

Examining processes of change in an online acceptance and commitment therapy dismantling  
trial with distressed college students

### Abstract

This secondary analysis examined the processes of change from a randomized dismantling trial evaluating the Open (i.e., cognitive defusion, acceptance) and Engaged (i.e., values, committed action) components of acceptance and commitment therapy (ACT). Analyses were conducted with 161 distressed college students randomly assigned to a full online ACT program (Full  $n=40$ ), online ACT targeting the Open components (Open  $n=41$ ) or targeting the Engaged components (Engaged  $n=39$ ), or a waitlist condition (Waitlist  $n=41$ ). The intervention occurred over six weeks followed by a post-treatment assessment with mental health symptoms as the primary outcome. Consistent with predictions, pre- to post-treatment improvements in global psychological inflexibility, cognitive fusion, acceptance, values, and committed action all predicted pre- to post-treatment improvements in mental health, with most processes continuing to independently predict improvements when included in a single model. The relations between changes in psychological flexibility and mental health were generally equivalent between conditions. Each psychological flexibility process separately mediated improvements in mental health for Engaged versus waitlist and Full versus waitlist conditions. However, global inflexibility, committed action, and values progress did not mediate effects for Open versus waitlist. Overall, results indicate a range of acceptance, defusion, values, and committed action processes are functionally relevant for outcomes with the Engaged components of ACT and Full ACT, but values, committed action, and global psychological inflexibility processes may be more weakly related to the effects of the Open components of ACT alone.

*Keywords:* Acceptance and commitment therapy; mindfulness; values; dismantling; eHealth; College student mental health.

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Cognitive behavioral therapies (CBT) include a variety of treatment components designed to target distinct therapeutic processes that are typically combined into empirically validated treatment packages. The recent process-based therapy movement has highlighted the importance of understanding the unique effects of CBT components in order to shift from brand name treatment packages to flexible treatments combining evidence-based components to target therapeutic processes tailored to the idiographic needs of clients (Hofmann & Hayes, 2018). However, this requires a foundational knowledge base of the effects of CBT components on mental health and targeted processes of change. Existing theoretical models for CBT packages can help organize and guide such component research, orienting to current research and theoretical predictions regarding how components might be distinguished and their expected effects in isolation and combination.

The psychological flexibility model represents one such theory derived from acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 2012). This model highlights a set of therapeutic processes of change linked to treatment components that reduce psychological inflexibility, a transdiagnostic pathological process in which behavior is rigidly guided by internal experiences (e.g., cognition, affect, urges), rather than direct contingencies or values (i.e., what would be effective or meaningful in the moment). One set of therapeutic processes in this model is designed to reduce maladaptive inflexibility patterns related to excessive control of cognitions over behavior (i.e., cognitive fusion) and rigid efforts to avoid or escape aversive internal states (i.e., experiential avoidance), through acceptance and cognitive defusion treatment components (in combination described as the Open components in ACT; Hayes, Villatte, Levin,

& Hildebrandt, 2011). Another set of processes aim to increase more adaptive sources of behavioral regulation linked to verbally established, intrinsically motivating guides for action (i.e., values) and to build patterns of behavior linked to values (i.e., committed action), which in combination are described as the Engaged components in ACT (Villatte et al., 2016). A third set of processes increase flexible attention to present moment experiences and a more flexible sense of self, but were not examined in the current dismantling trial due to their overlap with other ACT components (referred to as the Aware components; Hayes et al., 2011; Villatte et al., 2016). In combination, these ACT components target their specified therapeutic processes to increase psychological flexibility, the capacity to engage in meaningful, effective patterns of behavior while being aware and open to whatever internal experiences arise (Hayes et al., 2012). Thus, the psychological flexibility model specifies a set of therapeutic components that target distinct processes to address a wide range of mental health concerns.

