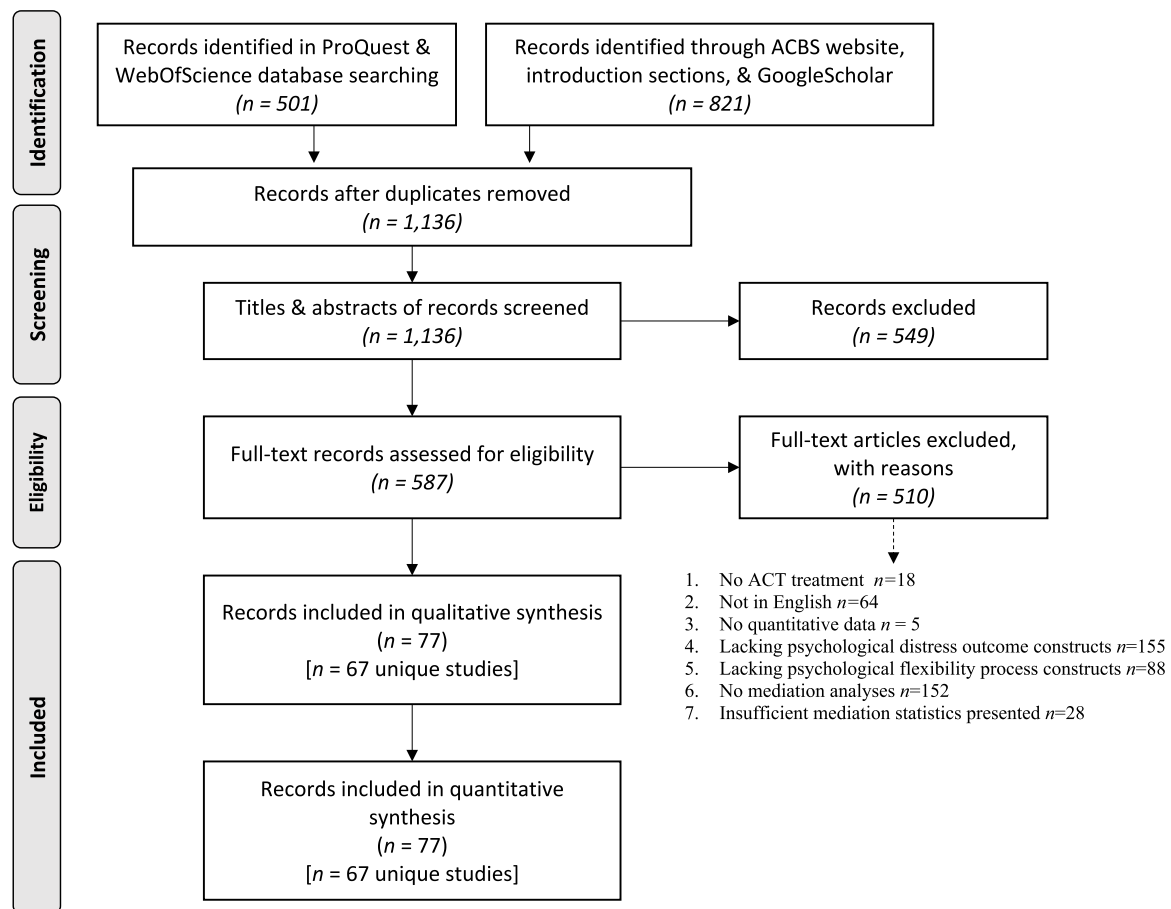


Fig. 2. PRISMA Flowchart of Screening Process.

written in English, (b) were conducted with human subjects, (c) examined the effects of an ACT-based intervention (including single-arm treatment studies as well as randomized, controlled trials), (d) included some form of global distress as an outcome (e.g., psychological distress, depressive symptoms, anxiety symptoms, mental health, stress, burnout, worry), (e) included a measure of psychological flexibility/inflexibility as a treatment process variable, (f) reported change in psychological flexibility due to ACT (path A results controlling for baseline; typically in the form of pre- and post-treatment means and standard deviations for the various treatment groups), (g) reported an effect linking pre- to post-treatment (or pre-treatment to follow-up) change on flexibility to pre to post/follow-up change on the outcome (path B results; typically as a correlation coefficient or a standardized regression coefficient), (h) and represented a novel and previously unpublished effect (relevant if multiple papers had been published out of the same data). To ensure that cross-sectional associations between outcome and process variables did not inflate estimates of path B, we only included studies if they specifically controlled for baseline levels of the outcome and process variables (i.e., focused on associations between change in both types of variables). We contacted the authors of 27 records containing mediation findings without presenting sufficient statistics to be included in the meta-analysis. A total of 7 authors responded to our requests, yielding effects from another 7 studies. Fig. 2 details the screening process which ultimately identified 77 records yielding 67 unique treatment studies from which effects could be extracted.

2.3. Data extraction

Procedure. The first author coded study characteristics (e.g., study design, comparison conditions used, length of follow-up, dimensions of

psychological flexibility examined), sample characteristics (e.g., sample size, demographics), record characteristics (published vs. unpublished), and effect sizes in the 77 studies. The second author then checked the data extracted. Discrepancies were rare (<1%) and were resolved through discussion.

Classification of flexibility variables. Following methodology established in previous meta-analyses (e.g., Daks & Rogge, 2020) based on the integrative measurement findings (Rogge et al., 2019) using the Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs et al., 2018), our review comprehensively explored all 12 dimensions of flexibility and inflexibility posited within the psychological flexibility model, including two additional global dimensions (*Global Flexibility* and *Global Inflexibility*), yielding a total of 14 possible treatment process variables. This process was facilitated by findings with the MPFI highlighting that scales from the mindfulness literature like the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) and the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) assess components of flexibility (Rogge & Daks, 2020). The breadth of our search allowed us to identify studies examining 11 of the 14 possible dimensions of flexibility as treatment mechanisms.

Aligning item content with the direction of effects. Much of the research in this area has been done using the Acceptance and Action Questionnaire – II (AAQ-II; Bond et al., 2011) or one of its derivatives. The AAQ-II is typically reverse scored, as responses to its 7 negatively worded items are combined so that higher scores reflect higher levels of flexibility. Despite that trend, recent measurement work (Rogge et al., 2019; Rolffs et al., 2018) has highlighted advantages to distinguishing between forms of flexibility and inflexibility as they would seem to assess meaningfully distinct constructs with unique information to contribute to models. Given those findings, we attended to the direction

of the majority of the original items of each process scale, ensuring that effects for each mediator were recorded in a manner consistent with the direction of a majority of its items. Thus, the AAQ-II was considered a measure of global inflexibility and the MAAS was considered a measure of lack of present moment awareness (i.e., reflecting an inattentive / distracted approach to daily life). The directions the effects presented using those scales were adjusted accordingly.

Effects extracted. Although treatment researchers have begun shifting toward more advanced multivariate frameworks like Structural Equation Modeling (SEM) for testing the mediation of treatment effects (e.g., [Wersebe et al., 2017](#)), that practice has yet to become universal for treatment studies. It remains far more common for researchers to provide means and standard deviations across repeated waves of assessment on outcome and mechanism variables and then run repeated measures ANOVAs or Mixed Method Repeated Measures (MMRM) analyses to test the ‘A’ and ‘C’ paths of the mediation model ([Fig. 1](#)), testing the impact of ACT on the mediators and the outcomes. Those treatment effect analyses are typically followed by demonstrating correlated pre-post change between change on the mechanisms and change on the outcomes to estimate path ‘B’. That more traditional approach also allows readers to see the actual change in scores observed for the outcomes and mechanisms and places the effects on far more familiar (and immediately interpretable) metrics (i.e., Cohen’s *ds* and correlations) than offered by the raw path coefficients of an SEM treatment mediation model. As the vast majority of studies in this review provided the statistics consistent with the more traditional approach, we chose to meta-analyze repeated measures Cohen’s *ds* for the ‘A’ and ‘C’ paths and correlations between change on mechanisms and change on outcomes for the ‘B’ paths. Toward that end, we extracted means and standard deviations for the various treatment conditions at pre-treatment, post-treatment, and follow-up to calculate repeated measures Cohen’s *ds* (d_{rm}) for each group to get standardized effects. For the single-arm treatment studies, the d_{rm} for distress represented the C path whereas the d_{rm} estimates for change in forms of flexibility represented the A paths. For RCTs with comparison conditions (i.e., waitlist or another active treatment), we calculated d_{rms} for the ACT groups (allowing those effects to be combined with the effects from the single-arm treatment studies). We also computed d_{rms} for the comparison groups and then subtracted those comparison effect sizes from the effects obtained from the ACT intervention (to represent the unique benefits of ACT). This allowed us to calculate separate meta-analytic effects considering ACT alone (as if every study was a single-arm treatment study), contrasting ACT to a waitlist condition, and contrasting ACT to another active treatment. For path B we extracted correlations (or standardized regression coefficients) representing associations between pre to post/follow-up change on specific dimensions of flexibility and pre to post/follow-up change on psychological distress. When studies assessed more than one dimension of psychological flexibility, we extracted separate path A and B estimates for each distinct dimension of flexibility. When studies demonstrated mediation results for both pre-treatment to post-treatment change as well as pre-treatment to follow-up change, we extracted separate path A, B, and C estimates for both time-frames. Thus, 584 effects were extracted from the 67 unique studies, representing 413 pre- to post-treatment change effects and 171 pre-treatment to follow-up effects that span roughly 11 distinct dimensions of psychological flexibility and inflexibility ([Table 2](#)).