Previous research indicates that the combination of these components in full ACT protocols leads to improvements in mental health outcomes including depression, anxiety, obsessive compulsive and related disorders, behavioral addictions, eating disorders and psychosis (ACBS, 2019; A-Tjak et al., 2015; Twohig, & Levin, 2017). Furthermore, the effects of ACT are consistently mediated by targeted processes of change including global psychological inflexibility (e.g., Twohig, Plumb Vilaradaga, Levin, & Hayes, 2015), acceptance (e.g., Forman et al., 2012), cognitive defusion (e.g., Zettle, Rains, & Hayes, 2011), and values (e.g., Gloster et al., 2017). Although this research provides broad support for the combination of ACT components improving mental health through psychological flexibility processes, it does not yet provide the specificity needed for more detailed clinical decision making with regards to

the effects of specific components and their targeted processes of change (Levin, Herbert, & Forman, 2017).

There is a relatively well-established knowledge base indicating the effectiveness of the individual components of ACT on mental health and related outcomes (e.g., Levin, Hildebrandt, Lillis, & Hayes, 2012; Villatte et al., 2016). A much more limited set of studies have directly compared ACT components to evaluate whether they target distinct psychological flexibility processes consistent with the underlying theoretical model. One previous component trial directly compared the Open and Engaged components delivered in face-to-face psychotherapy (Villatte et al., 2016). Consistent with the psychological flexibility model, participants in the Open condition reported greater improvements on acceptance and cognitive defusion, while those in the Engaged condition reported greater improvements on valued action, suggesting these distinct components engaged distinct processes of change. Similarly, a mobile app study examining the in-the-moment effects of ACT coaching sessions found that coaching sessions targeting acceptance were more effective at changing experiential avoidance in-the-moment than coaching sessions targeting other ACT components (Levin, Haeger, Pierce, & Cruz, 2017).

Although such research begins to clarify whether ACT components differ at engaging relevant processes of change (which could guide clinical decision making based on what processes are most relevant for a given client and moment), it does not indicate whether these changes in processes are functionally relevant for improving mental health. A few ACT component studies have examined the degree to which changes in relevant psychological flexibility processes correlate with changes in mental health outcomes. For example, changes in processes related to cognitive defusion are correlated with changes in mental health outcomes when evaluating the cognitive defusion component of ACT (Deacon, Fawzy, Lickel, &

Wolitzky-Taylor, 2011; Levin, Haeger, An, & Twohig, 2018; Yovel, Mor, & Shakarov, 2014). Similarly, changes in socially oriented positive emotions, but not self-directed positive emotions, mediated the effects of a values-focused intervention (Crocker, Niiya, & Mischkowski, 2008).

Going one step further, we are aware of no studies that have evaluated whether ACT components differ with regards to what processes of change are functionally relevant for improvements in mental health (i.e., whether the processes that mediate the effects of interventions differ based on the distinct processes engaged by different components of treatment). For example, theoretically, acceptance and cognitive defusion would be the primary mediators for the effects of the Open components of ACT on mental health, while values and committed action would be the primary mediators for the Engaged components. In other words, the Open components of ACT “work” by increasing acceptance and cognitive defusion, while the Engaged components do so through values and committed action processes. Testing this would further clarify the distinct processes through which ACT components produce their effects, providing a stronger evidence base and underlying support for the psychological flexibility model to guide clinical decision making (Levin, Herbert, et al., 2017). We are aware of no studies that have compared the distinct processes of change for ACT components.

We recently conducted a dismantling trial evaluating the Open and Engaged components of ACT through an online intervention (Levin et al., 2020). A sample of 181 distressed college students were randomized to use a 12-session online program targeting the full ACT model (Full), the Open components of ACT (Open), the Engaged components (Engaged), or to a waitlist condition. Equivalent session completion rates were found for the Open ( $M = 9.22$  sessions), Engaged ( $M = 7.57$ ) and Full conditions ( $M = 8.51$ ). All three ACT conditions significantly improved over time on the primary outcome of mental health symptoms relative to

the waitlist condition, with no difference between ACT conditions, although only the Engaged and Full conditions had higher rates of reliable change than the waitlist. Relative to the waitlist, all three ACT conditions improved on global psychological inflexibility, acceptance, cognitive fusion, and obstruction to values, but not values progress or committed action. The Full condition had greater improvements at 4-week follow up on cognitive fusion relative to the Open and Engaged conditions, and greater improvements on acceptance relative to the Engaged condition. Overall, results suggest the components of ACT were all effective at improving mental health, but combining the Engaged and Open components was most effective at targeting the Open processes, while none of the ACT websites appeared to effectively target values progress and committed action. However, these analyses do not yet clarify the degree to which changes in psychological flexibility processes are related to improvements in mental health, and whether relevant functional processes differ based on the included ACT components.

The current secondary analysis study further examined the processes of change for the Open, Engaged, and Full online ACT conditions from the previously reported dismantling trial (Levin et al., 2020). The first prediction was that pre- to post-treatment changes in each psychological flexibility process would relate to improvements in mental health across ACT conditions (i.e., each flexibility process is broadly relevant to improvements in mental health). The second prediction was that condition would moderate process/outcome relations consistent with targeted processes, such that improvements in acceptance and cognitive fusion relate more strongly to changes in mental health in the Open and Full conditions, while improvements in values and committed action relate more strongly to mental health in the Engaged and Full conditions (i.e., ACT components have distinct processes of change based on what they target). The third prediction was that changes in flexibility processes would mediate the effects of each

ACT condition on mental health relative to the waitlist condition, with stronger mediating effects for targeted processes relevant to each component condition (i.e., these distinct processes of change would account for how ACT components improve mental health).

## **Methods**

### **Participants**

Study participants were college students ( $n = 181$ ) with elevated distress based on meeting the clinical cutoff on at least one subscale of the Counseling Center Assessment of Psychological Symptoms (CCAPS-34; Center for Collegiate Mental Health, 2012). Additional inclusion criteria were being 18 years of age or older and not reporting significant suicidal or violent thoughts. The sample was young ( $M = 22.27$ ,  $SD = 5.08$ ), primarily female (72.4%, with 25.4% male and 2.2% other), and primarily White (92.8%) and non-Hispanic (92.3%). Some incentives were provided for assessment completion, including research participation credit in certain courses and being entered into a raffle for three \$90 gift cards. Further details on participant demographics and recruitment can be found in Levin et al. (2020). Analyses were conducted with the 161 participants randomized to a condition who completed the posttreatment assessment (89% of the 181 initially randomized sample; Full  $n = 40$  out of 45, Engaged  $n = 39$  out of 46, Open  $n = 41$  out of 45, Waitlist  $n = 41$  out of 45). Twenty participants from the initial sample of 181 were excluded from these analyses due to not completing the posttreatment assessment.

### **Procedures**

Participants were recruited at a mid-sized university in the Mountain West region of the United States through a wide variety of sources throughout campus and online in collaboration with the division of student affairs (e.g., website postings, email and class announcements,



flyers, referrals from counseling center, SONA research platform for courses). Interested individuals were screened for eligibility over the phone. Those who were eligible completed informed consent and a baseline assessment online and were then randomly assigned with equal likelihood (1:1:1:1) to one of the three website conditions (Open, Engaged, or Full) or waitlist. Participants were asked to use their assigned website, or to simply wait, for six weeks. After six weeks, a posttreatment survey was completed online, with a final follow-up survey four weeks later.

All website conditions comprised twelve online self-guided sessions. Sessions were relatively brief and participants were asked to finish two each week. The Full condition included six sessions targeting the Open components of ACT (acceptance, cognitive defusion) and six sessions targeting the Engaged components (values, committed action). The Open condition included the same six Open sessions from the Full website, plus an additional six sessions similarly targeting acceptance and cognitive defusion to balance dosage between conditions (i.e., so all conditions had 12 sessions). The Engaged condition similarly included the six Engaged sessions from the Full website, plus an additional six sessions targeting values and committed action. The Aware components of ACT were integrated throughout these conditions as part of the processes and procedures used to target either Open or Engaged components (e.g., mindfulness of internal experiences versus mindfulness of valued actions). Sessions were developed by ACT experts based on well-established ACT protocols, and incorporated a mixture of text, interactive elements, and multimedia content. A more detailed description of study procedures can be found in Levin et al. (2020). Ethical approval was provided for this study by the authors' institutional review board.

## **Measures**

**Mental health symptoms.** The primary outcome, mental health symptoms, was assessed using the 20-item distress index generated from the 34-item version of the CCAPS (Center for Collegiate Mental Health, 2012). The CCAPS distress index measures mental health symptoms including depression, social anxiety, other anxiety symptoms, anger, and academic distress. The CCAPS distress index had good internal consistency in the current study ( $\alpha = .88$ ).