2.4. Data analysis & synthesis

Meta-analytic estimates. Our analyses were conducted using Rstudio v.1.1.453 ([R Core Team, 2018](#)) using the metafor package ([Viechtbauer, 2010](#)). Random effects modeling using maximum likelihood estimation was used to estimate our meta-analytic effects in the current study ([Borenstein et al., 2009](#)), as this approach assumes heterogeneity in effect sizes. We saw this as an appropriate method given the heterogeneity in our sample sizes, measurement instruments,

Table 2
Summary of Records & Studies Reviewed.

Category	Count or %	Category	Count or %
Subcategories		Subcategories	
Records	77	Population ¹	
Publication status		Clinical (psych)	40
Unpublished records	20	Clinical (medical)	13
Peer reviewed articles	57	Community	32
Unique studies	67	Student	18
Total subjects	9123	Exclusion criteria	
Total effects	584	No severe pathology	9
Pre to post treatment effects	413	No suicidal ideation	18
Pre-treatment to follow-up effects	171	No psych medication	5
Female	75.6%	No other therapy	18
White	77.8%	No comorbidity	2
Age		ACT intervention format	
Mean	37.1	Group workshops	36
	15.4 to		
Range	61.8	Individual therapy	11
Study type		Online programs	13
Single-arm (Pre-Post)	17	Workbooks	8
RCT	60	Comparison groups ²	
		Waitlist	37
		Alternative treatment	25

Note. ¹These add to greater than the total number of records and studies because they are not mutually exclusive. For study-by-study details of the records included, see Supplemental Tables S1 and S2.

populations, and methods of data collection, all of which may be factors that impact the results obtained across studies. I^2 indices were estimated to quantify the level of heterogeneity present in each meta-analytic effect.

Examining effects. All extracted effects were weighted by sample size before analysis. For the path B effects, the correlations were transformed to Fisher’s *Z* values, were then meta-analyzed, and the results were subsequently transformed back into correlations for ease of interpretation ([Lipsey & Wilson, 2001](#)). The presence of potential outliers was assessed using the *influence measures* function within the *metafor* package in R, which calculates outlier diagnostics (e.g., studentized residuals, Cook’s distances, covariance ratios), and identifies individual effects that are disproportionately influential to the overall effect. Although these analyses identified a small number of outlying effects, results from analyses with and without the outliers remained largely unchanged across the roughly 90 meta-analytic effects calculated. Thus, to ensure maximum representation of the current literature, all reported results included those potentially outlying effects.

Publication bias. Our search strategy was successful at identifying 20 records from unpublished sources, representing 30% of all of the records included and thereby lessening the risk of publication bias artificially inflating our meta-analytic effects. To further address the possibility of publication bias, we examined funnel plots for each meta-analytic effect and ran Egger’s regression tests to examine possible funnel plot asymmetry ([Egger et al., 1997](#)). When these screens indicated possible publication bias, we ran *trim and fill* analyses to provide an adjusted average effect size ([Duval & Tweedie, 2000](#)) to help correct our funnel plot asymmetry. Finally, to further explore possible publication bias, we ran selection method analyses for each meta-analytic effect using R functions developed and validated by [McShane et al. \(2016\)](#). These analyses estimated the relative probability of a contradictory finding (i.e., non-significant or in the opposite direction of the predominant findings) being available in the literature in comparison to the probability of a consistent and significant finding being available for inclusion. On this index, relative probabilities close to a value of 1.0 would suggest the presence of very little publication bias whereas relative probabilities much lower than 1.0 would suggest publication bias.

3. Results

3.1. Systematic review

Sample Characteristics. As shown in Table 2, the 77 records identified in our comprehensive literature search represented 67 unique studies of 9123 individuals. Across those studies, average sample ages ranged from 15.4 to 61.8 years old, with a weighted mean of 37.1 years of age, and the individuals were primarily female (75.6%) and white (77.8%). Over half of the studies ($n = 40$) drew at least part of their sample from clinical populations of clients seeking therapy (e.g., Canadian adolescent outpatients with anxiety and/or depressive disorders – Dhariwal, 2017; Scottish inpatients and outpatients in treatment for comorbid MDD and schizophrenia – Gumley et al., 2017). Thirty-two studies drew at least some of their participants from community populations (e.g., UK adults from a large media company – Bond & Bunce, 2000; US school district personnel – Kelly, 2015; Swedish social workers – Brinkborg et al., 2011). Fewer studies drew participants from student populations ($k = 18$) and from populations of individuals with specific medical disorders ($k = 13$). Thus, the 9123 individuals primarily represent adults with a range of presenting problems. For a study-by-study listing of the included records, see Supplemental Tables S1 and S2.

Study Designs. A majority (59 of the 67) studies were randomized controlled trials using waitlist ($k = 37$) and/or alternative active

treatments ($k = 25$) as comparison conditions (Table 2). Most of the trials allowed for a full range of pathology, but 9 studies excluded participants for severe pathology, 18 excluded participants for suicidal ideation, and 2 studies excluded participants for having comorbid disorders. Most of the trials also allowed the participants to be receiving other treatments, but 5 excluded participants if they were currently on psychotropic medications, and 18 excluded participants if they were already receiving therapy. A majority of the ACT-interventions (36 out of 67) were given as group workshops, with 11 studies providing individual therapy, 13 studies examining exclusively online interventions, and 8 studies evaluating ACT workbooks. Across these studies, we were able to extract 584 effects, with most of those effects examining change from pre-treatment to post-treatment (413 or 71%; see Table 2). The remaining effects examined change from pre-treatment to a follow-up assessment ranging from 1 month to 15 months after pre-treatment (median = 3.0 months, $M = 3.7$, $SD = 2.8$). Thus, the 67 studies included represented a range of designs, methods, and interventions.

Despite a few notable exceptions (e.g., Forman et al., 2007; Hindman et al., 2015; Levin et al., 2017), most studies only presented results for just one or two dimensions of flexibility, often focusing exclusively on global psychological inflexibility through the use of scales like the AAQ-II. Thus, although the review was able to identify studies evaluating 11 distinct dimensions of psychological flexibility as possible mediators, many of those dimensions had been evaluated in just a small handful of

Table 3
Meta-Analytic Estimates of Treatment Mechanism Effects for Specific Forms of Psychological Flexibility.

TYPE OF DATA	Path A: Repeated Measures Cohen's ds						Path B: Correlated Change		Path C: Repeated Measures Cohen's ds					
	Single Group		ACT vs Waitlist		ACT vs Oth Tx				Single Group		ACT vs Waitlist		ACT vs Oth Tx	
Class of Mechanisms	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate
Flexibility Mechanism	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate	k	estimate
PRE to POST change														
Forms of inflexibility														
Global inflexibility	42	−0.586***	18	−0.423***	12	−0.370***	42	0.457***	42	−0.714***	18	−0.561***	12	−0.378***
vs TAU only					4	−0.424***							4	−0.625***
vs Oth Tx (no TAU)					8	−0.319**							8	−0.245**
Lack of present														
moment awareness	12	−0.423***	7	−0.414***	6	−0.192*	12	0.381***	12	−0.677***	7	−0.613***	6	−0.397*
Cognitive fusion	13	−0.626***	7	−0.605***	2	−0.163	13	0.376***	13	−0.623***	7	−0.518***	2	−0.213
Experiential														
avoidance	3	−0.481***	2	−0.389*	1	−1.804***	3	0.574***	3	−0.474**	2	−0.525**	1	−0.610*
Self-as-content	6	−0.627***	4	−0.520***	3	−0.190	6	0.324***	6	−0.906***	4	−0.744***	3	−0.360
Inaction	6	−0.516***	5	−0.275**	0		6	0.381***	6	−0.551**	5	−0.431***	0	
Forms of flexibility														
Committed action /														
contact with values	15	0.502***	6	0.279***	2	0.358**	15	−0.368***	15	−0.655***	6	−0.434***	2	−0.275
Global flexibility /														
acceptance	8	0.924***	5	0.823**	2	1.003**	8	−0.366***	8	−1.016***	5	−0.624***	2	−0.520***
Defusion	8	0.623***	3	0.529***	5	0.358*	8	−0.378***	8	−0.834***	3	−0.660***	5	−0.328**
Self-as-context	1	0.635	1	0.855†	0		1	−0.569**	1	−0.786†	1	−0.630	0	
Present moment														
awareness	1	0.115	1	0.042	0		1	−0.104	1	−0.184	1	−0.314	0	
PRE to FOLLOW-UP change														
Forms of inflexibility														
Global inflexibility	19	−0.621***	9	−0.589***	6	−0.435**	19	0.401***	19	−0.790***	9	−0.797***	6	−0.354***
Lack of present														
moment awareness	3	−0.207	1	−0.138	4	−0.157†	4	0.205***	3	−0.754†	1	−0.451**	4	−0.185*
Cognitive fusion	2	−0.677**	1	−0.739†	0		2	0.555***	2	−1.271†	1	−1.945***	0	
Self-as-content	2	−0.683***	1	−0.566***	3	−0.230*	3	0.296***	2	−1.281***	1	−0.451**	3	−0.272*
Forms of flexibility														
Committed action /														
contact with values	3	0.594***	0		0		3	−0.331***	3	−0.692***	0		0	
Global flexibility /														
acceptance	2	1.294***	1	1.294***	1	1.223***	2	−0.119	2	−0.916***	1	−0.873***	1	−0.440*
Defusion	4	0.541**	1	0.694***	3	0.186*	5	−0.238***	4	−0.570†	1	−0.451**	3	−0.164†