**Psychological flexibility processes.** General psychological inflexibility (theoretically targeted by both Open and Engaged components) was assessed with the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). Two processes theoretically targeted primarily by the Open components of ACT, cognitive fusion and acceptance, were assessed with the Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014) and acceptance subscale of the Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) respectively. Two processes theoretically targeted primarily by the Engaged components of ACT, values and committed action, were assessed with the Valuing Questionnaire (VQ; Smout, Davies, Burns, & Christie, 2014) and the Committed Action Questionnaire (CAQ-8; McCracken, Chilcot, & Norton, 2015) respectively. Of note, the VQ includes two subscales, with the progress in values subscale most relevant to the Engaged components of ACT. In contrast, the obstruction to values subscale assesses the degree to which internal experiences seem to prevent meaningful action, which may be relevant to both the Engaged and Open components. All of the psychological flexibility measures had good internal consistency (AAQ-II  $\alpha = .86$ , CFQ  $\alpha = .93$ , PHLMS  $\alpha = .87$ , VQ Progress  $\alpha = .81$ , VQ Obstruction  $\alpha = .80$ , CAQ  $\alpha = .85$ ).

### **Data Analysis Plan**

A series of hierarchical linear regression models tested whether changes in psychological flexibility processes related to improvements in mental health within the three active conditions.

Waitlist was excluded from these analyses given the focus was on whether improvements in psychological flexibility processes following ACT predicted improvements in mental health. Analyses included the sample of 120 participants in the Open, Engaged, or Full condition who completed the posttreatment assessment (88% of the 137 randomized to one of these conditions). Each model first included baseline mental health (CCAPS) regressed on posttreatment mental health. A second step then added one pre- to post-treatment psychological flexibility change score regressed on posttreatment mental health to examine the additional proportion of variance in mental health accounted for by changes in the relevant flexibility process. After testing the direct, independent relation between each individual process and mental health, a multivariate model tested the unique effects of each process measure, over and above other measures, when combined into a single model.

To examine whether processes of change differ by ACT component condition, regression models tested if condition moderated the relation between changes in processes of change and posttreatment mental health within the three ACT conditions ( $n = 120$ ). Models were run separately for each psychological flexibility process and pair of active condition comparisons (Full vs Engaged, Full vs Open, Engaged vs Open). Each model included baseline CCAPS, condition comparison, and process change score in an initial step, with the interaction between condition and process change score added in a second step.

A series of cross product of coefficient models (Preacher & Hayes, 2004) were conducted in SPSS version 25 to separately test each psychological flexibility process as a mediator for each ACT component condition relative to waitlist on CCAPS mental health. These models included the full sample of participants who completed a posttreatment assessment and waitlist was included as a comparison for each ACT condition. Each model included a baseline CCAPS

covariate and a single pre- to post-treatment process change score mediating the effects of condition (Full vs. waitlist, Engaged vs. waitlist, or Open vs. waitlist) on posttreatment CCAPS. Models were first run separately for each potential mediating psychological flexibility process given the correlations and conceptual overlap between these processes. A subsequent set of models included all of the psychological flexibility processes combined in a multiple mediator model to test which psychological flexibility processes mediated effects above and beyond other processes for each ACT condition relative to waitlist.

## Results

### **Do changes in each psychological flexibility process relate to improvements in mental health in online ACT?**

Improvements in each psychological flexibility process significantly related to improvements in mental health (CCAPS) at posttreatment when included in independent models (see Table 1). Adding each psychological flexibility process increased the proportion of variance accounted for in posttreatment mental health by 10% to 19%, over and above baseline mental health.

When combining all of the processes of change together into a single model, improvements in psychological inflexibility (AAQ-II), cognitive fusion (CFQ), acceptance (PHLMS), and values progress (VQ-Progress) each significantly related to improvements in mental health over (CCAPS) and above other processes. Values obstruction (VQ-Obstruction) and committed action (CAQ) did not predict posttreatment mental health when controlling for other psychological flexibility processes. This model including all six psychological flexibility variables accounted for an additional 28% of the variance in posttreatment mental health after controlling for baseline mental health symptoms.

**Do relations between changes in psychological flexibility processes and mental health vary by ACT component condition?**

A significant interaction effect was found for the Engaged versus Open condition moderating the relation between pre- to post-treatment cognitive fusion (CFQ) and posttreatment mental health (CCAPS;  $F[1,75] = 5.61, p = .020, \Delta R^2 = .03$ ). Post hoc analyses indicated that improvements on cognitive fusion were more strongly related to improvements on mental health in the Engaged condition ( $F[1,36] = 39.08, p < .001, \Delta R^2 = .36, \beta = -.60$ ) relative to the Open condition ( $F[1,38] = 3.29, p = .077, \Delta R^2 = .04, \beta = -.22$ ). There were no other significant moderation effects between ACT conditions and processes of change, suggesting the relations between changes in psychological flexibility and changes in mental health were generally equivalent between conditions.

**Do changes in psychological flexibility processes mediate mental health outcomes for each ACT component condition relative to waitlist?**

When examined in separate models, each psychological flexibility process mediated the effects of the Full ACT condition relative to waitlist on mental health (CCAPS), with each mediator accounting for 16% to 69% of the variance in treatment effects (see Table 2). Similarly, each psychological flexibility process mediated effects of Engaged relative to waitlist on mental health, with mediators accounting for 20% to 51% of the variance in treatment effects. However, only cognitive fusion, acceptance, and values obstruction mediated the effects of the Open condition relative to waitlist on mental health (psychological inflexibility, committed action and values progress did not mediate effects for Open versus Waitlist). Consistent with null results found in the primary trial (Levin et al., 2020), the *a* path was not significant for the Open

condition versus Waitlist for changes on psychological inflexibility (AAQ-II) or committed action (CAQ), which contributed to lack of mediation for these processes.

Multiple mediator models combining all six psychological flexibility processes overall accounted for 92% of the variance in the Full ACT condition versus waitlist, 76% of the variance for Engaged versus waitlist, and 51% of the variance for Open versus waitlist. The only significant mediator when combining all of the processes of change in a multiple mediator model was psychological inflexibility (AAQ-II) for Full ACT versus waitlist (point estimate =  $-.09$ , SE =  $.05$ , 95% CI =  $-.217, -.014$ ) and Engaged versus waitlist (point estimate =  $-.09$ , SE =  $.05$ , CI =  $-.212, -.021$ ). There were no significant individual mediators in the multiple mediator model for Open versus waitlist conditions.

### **Discussion**

This secondary analysis study examined the processes of change for ACT components based on the psychological flexibility model. Consistent with predictions, improvements in global psychological inflexibility, cognitive fusion, acceptance, values, and committed action all predicted improvements in mental health, with most processes continuing to independently predict improvements when included in a combined model (besides values obstruction and committed action). Contrary to predictions, the relation between changes in psychological flexibility and changes in mental health were generally equivalent between ACT conditions. Finally, each psychological flexibility process mediated improvements in mental health relative to the waitlist in the Engaged and Full condition, but global inflexibility, committed action, and values progress did not mediate treatment effects for the Open condition. Overall, results indicate a range of psychological flexibility processes are functionally relevant for the Engaged

components of ACT, but values, committed action, and global psychological inflexibility processes may be more weakly related to the effects of the Open components of ACT alone.

Consistent with the psychological flexibility model, improvements in processes relevant to Open (i.e., acceptance, cognitive fusion) and Engaged components (i.e., values, committed action) predicted improvements in outcomes for the Full website and mediated outcomes relative to waitlist. These results further confirm the underlying treatment model that the combination of Open and Engaged ACT components improve mental health through a range of psychological flexibility processes including acceptance, cognitive defusion, values, and committed action. These findings are also consistent with previous research in which the effects of ACT protocols on outcomes were mediated by specific psychological flexibility processes including acceptance (e.g., Forman et al., 2012), cognitive defusion (e.g., Zettle et al., 2011), and values (e.g., Gloster et al., 2017).