NOTE: All meta-analytic effects were estimated with random effects modeling due to the heterogeneity across the studies examined. Oth Tx = other active treatment group; TAU = treatment as usual. For greater details on each of these effects, see Supplemental Tables S3 through S6. All significant and marginally significant effects have been bolded for ease of interpretation.

*** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

studies (i.e., 1–4 studies; see Table 3), highlighting that the rich complexity of the psychological flexibility model has yet to be fully and comprehensively evaluated across studies of treatment mechanisms. The numbers of studies (i.e., the k values) supporting the mediation findings for each dimension presented in Table 3 also reveal that more research has examined dimensions of inflexibility than flexibility, highlighting yet another opportunity for future research.

3.2. Path A: impact of ACT on psychological flexibility/inflexibility

Single Group Results. Table 3 summarizes the meta-analytic estimates obtained across the analyses and Supplemental Tables S3–S6 provide greater details on each of the effects. As shown in the first set of columns of Table 3, when the ACT intervention groups of each study were examined by themselves (as if all studies were single-arm treatment studies), the ACT interventions yielded reasonably robust pre-treatment to post-treatment improvements on a majority of flexibility processes examined (with the possible exception of self-as-context and present moment awareness – each of which had only been examined in a single study). Similarly, a majority of flexibility processes demonstrated robust pre-treatment to follow-up improvements in the ACT intervention groups (with the possible exception of lack of present moment awareness – which had only been examined across 3 studies). Within these single-group findings, the dimensions of global flexibility/acceptance, global inflexibility, defusion, cognitive fusion, committed action, and self-as-content emerged with particularly robust treatment effects. Taken as a set, these results suggest that ACT promotes improvement and growth on a wide range of dimensions of psychological flexibility and inflexibility that it targets.

ACT vs Waitlist Results. When the ACT treatment effects on dimensions of flexibility were estimated in direct comparison to effects from waitlist conditions (i.e., subtracting treatment gains in the waitlist conditions away from treatment gains in the ACT conditions), the meta-analytic estimates of treatment effects were slightly smaller but still largely statistically significant (Table 3). Notably, the effect for self-as-context became stronger and marginally significant when contrasted with a waitlist condition in the single study examining that mediator of pre-post treatment change. Taken as a set, these results suggest that most of the improvement observed in the single-group effects was not simply due to spontaneous improvement and can therefore be more directly attributed to the ACT interventions used.

ACT vs. Other Treatment Results. Fewer studies contrasted treatment gains from ACT interventions with treatment gains from other active therapies (e.g., treatment as usual, CBT). As seen in Table 3, within the studies contrasting ACT from another active treatment, although a few of the effects remained reasonably robust (e.g., $d_{rm} = 1.003$ for global flexibility/acceptance pre-post, $d_{rm} = 1.223$ for global flexibility/acceptance pre-follow-up, $d_{rm} = -0.370$ for global inflexibility, $d_{rm} = 0.358$ for committed action/contact with values) or became stronger (e.g., $d_{rm} = -1.804$ for experiential avoidance), most of the effects became weaker (e.g., halving in size for cognitive fusion, lack of present moment awareness, and global inflexibility) and/or non-significant (e.g., self-as-content, defusion). Analyses distinguishing treatment as usual (TAU) comparisons from comparisons to more specific active treatments (e.g., CBT) for studies examining global inflexibility as a mechanism (the only dimension of flexibility with a sufficient number of studies to support such analyses) shed additional light on this trend. ACT leads to significant unique drops in global inflexibility both when contrasted with TAU ($d_{rm} = -0.424^{***}$, $k = 4$) and when contrasted with active treatment comparisons ($d_{rm} = -0.319^{**}$, $k = 8$). Similarly, ACT leads to unique drops in inflexibility (path C) when contrasted with TAU ($d_{rm} = -0.625^{***}$, $k = 4$) and to more modest drops when contrasted with more specific active treatment conditions ($d_{rm} = -0.245^{**}$, $k = 8$). Taken as a set, these results suggest that specific active treatments (like CBT) served as particularly stringent comparison conditions as many of those alternative treatments also

yielded modest benefits on both distress and on dimensions of psychological flexibility and inflexibility (thereby weakening the treatment effects unique to ACT interventions). In fact, a significant single-group, meta-analytic, pre-post treatment effect emerged showing reductions in global psychological inflexibility across the active treatments that served as comparisons to ACT in these studies ($k = 12$, $N_{total} = 835$, estimate = -0.239 , $p < .01$; 95% CI lower = -0.392 , upper = -0.085). Thus, although ACT interventions demonstrated a far stronger impact on psychological inflexibility, these results suggest that psychological inflexibility might function as a common mechanism across various treatment approaches.

3.3. Path B: links between change in flexibility and change in depressive symptoms

As seen in the middle columns of Table 3, the meta-analytic effects suggested that, for a majority of the dimensions of flexibility examined, pre-post treatment change on forms of psychological flexibility was significantly linked to pre-post treatment change on psychological distress. Similar findings emerged when meta-analyzing the studies examining pre-treatment to follow-up change. Among these results, change in experiential avoidance, self-as-context, cognitive fusion, and global inflexibility demonstrated some of the strongest links to improvements in psychological distress, suggesting that those forms of psychological flexibility and inflexibility might be more proximally linked to change on that outcome.

3.4. Path C: impact of ACT treatment on depressive symptoms

To ensure that the meta-analytic effects for path C were estimated in the same subgroups of studies as the path A and B meta-analytic effects (corresponding to each row of Table 3), we estimated those path C effects in each corresponding subgroup of studies. As shown in the final set of columns of Table 3, with the exception of one effect based on a single study, all of the single-group analyses for path C suggested that the ACT interventions significantly reduced psychological distress. In fact, the 17 of the 18 single-group meta-analytic estimates were significant, ranging from a drop of 0.474 standard deviations in distress to a drop of 1.281 standard deviations in distress, with 14 of those effects dropping 0.6 standard deviations or more. Although the magnitude of those effects lowered slightly when ACT was compared to a waitlist control, a majority of those effects remained significant, continuing to suggest that ACT helped to reduce psychological distress across the studies examined.

3.5. Moderation of treatment mechanisms

To explore possible moderators that might help explain that heterogeneity, we ran a series of weighted random-effects meta-regression models using the metafor package in Rstudio. For these analyses we focused on the single-group, pre-post A, B, and C path estimates for psychological inflexibility as a mediator, as that treatment mechanism and those effects had the largest number of independent studies supporting them. Given the broad range of samples, methods, interventions, and measures employed across the 42 studies evaluating those global inflexibility effects in the current review, the Q statistics for the corresponding Path A, B, and C single-group effects suggested significant heterogeneity, and the I^2 statistics estimated fairly high levels of heterogeneity (74.9% to 85.6%) across those three effects (Supplemental Table S3), supporting the examination of possible moderators of those three effects.

Moderation by Sample Characteristics. As shown in the first set of rows of Table 4, the single-group, pre-post, repeated-measures Cohen's d meta-analytic estimates for the intercepts suggested that ACT decreased psychological inflexibility ($\beta = -0.91$, $p < .0001$; path A) and depressive symptoms ($\beta = -0.95$, $p = .0001$; path C) nearly a full

Table 4Moderation of Mediation Links through Psychological Inflexibility ($k = 38$).