Surprisingly, the range of psychological flexibility processes, including values, committed action, acceptance, and cognitive fusion, also predicted and mediated the effects of the Engaged components of ACT alone on mental health outcomes. Previous research has not evaluated the range of psychological flexibility processes as potential mediators in Engaged-only websites, but if replicated, it might raise questions regarding the processes through which values and committed action procedures influence mental health. It may be that the Engaged components of ACT alone work through a wider spectrum of flexibility processes, including those that are not directly targeted such as cognitive fusion and acceptance. Of note, the dismantling trial did find the Full website led to stronger improvements in acceptance and cognitive fusion than the Engaged condition, but the Engaged condition did improve on these flexibility process relative to waitlist (Levin et al., 2020). It may also be the case that values and

committed action procedures, such as identifying personal values distinct from what one “should” do and committing to specific valued actions, naturally lead to greater acceptance and defusion without directly teaching individuals how to respond to challenging thoughts, feelings, and other internal experiences that arise.

Of note, the dismantling trial failed to find an omnibus time by condition effect for values and committed action, suggesting the ACT conditions did not improve these processes relative to a waitlist (Levin et al., 2020). These mediational results suggest that although there was not an overall treatment effect, values and committed action were still functionally relevant processes related to how the Engaged and Full websites improved mental health.

In contrast with the Engaged and Full websites, and consistent with the psychological flexibility model, acceptance and cognitive fusion mediated the effects of the Open condition, but not values progress or committed action. Values obstruction also mediated effects for the Open condition, but this measure focuses on the degree to which internal experiences prevent valued action (e.g., “Difficult thoughts, feelings or memories got in the way of what I really wanted to do”), which is more in line with processes targeted by the Open components of ACT. These results are consistent with the underlying theoretical model, indicating that the effects of the Open components of ACT improve mental health through their targeted processes of change, while Engaged processes that were not directly targeted were not functionally relevant to improvements in mental health.

Additional results further confirmed that while the Engaged and Full conditions shared similar processes of change, a more limited subset of processes were functionally relevant for improvements in the Open condition. While global psychological inflexibility as measured by the AAQ-II did not mediate the effects of the Open condition, it was the only significant



mediator for the Engaged and Full conditions when all processes were combined in a multiple mediator model. Another surprising finding was that cognitive fusion was a stronger predictor of mental health improvements in the Engaged condition than the Open condition. This may be due to the Open website being less effective at targeting its key processes, possibly due to the specific sessions developed or to broader challenges in delivering Open components of ACT in a self-guided format without a therapist. Consistent with this, the dismantling trial found that the Open condition improved cognitive fusion less than the Full condition, despite the Open condition actually including twice as many sessions focusing on cognitive defusion and equivalent intervention completion rates to the Full condition (Levin et al., 2020). Similarly, the Open condition failed to improve global psychological inflexibility at posttreatment relative to the waitlist condition (Levin et al., 2020). Consistent with the psychological flexibility model, it may be that cognitive defusion and psychological flexibility more broadly cannot be as effectively targeted, and thus are weaker mediators, when introduced outside the context of values. This is also consistent with the somewhat weaker effects on mental health outcome found for the Open condition relative to Full or Engaged in the RCT (Levin et al., 2020).

In sum, it appears that the conditions including the Engaged components had similar processes of change, whether or not the Open components were also included. That said, the primary RCT did find the Full condition more effectively targeted acceptance and cognitive fusion than the Engaged condition. Given these Open processes appear functionally relevant to the effects of the Engaged components, it is possible the Full condition might be more effective in some contexts or with additional refinements (Levin et al., 2020). In contrast, it appears that the Open components of ACT work through a more limited set of processes, and that they may

be less effective at engaging these processes when targeted in isolation, consistent with the poorer outcome results found in the primary trial (Levin et al., 2020).