MODEL	Path A (ACT $\rightarrow$ Δ INFLEX)			Path B Δ INFLEX $\rightarrow$ Δ Distress)			Path C (ACT $\rightarrow$ Δ Distress)		
	coeff	[95% CI]	p	coeff	[95% CI]	p	coeff	[95% CI]	p
SAMPLE CHARACTERISTICS									
Intercept (white females w/ disorders)	-0.91	[-1.22, -0.59]	<0.0001	0.44	[0.21, 0.68]	<0.0001	-0.95	[-1.47, -0.44]	<0.0001
Proportion Men	0.18	[-0.49, 0.85]	0.602	0.23	[-0.23, 0.7]	0.323	-0.03	[-1.03, 0.97]	0.956
Proportion People of Color	0.00	[-0.01, 0]	0.761	0.00	[-0.01, 0]	0.178	-0.01	[-0.01, 0]	0.164
Community members	0.17	[-0.09, 0.43]	0.205	-0.06	[-0.25, 0.14]	0.566	0.20	[-0.23, 0.64]	0.353
Students	0.57	[0.31, 0.83]	<0.0001	-0.07	[-0.26, 0.12]	0.491	0.57	[0.15, 0.99]	0.008
EXCLUSION CRITERIA									
Intercept (not excluding these 3 criteria)	-0.43	[-0.56, -0.3]	<0.0001	0.45	[0.36, 0.54]	<0.0001	-0.64	[-0.83, -0.45]	<0.0001
No suicidal ideation	-0.25	[-0.49, -0.02]	0.033	0.02	[-0.14, 0.19]	0.765	-0.21	[-0.55, 0.14]	0.248
No other treatment	-0.06	[-0.3, 0.18]	0.601	0.10	[-0.06, 0.27]	0.208	-0.13	[-0.48, 0.23]	0.481
No severe symptoms	-0.17	[-0.46, 0.11]	0.235	-0.19	[-0.4, 0.01]	0.068	0.20	[-0.24, 0.64]	0.370
INTERVENTION FORMAT									
Intercept (group workshop)	-0.60	[-0.9, -0.31]	<0.0001	0.52	[0.31, 0.73]	<0.0001	-0.65	[-1.06, -0.24]	0.002
Hours of intervention	0.00	[-0.03, 0.03]	0.999	-0.01	[-0.03, 0.01]	0.349	0.00	[-0.04, 0.03]	0.802
Book / Workbook	-0.16	[-0.45, 0.13]	0.287	-0.08	[-0.29, 0.12]	0.430	-0.11	[-0.51, 0.28]	0.575
Online Tx	0.27	[0.02, 0.51]	0.036	-0.01	[-0.19, 0.17]	0.913	0.23	[-0.12, 0.57]	0.198
Individual Tx	-0.28	[-0.58, 0.03]	0.079	0.18	[-0.02, 0.38]	0.074	-0.52	[-0.92, -0.12]	0.010
COMPARISON									
Intercept	-0.69	[-0.86, -0.51]	<0.0001				-0.61	[-0.82, -0.39]	<0.0001
Vs. waitlist	0.26	[0.02, 0.49]	0.032				0.05	[-0.24, 0.34]	0.732
Vs. other active treatment	0.31	[0.05, 0.56]	0.020				0.22	[-0.1, 0.54]	0.169
EVALUATING PUBLICATION BIAS									
Intercept	-0.57	[-0.69, -0.44]	<0.0001	0.48	[0.41, 0.56]	<0.0001	-0.75	[-0.92, -0.59]	<0.0001
Peer reviewed publication	-0.05	[-0.31, 0.21]	0.702	-0.11	[-0.27, 0.05]	0.190	0.15	[-0.19, 0.48]	0.390

NOTE: For the weighted random-effects meta-regression models contrasting comparison groups, the Cohen's repeated measure d_s (d_{rm}) adjusted for gains in another active treatment group (for studies with active comparison groups) were directly compared to d_{rm} estimates adjust for gains in a waitlist condition (for studies with only a waitlist comparison) and to single-group pre-post d_{rm} estimates for studies with no comparison groups (i.e., single-arm treatment studies). For all other models, the analyses focused on the single-group pre-post d_{rm} estimates to test for moderation as those effects had the most studies supporting them ($k = 37$). Effects that were significant at $p < .05$ or marginally significant at $p < .10$ have been bolded for ease of interpretation.

standard deviation in white women with mental health disorders (i.e., drawn from a clinical population). Drawing subjects from student populations significantly weakened both of those effects, predicting an average decrease of only 0.34 standard deviations in psychological inflexibility (i.e., $-0.91 + 0.57$) and an average decrease of only 0.38 standard deviations in psychological distress for studies of students. Taken together, these findings provide a note of caution toward conducting treatment studies in non-clinical populations as those tended to yield weaker effects. Unexpectedly, the correlation between pre-post drops in inflexibility and corresponding drops in depressive symptoms was marginally stronger in samples with high proportions of non-white participants, suggesting that ACT might be effective for a range of racial/ethnic groups.

Moderation by Exclusion Criteria. As shown in the second set of rows of Table 4, a separate set of weighted random effect meta-regression analyses examined the degree to which common exclusion criteria might have impacted the strength of the mediation findings. Excluding participants with suicidal ideation significantly strengthened the benefits of ACT at reducing psychological inflexibility. This would begin to suggest that clients currently in extreme crisis (i.e., at risk for self-harm) might show more modest gains from fairly brief ACT interventions. In contrast, a number of studies used a far lower threshold for levels of symptoms/distress, excluding participants if their levels of distress was too high (e.g., approaching that of a clinical population). As shown in in Table 4, more broadly excluding clinical levels of symptoms seemed to have weakened both the path B effects, potentially by restricting the range for observing treatment benefits.

Moderation by Intervention Format. As shown in the third set of models in Table 4, offering ACT as an online intervention led to smaller drops in psychological inflexibility ($\beta = 0.27, p = .036$), weakening that effect. Notably, offering ACT as an individual therapy (in comparison to a group format) demonstrated: (1) significantly stronger drops in distress (path C), (2) marginally stronger drops in psychological inflexibility (path A), and (3) marginally stronger links between drops in

inflexibility and corresponding drops in distress (path B), suggesting more robust benefits from the one-on-one attention offered in individual treatment. Although we anticipated that number of hours of intervention might have yielded a significant dosage effect across studies, those effects failed to emerge as significant. This might suggest that the researchers effectively tailored the dosages of ACT offered to the populations being served, the presenting problems being targeted, and the corresponding outcomes being examined (e.g., shorter interventions for moderate stress/burnout, longer interventions for clinical levels of depressive symptoms).

Moderation by Comparison Group. To examine the potential impact of comparison groups on effect sizes, we shifted our focus from exclusively examining single-group, pre-post effects, and instead allowed each study to be represented by its most stringent comparison group effect. Thus, studies with active treatment comparisons ($k = 12$ out of the 42 studies yielding inflexibility effects that could be extracted) were represented by the path A and C estimates adjusted for that comparison, whereas the studies with only waitlist control groups ($k = 18$ for inflexibility) were represented by estimates contrasted to waitlists, and the remaining single-arm studies ($k = 12$ for inflexibility) continued to be represented by their single-group pre-post Cohen's d_{rm} effects. As seen in the penultimate set of rows in Table 4, comparing ACT to another active treatment generally served to weaken the estimates of drops in psychological inflexibility due uniquely to ACT. Thus, the path A effect without control groups estimated from this regression ($\beta = -0.69, p < .0001$) was predicted to be weaker ($\beta = 0.31, p = .033$) if compared to another active treatment. In a similar manner, the use of a waitlist control marginally weakened the predicted drops in psychological inflexibility (path A; $\beta = 0.18, p = .074$) due to ACT.

3.6. Publication bias

We ran a final set of weighted, random-effect meta-regressions to specifically examine publication status as a possible moderator of the

effects examined. As seen in Table 4, publication status failed to emerge as a significant moderator of the path A, B, and C effects for psychological inflexibility as a treatment mechanism, suggesting that those effects did not significantly differ between published and unpublished research studies.

Expanding the search for possible publication bias to all of the effects meta-analyzed, Egger's regression tests only identified significant funnel plot asymmetry for 3 of the 72 effects for which it could be estimated (i.e., those with $k \geq 3$; see Supplemental Tables S3-S6). Consistent with those findings, the relative probabilities estimated by selection method analyses (e.g., McShane et al., 2016) also suggest a general lack of publication bias. The relative probabilities of contradictory findings (e.g., non-significant or in the opposite direction) being included in the current review was roughly equivalent if not greater than the probabilities of consistent findings being included (i.e., relative probabilities ≥ 0.80) for 66 of the 72 effects for which they could be estimated ($k \geq 3$). Taken as a set, these results suggest that minimal levels of publication bias were present in the meta-analyzed effects.

4. Discussion

Increasing attention has been paid to examining dimensions of psychological flexibility and inflexibility as potential treatment mechanisms explaining the benefits of ACT-based interventions for reducing psychological distress. The rapid growth of research on this topic has begun to present increasing challenges for researchers and clinicians as the dimensions of psychological flexibility and inflexibility examined, the populations treated, the presenting problems targeted, the specific ACT interventions used, the format of those interventions, the treatment comparison conditions included, and the specific measures used to assess both treatment mechanisms and outcomes vary widely across this body of work. The current study quantitatively integrated those findings with a comprehensive meta-analysis. The study used the six dimensions of psychological flexibility and six dimensions of psychological inflexibility targeted within ACT as a conceptual framework to organize the results in a manner that might allow the results to most directly inform clinical practice. To facilitate that goal, the study drew upon recent measurement work on the MPFI (Rolfs et al., 2018) elucidating the common dimensions underlying both ACT process measures (Rogge et al., 2019) and mindfulness process measures (Rogge & Daks, 2020) as an operational framework to integrate previous work.

The comprehensive review revealed that much of the work in this area focused on a small number of dimensions of psychological flexibility (global inflexibility, lack of present moment awareness, cognitive fusion, and committed action/contact with values), leaving many of the remaining dimensions of psychological flexibility and inflexibility with just a handful of studies examining each of them. Despite this imbalance, the meta-analytic results revealed significant mediation results for a majority of the dimensions examined, suggesting that the ACT interventions produced consistent change on the psychological flexibility and inflexibility dimensions they targeted, and those changes were linked to corresponding drops in psychological distress. Subsequent moderation analyses suggested that the ACT interventions yielded stronger effects in clinical populations, with correspondingly weaker effects in samples of students—particularly if the study purposefully excluded individuals with higher levels of distress/symptoms.

4.1. Implications for theory, research, & clinical practice

Psychological Flexibility & Inflexibility are Effective Treatment Targets. The current findings are consistent with the psychological flexibility model guiding ACT (Hayes et al., 2011; Luoma et al., 2007), suggesting that targeting forms of psychological inflexibility and promoting psychological flexibility behavioral repertoires can reduce distress across a wide range of populations and presenting problems. Although this offers support for the rich body of psychological flexibility

exercises and metaphors developed for ACT, the current review remains limited as it focused exclusively on forms of distress (i.e., depressive symptoms, anxiety symptoms, worry, stress, burnout) as outcomes. Future work might uncover additional treatment benefits and treatment mechanism findings by broadening the outcomes examined to include various forms of well-being like vitality, life satisfaction, peace of mind / tranquility, and quality of life. For example, psychological flexibility in parents has been linked to improved relationship quality, family dynamics, and child functioning in a recent meta-analytic review (Daks & Rogge, 2020), highlighting the diverse range of possible well-being constructs that could be examined.

Move beyond Single-Dimension Scales. The widespread adoption and implementation of short, single-dimension scales like the AAQ-II for assessing global inflexibility has provided a foundation underscoring the key role that psychological inflexibility can play in treating psychological distress and psychopathology. Consistent with this, global inflexibility has been quantitatively examined as a treatment mechanism for reducing psychological distress in 42 studies. Despite the notable contributions of such scales, collapsing the psychological flexibility model down from 12 distinct dimensions to a single dimension raises conceptual concerns, as it runs the risk of obscuring meaningful results that could have been obtained if the various dimensions of flexibility and inflexibility had been examined separately. Thus, a researcher using the AAQ-II as the only process measure would never know if a specific ACT workshop was particularly effective at reducing cognitive fusion or at promoting acceptance, for example, as the AAQ-II could simply not provide that level of detail. Extending these conceptual issues, additional concerns have been raised with the AAQ-II as recent findings have suggested that it might represent more of a measure of psychological distress (Wolgast, 2014) or neuroticism/negative affect (Rochefort et al., 2018) than a measure of inflexibility. The current findings add to that work by suggesting that the mediation results with global inflexibility (based heavily on the AAQ-II) might represent just the tip of a diverse iceberg of more specific and nuanced findings that could be obtained by incorporating a broader range of dimensions of psychological flexibility and inflexibility into future treatment studies. Toward this end, several multidimensional scales (e.g., the 3-dimensional CompACT and the 12-dimensional MPFI) have recently been developed to assess a broader range of flexibility dimensions. Although these scales are longer than the AAQ-II, the current results suggest that the potential insights they could offer would likely far outweigh the cost of their extra length. In addition, shortened versions of both of those scales have been developed and validated to facilitate their use across a wide range of settings. Future studies would benefit from the inclusion of such scales (potentially augmented by more specific scales like the VLQ when appropriate). Consistent with this, a recent case study using the AAQ-II, the CompACT, and the MPFI within an individual client receiving ACT (Rogge et al., 2019) demonstrated the more nuanced and clinically relevant information afforded by scales like the CompACT and the MPFI.

Examine both Inflexibility and Flexibility. Given that 66 of the 114 effects presented in Table 3 (58%) were based on 4 or fewer studies, Table 3 highlights a wealth of opportunities for examining specific treatment mechanisms in future ACT studies. Extending this point, although number of psychological flexibility dimensions (e.g., committed action / contact with values) have been examined as treatment mechanisms, the bulk of the work in this area has made use of scales with negatively worded items assessing rigid and inflexible responses to difficult thoughts, feelings, and experiences (i.e., psychological inflexibility). Given the promising findings demonstrated by dimensions of psychological flexibility, future work could seek to include more comprehensive sets of process measures by including scales that directly assess dimensions of psychological flexibility alongside those assessing psychological inflexibility.

Explore Longitudinal Mediation. Out of the 54 studies presenting pre-treatment to post-treatment outcome data (see Supplemental Table S1), the vast majority (48 or 89%) presented analyses based on

just those two waves of assessment. Thus, the associations between change in flexibility and change in distress (i.e., the path B estimates) were based on the same two assessment points, leaving the direction of causality unclear. In contrast to this trend, a handful of studies (e.g., Fiorillo, 2014; *Levin, An, Davis, & Twohig, 2020; Rost et al., 2012) used a mid-treatment assessment to more precisely examine the timing of mediation. For example, results of a single-arm treatment study delivering online ACT to women with a history of interpersonal trauma (Fiorillo, 2014) suggested that drops in psychological inflexibility from pre-treatment to mid-treatment were linked to mid-treatment to post-treatment drops in psychological distress, demonstrating a longitudinal link supportive of the proposed direction of causality.

The use of longitudinal analyses was more prominent among the 24 studies presenting pre-treatment to follow-up (typically about 3–4 months after post-treatment) findings (see Supplemental Table S2), as 11 of those studies presented data using three distinct waves. Most commonly, this took the form of linking pre-treatment to post-treatment changes on dimensions of psychological flexibility with pre-treatment to follow-up changes on distress (Arch & Mitchell, 2015; Arch et al., 2020; Fledderus et al., 2010; Jeffcoat & Hayes, 2012; Levin et al., 2016; Luciano et al., 2014; Muto et al., 2011; Yadavaia et al., 2014). Future work could extend the current findings and the current body of work by examining treatment mechanisms across at least 3 waves of data to allow such longitudinal associations to be modeled.

Assess Progress During Treatment. Although some studies included repeated assessments during the course of therapy (e.g., A-Tjak et al., 2021; Eustis et al., 2016; Wersebe et al., 2017), a majority of previous studies restricted themselves to assessing clients only at pre-treatment and post-treatment (and for 24 of the studies, in a follow-up typically 3–4 months after treatment). The current work on ACT treatment mechanisms could be markedly extended by collecting multiple waves of data throughout the course of therapy, tracking outcomes and treatment mechanisms possibly even on a session-by-session basis. Such intensive longitudinal data would allow researchers to more precisely model how shifts in psychological flexibility and inflexibility are linked to shifts in a range of outcomes over the course of treatment. For example, a study using an acceptance-based therapy to target experiential avoidance and cognitive fusion in clients with depression (encouraging clients to open themselves to difficult thoughts and feelings and process them rather than avoiding them) encouraged clients to write weekly essays about their depression as part of the treatment (Hayes et al., 2005). Objective coding of those essays demonstrated that high levels of adaptive emotion processing in specific weeks of treatment were linked to greater improvement in depressive symptoms, positive self-views, and hope whereas greater avoidance on a specific week was linked to reduced improvement in depressive symptoms, greater hopelessness, and more negative self-views.

To apply such an approach to studies of ACT, researchers could consider collecting brief assessments throughout the course of treatment (e.g., every session, every other session, or at key points in treatment). Toward that end, researchers have developed and validated brief versions of outcome measures assessing distress (e.g., the Patient Health Questionnaire-9 or PHQ-9 for assessing depressive symptoms; Kroenke et al., 2001; the Generalized Anxiety Disorder-7 or GAD-7 for assessing anxiety symptoms; Spitzer et al., 2006) as well as well-being (e.g., the 7-item Peace of Mind scale or PoM; Lee et al., 2013). As mentioned above, brief versions of measures of psychological flexibility have also been developed (e.g., the MPFI-24, Rolffs et al., 2018; the Unified Flexibility & Mindfulness scale or UFM-28, Rogge & Daks, 2020). Future studies could make use of such scales to assess a range of outcomes and dimensions of flexibility repeatedly throughout the course of treatment while still only requiring as little as 3–5 min of clients' time (i.e., 30–50 items) for each assessment. Such assessments could not only offer helpful clinical insights to the therapists as they track progress, but would allow researchers to use advanced statistical techniques like random-intercepts cross-lagged panel modeling (e.g., Hamaker et al.,

2015) and dynamic systems modeling (e.g., Laurenceau et al., 2007) to more precisely characterize the contributions of specific treatment mechanisms in reducing distress and promoting various forms of well-being as those processes naturally evolve over the course of treatment.

Conduct More Effectiveness Studies. One of the earliest studies on the efficacy of ACT in real-world settings took an innovative approach by manipulating treatment approach (ACT vs. treatment as usual) at the level of therapist training and then prospectively evaluating treatment gains for all of the clients treated by those 18 clinicians in the following year (Strosahl et al., 1998). Since that first study, other studies have demonstrated ACT to be effective when given in outpatient clinics (Forman et al., 2007), private psychiatric centers (Pinto et al., 2015), and primary care settings (O'Dell et al., 2020). ACT has also demonstrated effectiveness when provided by trainee therapists (e.g., Lappalainen et al., 2007), by less-specialized staff in residential treatment centers (Livheim et al., 2020), and even when provided by school nurses (Livheim et al., 2015). This growing body of work therefore provides compelling evidence to suggest that ACT remains effective even when given across a wide range of community settings and by a wide range of clinicians (with varied levels of clinical training). However, the number of ACT effectiveness studies (i.e., studies focused on evaluating the effectiveness of ACT in community settings more closely approximating typical real-world conditions) remains quite small in comparison to the number of ACT efficacy studies (i.e., RCTs designed to maximize internal consistency). In addition, only a small handful of those effectiveness studies presented mediation results examining treatment mechanisms (e.g., Forman et al., 2007). Thus, future work on treatment mechanisms within ACT would be markedly advanced through the increased use of effective studies.

4.2. Limitations & future directions

There are a number of limitations to our comprehensive review that need to be considered when interpreting the results. First, we only included articles written in English, so future reviews could extend this work by drawing from a wider range of languages. Second, the current review focused on psychological distress as the only outcome. It is likely that different patterns of mediation could emerge for different outcomes as specific treatment mechanisms (i.e., specific forms of flexibility and inflexibility) might be more proximally linked to specific outcomes. Third, the current review focused exclusively on studies providing quantitative data (to support the meta-analytic analyses). Thus, although it included RCTs, non-randomized studies, and single-arm treatment studies, it did not include case studies. As future treatment mechanism studies seek to link various forms of psychological flexibility and inflexibility to improvement across a range of outcomes and presenting problems, the qualitative literature could offer critical insights to guide that work. Fourth, although change in various forms of flexibility and inflexibility during treatment were consistently linked to corresponding improvements in psychological distress, the bulk of those findings were essentially cross-sectional in nature, leaving the direction of causality uncertain. Future work could employ study designs with more waves of assessment to help clarify the underlying directions of causality. Fifth, the number of studies examining each dimension of psychological flexibility and inflexibility was often very small. As a result, the current meta-analytic results should be interpreted cautiously until more studies have been conducted. Finally, the review focused exclusively on interventions based on ACT (or including acceptance components). However, recent work has highlighted shared mechanisms between the ACT and mindfulness intervention literatures (Rogge & Daks, 2020), highlighting the possibility that dimensions of psychological flexibility and inflexibility might serve as key treatment mechanisms for mindfulness-based interventions. Extending this point, secondary analyses in the current set of studies suggested that other treatments also yielded modest gains in psychological flexibility, suggesting that forms of psychological flexibility might serve as more

universal treatment mechanisms. Future work could extend these findings by broadening the scope of a review to include a broader range of interventions to clarify the role of psychological flexibility as a mechanism across treatments.

5. Recommendations

Despite those limitations, the current comprehensive review and meta-analysis offer unique insights into this growing body of research and suggest a number of concrete recommendations for future studies of ACT treatment mechanisms.

- 1. Balance the evaluation of psychological inflexibility with psychological flexibility.** As much of the work on treatment mechanisms has focused on dimensions of psychological inflexibility, the current results suggest that future clinical work and research would benefit from a more balanced approach, evaluating dimensions of both psychological inflexibility and flexibility.
- 2. Augment the assessment of psychological flexibility and inflexibility with multidimensional scales.** To make use of the full diversity of the psychological flexibility model, future treatment mechanism studies could make use of multidimensional scales like the CompACT and the MPFI.
- 3. Augment the assessment of psychological distress with measures of well-being.** To better capture the full range of benefits offered by ACT, future work on treatment mechanisms would be enriched by broadening the range of outcome measures examined.
- 4. Examine mediation longitudinally.** To build on a predominantly 2-wave (pre-post treatment) and three-wave (pre, post, & follow-up) literature, future work would be enriched by collecting more intensive longitudinal data from clients (e.g., short weekly assessments, monthly diaries, end-of-session check-ins) throughout the course of treatment (and even after treatment), thereby offering greater insights into directions of causality.
- 5. Examine non-specific treatment mechanisms.** Given that none of the studies reviewed addressed non-specific factors in their mediation analyses, future studies could extend previous work by modeling those non-specific factors (e.g., therapeutic alliance, treatment adherence, therapist competence; Chatoor & Kurpnick, 2001) as competing treatment mechanisms, thereby uncovering the unique roles of psychological flexibility/inflexibility skills.
- 6. Examine treatment mechanisms in effectiveness studies.** To clarify the treatment mechanisms that take on the greatest salience for specific treatment outcomes when ACT is delivered across a range of real-world settings, future studies could explore those mechanisms within effectiveness studies.

Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Transparency & data availability

All data and R code associated with the analyses presented in this manuscript will be made available on the second author's profile on osf.io upon publication.

Declaration of competing interest

The authors declare they have no conflicts of interest.

Data availability

Data will be made available on request.

Acknowledgements

We would like to acknowledge all of the researchers and participants whose efforts created the body of work reviewed.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cpr.2024.102432>.

References

- *Arch, J. J., Fishbein, J. N., Ferris, M. C., Mitchell, J. L., Levin, M. E., Slivjak, E. T., ... Kutner, J. S. (2020). Acceptability, feasibility, and efficacy potential of a multimodal acceptance and commitment therapy intervention to address psychosocial and advance care planning needs among anxious and depressed adults with metastatic cancer. *Journal of Palliative Medicine*, 23(10), 1380–1385. <https://doi.org/10.1089/jpm.2019.0398>
- *Arch, J. J., & Mitchell, J. L. (2015). An acceptance and commitment therapy (ACT) group intervention for cancer survivors experiencing anxiety at re-entry. *Psycho-Oncology*, 25(5), 610–615. <https://doi.org/10.1002/pon.3890>
- A-Tjak, J. G., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A. J., & Emmelkamp, P. M. G. (2015). A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems. *Psychotherapy and Psychosomatics*, 84, 30–36. <https://doi.org/10.1159/000365764>
- *A-Tjak, J. G., Morina, N., Topper, M., & Emmelkamp, P. M. (2021). One year follow-up and mediation in cognitive behavioral therapy and acceptance and commitment therapy for adult depression. *BMC Psychiatry*, 21(1), 1–17. <https://doi.org/10.1186/s12888-020-03020-1>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27–45.
- Bluett, E. J., Homan, K. J., Morrison, K. L., Levin, M. E., & Twohig, M. P. (2014). Acceptance and commitment therapy for anxiety and OCD spectrum disorders: An empirical review. *Journal of Anxiety Disorders*, 28(6), 612–624. <https://doi.org/10.1016/j.janxdis.2014.06.0080887-6185>
- *Bohlmeijer, E. T., Fledderus, M., Roks, T. A. J. J., & Pieterse, M. E. (2011). Efficacy of an early intervention based on acceptance and commitment therapy for adults with depressive symptomatology: Evaluation in a randomized controlled trial. *Behaviour Research and Therapy*, 49, 62–67. <https://doi.org/10.1016/j.brat.2010.10.003>
- *Bond, F. W., & Bunce, D. (2000). Mediators of change in emotion-focused and problem-focused worksite stress management interventions. *Journal of Occupational Health Psychology*, 5(1), 156–163. <https://doi.org/10.1037/1076-8998.5.1.156>
- Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., ... Zettle, R. D. (2011). Preliminary psychometric properties of the acceptance and action questionnaire-II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy*, 42, 676–688. <https://doi.org/10.1016/j.beth.2011.03.007>
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons Ltd.
- *Brinkborg, H., Michanek, J., Hesser, H., & Berglund, G. (2011). Acceptance and commitment therapy for the treatment of stress among social workers: A randomized controlled trial. *Behaviour Research and Therapy*, 49(6–7), 389–398. <https://doi.org/10.1016/j.brat.2011.03.009>
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822–848. <https://doi.org/10.1037/0022-3514.84.4.822>
- Chatoor, I., & Kurpnick, J. (2001). The role of non-specific factors in treatment outcome of psychotherapy studies. *European Child & Adolescent Psychiatry*, 10(1), S19–S25. <https://doi.org/10.1007/s007870170004>
- Coto-Lesmes, R., Fernández-Rodríguez, C., & González-Fernández, S. (2020). Acceptance and commitment therapy in group format for anxiety and depression: A systematic review. *Journal of Affective Disorders*, 263, 107–120. <https://doi.org/10.1016/j.jad.2019.11.154>
- Daks, J. S., & Rogge, R. D. (2020). Examining the correlates of psychological flexibility in romantic relationship and family dynamics: A meta-analysis. *Journal of Contextual Behavioral Science*, 18, 214–238. <https://doi.org/10.1016/j.jcbs.2020.09.010>
- *Dhariwal, T. U. (2017). *An exploratory mixed-methods evaluation of acceptance and commitment therapy for outpatient group treatment of adolescents* [Unpublished doctoral dissertation]. University of Toronto
- Duval, S., & Tweedie, R. (2000). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, 56, 455–463. <https://doi.org/10.1111/j.0006-341X.2000.00455.x>
- Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal*, 315, 629–634. <https://doi.org/10.1136/bmj.315.7109.629>
- *Eustis, E. H., Hayes-Skelton, S. A., Roemer, L., & Orsillo, S. M. (2016). Reductions in experiential avoidance as a mediator of change in symptom outcome and quality of life in acceptance-based behavior therapy and applied relaxation for generalized anxiety disorder. *Behaviour Research and Therapy*, 87, 188–195. <https://doi.org/10.1016/j.brat.2016.09.012>

- *Fiorillo, D. (2014). *Development and evaluation of a web-based acceptance and commitment therapy program for trauma related problems: A pilot study* [Unpublished doctoral dissertation]. The Graduate School.
- *Fledderus, M., Bohlmeijer, E. T., Fox, J. P., Schreurs, K. M. G., & Spinhoven, P. (2013). The role of psychological flexibility in a self-help acceptance and commitment therapy intervention for psychological distress in a randomized controlled trial. *Behaviour Research and Therapy*, 51, 142–151. <https://doi.org/10.1016/j.brat.2012.11.007>
- *Fledderus, M., Bohlmeijer, E. T., Smit, F., & Westerhof, G. J. (2010). Mental health promotion as a new goal in public mental health care: A randomized controlled trial of an intervention enhancing psychological flexibility. *American Journal of Public Health*, 100, 2372–2378. <https://doi.org/10.2105/AJPH.2010.196196>
- *Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A randomized controlled effectiveness trial of acceptance and commitment therapy and cognitive therapy for anxiety and depression. *Behavior Modification*, 31, 772–799. <https://doi.org/10.1177/0145445507302202>
- Francis, A. W., Dawson, D. L., & Golijani-Moghaddam, N. (2016). The development and validation of the comprehensive assessment of acceptance and commitment therapy processes (CompACT). *Journal of Contextual Behavioral Science*, 5, 134–145.
- French, K., Golijani-Moghaddam, N., & Schröder, T. (2017). What is the evidence for the efficacy of self-help acceptance and commitment therapy? A systematic review and meta-analysis. *Journal of Contextual Behavioral Science*, 6(4), 360–374. <https://doi.org/10.1016/j.jcbs.2017.08.002>
- *Frögel, E., Djordjevic, A., Rudman, A., Livheim, F., & Gustavsson, P. (2015). A randomized controlled pilot trial of acceptance and commitment training (ACT) for preventing stress-related ill health among future nurses. *Anxiety, Stress and Coping*, 29, 202–218. <https://doi.org/10.1080/10615806.2015.1025765>
- Gillanders, D. T., Bolderston, H., Bond, F. W., Dempster, M., Flaxman, P. E., Campbell, L., ... Remington, B. (2014). The development and initial validation of the cognitive fusion questionnaire. *Behavior Therapy*, 45(1), 83–101. <https://doi.org/10.1016/j.beth.2013.09.001>
- Gloster, A. T., Walder, N., Levin, M., Twohig, M., & Karekla, M. (2020). The empirical status of acceptance and commitment therapy: A review of meta-analyses. *Journal of Contextual Behavioral Science*, 18, 181–192. <https://doi.org/10.1016/j.jcbs.2020.09.009>
- Griffiths, C., Williamson, H., Zucchelli, F., Paraskeva, N., & Moss, T. (2018). A systematic review of the effectiveness of acceptance and commitment therapy (ACT) for body image dissatisfaction and weight self-stigma in adults. *Journal of Contemporary Psychotherapy*, 48(4), 189–204. <https://doi.org/10.1007/s10879-018-9384-0>
- *Gumley, A., White, R., Briggs, A., Ford, I., Barry, S., Stewart, C., ... Lidstone, E. (2017). A parallel group randomised open blinded evaluation of acceptance and commitment therapy for depression after psychosis: Pilot trial outcomes (ADAPT). *Schizophrenia Research*, 183, 143–150. <https://doi.org/10.1016/j.schres.2016.11.026>
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, 20(1), 102–116. <https://doi.org/10.1037/a0038889>
- Han, A., & Kim, T. H. (2022). The effects of internet-based acceptance and commitment therapy on process measures: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 24(8), Article e39182. <https://doi.org/10.2196/39182>
- Hayes, A. M., Beevers, C. G., Feldman, G. C., Laurenceau, J. P., & Perlman, C. (2005). Avoidance and processing as predictors of symptom change and positive growth in an integrative therapy for depression. *International Journal of Behavioral Medicine*, 12, 111–122. https://doi.org/10.1207/s15327558ijbm1202_9
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44, 1–25. <https://doi.org/10.1016/j.brat.2005.06.006>
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford Press.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and commitment therapy: The process and practice of mindful change*. New York, NY: Guilford Press.
- Hayes, S. C., Strosahl, K. D., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., & McCurry, S. M. (2004). Measuring experiential avoidance: A preliminary test of a working model. *Psychological Record*, 54, 553–578. <https://doi.org/10.1007/BF03395492>
- *Hindman, R. K., Glass, C. R., Arnkoff, D. B., & Maron, D. D. (2015). A comparison of formal and informal mindfulness programs for stress reduction in university students. *Mindfulness*, 6(4), 873–884. <https://doi.org/10.1007/s12671-014-0331-1>
- *Jeffcoat, T., & Hayes, S. C. (2012). A randomized trial of ACT bibliotherapy on the mental health of K-12 teachers and staff. *Behaviour Research and Therapy*, 50(9), 571–579. <https://doi.org/10.1016/j.brat.2012.05.008>
- *Kelly, M. (2015). *Effectiveness of acceptance and commitment group therapy for the treatment of perfectionistic and anxious adolescent girls* [Unpublished doctoral dissertation]. Palo Alto University
- Kronke, K., Spitzer, R., Williams, J., & Lowe, B. (2001). The PHQ-9. *Journal of General Internal Medicine*, 16, 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Lappalainen, R., Lehtonen, T., Skarp, E., Taubert, E., Ojanen, M., & Hayes, S. C. (2007). The impact of CBT and ACT models using psychology trainee therapists: A preliminary controlled effectiveness trial. *Behavior Modification*, 31, 488–511. <https://doi.org/10.1177/0145445506298436>
- Laurenceau, J. P., Hayes, A. M., & Feldman, G. C. (2007). Some methodological and statistical issues in the study of change processes in psychotherapy. *Clinical Psychology Review*, 27(6), 682–695. <https://doi.org/10.1016/j.cpr.2007.01.007>
- Lee, Y. C., Lin, Y. C., Huang, C. L., & Fredrickson, B. L. (2013). The construct and measurement of peace of mind. *Journal of Happiness Studies*, 14(2), 571–590. <https://doi.org/10.1007/s10902-012-9343-5>
- *Levin, M. E., An, W., Davis, C., & Twohig, M. P. (2020). Evaluating acceptance and commitment therapy and mindfulness-based stress reduction self-help books for college student mental health. *Mindfulness*, 11, 1275–128.
- *Levin, M. E., Haeger, J., Pierce, B., & Twohig, M. (2017). Web-based acceptance and commitment therapy for mental health problems in college students: A randomized controlled trial. *Behavior Modification*, 4, 141–162. <https://doi.org/10.1177/0145445516659645>
- *Levin, M. E., Hayes, S. C., Pistorello, J., & Seeley, J. R. (2016). Web-based self-help for preventing mental health problems in universities: Comparing acceptance and commitment training to mental health education. *Journal of Clinical Psychology*, 72(3), 207–225. <https://doi.org/10.1002/jclp.22254>
- Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012). The impact of treatment components suggested by the psychological flexibility model: A meta-analysis of laboratory-based component studies. *Behavior Therapy*, 43(4), 741–756. <https://doi.org/10.1016/j.beth.2012.05.003>
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Sage Publications, Inc.
- Livheim, F., Hayes, L., Ghaderi, A., Magnusdottir, T., Högfeldt, A., Rowse, J., ... Tengström, A. (2015). The effectiveness of acceptance and commitment therapy for adolescent mental health: Swedish and Australian pilot outcomes. *Journal of Child and Family Studies*, 24(4), 1016–1030. <https://doi.org/10.1007/s10826-014-9912-9>
- Livheim, F., Tengström, A., Andersson, G., Dahl, J., Björck, C., & Rosendahl, I. (2020). A quasi-experimental, multicenter study of acceptance and commitment therapy for antisocial youth in residential care. *Journal of Contextual Behavioral Science*, 16, 119–127. <https://doi.org/10.1016/j.jcbs.2020.03.008>
- Luciano, J. W., Guallar, J. A., Aguado, J., López-Del-Hoyo, Y., Olivan, B., Magallón, R., ... Garcia-Campayo, J. (2014). Effectiveness of group acceptance and commitment therapy for fibromyalgia: A 6-month randomized controlled trial (EFFIGACT study). *Pain*, 155, 693–702. <https://doi.org/10.1016/j.pain.2013.12.029>
- Luoma, J. B., Hayes, S. C., & Walser, R. D. (2007). *Learning ACT: An acceptance and commitment therapy skills-training manual for therapists* (1st ed.). Oakland, CA: New Harbinger Publications.
- McShane, B. B., Bockenholt, U., & Hansen, K. T. (2016). Adjusting for publication bias in meta-analysis: An evaluation of selection methods and some cautionary notes. *Perspectives on Psychological Science*, 11, 730–749. <https://doi.org/10.1177/17456916166662243>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *International Journal of Surgery*, 8(5), 336–341.
- Mowrey, C. L. (2015). *Feminist multiculturalism in acceptance and commitment therapy research: A meta-analysis of voice and power* [Unpublished doctoral dissertation]. North Carolina State University
- Murillo, C., Vo, T. T., Vansteelandt, S., Harrison, L. E., Cagnie, B., Coppieters, I., ... Meus, M. (2022). How do psychologically based interventions for chronic musculoskeletal pain work? A systematic review and meta-analysis of specific moderators and mediators of treatment. *Clinical Psychology Review*, 94, Article 102160. <https://doi.org/10.1016/j.cpr.2022.102160>
- Murrell, A. R., & Scherbarth, A. J. (2006). State of the research & literature address: ACT with children, adolescents and parents. *The International Journal of Behavioral Consultation and Therapy*, 7, 531–543. <https://doi.org/10.1037/h0101005>
- *Muto, T., Hayes, S. C., & Jeffcoat, T. (2011). The effectiveness of acceptance and commitment therapy bibliotherapy for enhancing the psychological health of Japanese college students living abroad. *Behavior Therapy*, 42, 323–335. <https://doi.org/10.1016/j.beth.2010.08.009>
- *Niles, A. N., Burklund, L. J., Arch, J. J., Lieberman, M. D., Saxbe, D., & Craske, M. G. (2014). Cognitive mediators of treatment for social anxiety disorder: Comparing acceptance and commitment therapy and cognitive-behavioral therapy. *Behavior Therapy*, 45, 664–677. <https://doi.org/10.1016/j.beth.2014.04.006>
- O'Dell, S. M., Hosterman, S. J., Hostutler, C. A., Nordberg, C., Klinger, T., Petts, R. A., ... Massura, C. A. (2020). Retrospective cohort study of a novel acceptance and commitment therapy group intervention for adolescents implemented in integrated primary care. *Journal of Contextual Behavioral Science*, 16, 109–118.
- Pinto, R. A., Kienhuis, M., Slevison, M., Chester, A., Sloss, A., & Yap, K. (2015). The effectiveness of an outpatient acceptance and commitment therapy group programme for a transdiagnostic population. *Clinical Psychologist*, 21(1), 33–43. <https://doi.org/10.1111/cp.12057>
- *Pots, W. T. M., Trompetter, H. R., Schreurs, K. M. G., & Bohlmeijer, E. T. (2016). How and for whom does web-based acceptance and commitment therapy work? Mediation and moderation analyses of web-based ACT for depressive symptoms. *BMC Psychiatry*, 16, 1–13. <https://doi.org/10.1186/s12888-016-0841-6>
- R Core Team. (2018). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>
- Ren, Z., Zhao, C., Bian, C., Zhu, W., Jiang, G., & Zhu, Z. (2019). Mechanisms of the acceptance and commitment therapy: A meta-analytic structural equation model. *Acta Psychologica Sinica*, 51(6), 662–676. <https://doi.org/10.3724/SP.J.1041.2019.00662>
- Rocheftort, C., Baldwin, A. S., & Chmielewski, M. (2018). Experiential avoidance: An examination of the construct validity of the AAQ-II and MEAQ. *Behavior Therapy*, 49, 435–449. <https://doi.org/10.1016/j.beth.2017.08.008>
- Rogge, R. D., & Daks, J. S. (2020). Embracing the intricacies of the path toward mindfulness: Broadening our conceptualization of the process of cultivating mindfulness in day-to-day life by developing the unified flexibility and mindfulness model. *Mindfulness*, 12, 701–721. <https://doi.org/10.1007/s12671-020-01537-w>

- Rogge, R. D., Daks, J. S., Dubler, B. A., & Saint, K. J. (2019). It's all about the process: Examining the convergent validity, conceptual coverage, unique predictive validity, and clinical utility of ACT process measures. *Journal of Contextual Behavioral Science*, 14, 90–102. <https://doi.org/10.1016/j.jcbs.2019.10.001>
- Rolfs, J. L., Rogge, R. D., & Wilson, K. G. (2018). Disentangling components of flexibility via the hexaflex model development and validation of the multidimensional psychological flexibility inventory (MPFI). *Assessment*, 25, 458–482. <https://doi.org/10.1177/1073191116645905>
- *Rost, A. D., Wilson, K., Buchanan, E., Hildebrandt, M. J., & Mutch, D. (2012). Improving psychological adjustment among late-stage ovarian cancer patients: Examining the role of avoidance in treatment. *Cognitive and Behavioral Practice*, 19, 508–517. <https://doi.org/10.1016/j.cbpra.2012.01.003>
- Ruiz, F. J. (2010). A review of acceptance and commitment therapy (ACT) empirical evidence: Correlational, experimental psychopathology, component and outcome studies. *International Journal of Psychology and Psychological Therapy*, 10(1), 125–162.
- Ruiz, F. J. (2012). Acceptance and commitment therapy versus traditional cognitive behavioral therapy: A systematic review and meta-analysis of current empirical evidence. *International Journal of Psychology and Psychological Therapy*, 12(3), 333–358.
- Shah, T. (2015). *Acceptance and commitment therapy for the treatment of information processing biases associated with social anxiety disorder* [Unpublished doctoral dissertation]. Pepperdine University
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, 166(10), 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Stockton, D., Kellett, S., Berrios, R., Sirois, F., Wilkinson, N., & Miles, G. (2019). Identifying the underlying mechanisms of change during acceptance and commitment therapy (ACT): A systematic review of contemporary mediation studies. *Behavioural and Cognitive Psychotherapy*, 47(3), 332–362. <https://doi.org/10.1017/S1352465818000553>
- Strosahl, K. D., Hayes, S. C., Bergan, J., & Romano, P. (1998). Assessing the field effectiveness of acceptance and commitment therapy: An example of the manipulated training research method. *Behavior Therapy*, 29(1), 35–63. [https://doi.org/10.1016/S0005-7894\(98\)80017-8](https://doi.org/10.1016/S0005-7894(98)80017-8)
- Twohig, M. P., & Levin, M. E. (2017). Acceptance and commitment therapy as a treatment for anxiety and depression: A review. *Psychiatric Clinics*, 40(4), 751–770. <https://doi.org/10.1016/j.psc.2017.08.009>
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, 36, 1–48. <https://doi.org/10.18637/jss.v036.i03>
- *Wersebe, H., Lieb, R., Meyer, A. H., Hofer, P., & Gloster, A. T. (2017). The link between stress, well-being, and psychological flexibility during an acceptance and commitment therapy self-help intervention. *International Journal of Clinical and Health Psychology*, 18, 60–68. <https://doi.org/10.1016/j.ijchp.2017.09.002>
- Wilson, K. G., Sandoz, E. K., Kitchens, J., & Roberts, M. (2010). The valued living questionnaire: Defining and measuring valued action within a behavioral framework. *The Psychological Record*, 60(2), 249–272. <https://doi.org/10.1007/BF03395706>
- Wolgast, M. (2014). What does the acceptance and action questionnaire (AAQ-II) really measure? *Behavior Therapy*, 45, 831–839. <https://doi.org/10.1016/j.beth.2014.07.002>
- *Yadavaia, J. E., Hayes, S. C., & Vilardaga, R. (2014). Using acceptance and commitment therapy to increase self-compassion: A randomized controlled trial. *Journal of Contextual Behavioral Science*, 3, 248–257. <https://doi.org/10.1016/j.jcbs.2014.09.002>