Study limitations included the self-report measures used to assess ACT processes. There has been recent, rapid growth in ACT process of change measures seeking to develop more refined, precise measurement of distinct processes of change. Rather than using a multidimensional measure that assesses all relevant aspects of psychological flexibility in a single scale (e.g., Multidimensional Psychological Flexibility Inventory [MPFI]; Rolffs, Rogge, & Wilson, 2018), we used a set of separately developed measures. These measures may overlap more given they were not developed primarily in relation to each other to differentiate and predict unique aspects of psychological flexibility. This is indicated in the current study by only the AAQ-II remaining a significant mediator in multiple mediator models. In contrast, research on multidimensional measures of psychological flexibility such as the MPFI indicates they can distinguish between psychological flexibility process and account for substantial variance above and beyond the AAQ-II (Rogge, Daks, Dubler, & Saint, 2019). The current study also did not discriminate between positively framed measures of flexibility representing functional response classes (i.e., CAQ, PHLMS-Acceptance, VQ Progress) and negatively framed measures of inflexibility representing pathological response classes (i.e., AAQ-II, CFQ, VQ Obstruction), rather combining them under the umbrella of psychological flexibility given the focus on therapeutic change processes. Each of these variables are typically conceptualized as representing one pole of a dimensional construct and are sometimes even labeled in ways that oppose the direction of the stated items (e.g., PHLMS Acceptance is composed of all negatively worded items indicating experiential avoidance). However, it is possible that there are distinctions between reducing psychological inflexibility versus increasing psychological

flexibility, and there are certainly potential methodological effects when examining correlations between positive versus negatively framed process and outcome measures. These issues would be best addressed through the use of more comprehensive assessment of both poles of these dimensional constructs, such as that provided by the MPFI (Rolffs et al., 2018). One of the ongoing challenges for process-based therapy (PBT) is the need for precise process measures that are sensitive to detecting the unique effects of distinct therapeutic components linked to distinct processes of change. Future research should consider using multidimensional measures such as the MPFI when seeking to disentangle the effects of distinct treatment components.

This study was similarly limited by the use of a pre- to post-treatment assessment design, which does not allow for more refined examination of temporal relations between changes in processes and outcomes. Without assessments at multiple time points throughout treatment, it is not possible to determine whether changes in mediating variables preceded and predicted changes in outcomes, or vice versa, to establish causal assertions. Furthermore, more intensive longitudinal data would afford more sophisticated analyses that are likely relevant in modeling the idiographic processes of change for distinct clinical presentations (Hayes et al., 2019).

Finally, it is worth noting the methodological and conceptual limitations with regards to examining between-condition differences in the relations between processes and mental health. This study is predicated on the importance of not only examining whether interventions differ with regards to changing psychological flexibility processes, but also how components differ on which processes are *functionally relevant* to improving mental health. Testing for differences in process-outcome relations and the degree to which they account for treatment outcomes is critical for determining the potential unique functions of treatment components (i.e., how do these components work), which can inform a process-based therapy approach. However, there

may be alternate explanations for relations found, given changes in these psychological flexibility processes are also known to predict mental health outside the context of any intervention (e.g., Bond et al., 2011; Gillanders et al., 2014; Smout et al., 2014). Thus, in some ways it would be surprising to find that changes in a given psychological flexibility process did not relate to changes in mental health, even if such changes were not primarily due to the intervention. Furthermore, it may be that some process measures are more likely to have such naturally occurring relations depending on the outcome measure used. For example, negatively framed measures assessing psychological inflexibility are more likely to correlate with psychological distress (Rogge et al., 2019). Many of the measures assessing the Open processes in ACT are negatively worded (CFQ, PHLMS acceptance subscale), while Engaged process measures are more typically positively worded (VQ Progress), which could affect our understanding of how these processes function. Theoretically, such naturally occurring relations would be augmented with an intervention targeting the process, as changes are directed towards improvements in flexibility that can account for differential improvements in mental health. Yet, if other methodological confounds such as demand characteristics also drive changes in process measures, arguably the relation to outcome could become attenuated as changes on the measure are due to less to valid changes in the target process. Potential issues such as these point to the importance of future research using more rigorous designs to examine mediational effects and more rigorous multidimensional measures.

This study adds to the previously reported dismantling trial (Levin et al., 2020), further clarifying distinctions between the Open and Engaged ACT components in isolation and combination. Such dismantling and process of change research is critical for a PBT approach, seeking to develop a knowledge base of how procedures linked to distinct theoretical treatment

components engage distinct processes of change that may be relevant to given clinical presentations. Although the psychological flexibility model derived from ACT was used as the guide for selecting components and associated procedures, importantly the Open and Engaged components are relevant much more broadly to a wide range of modern CBTs (Hayes et al., 2011). This study thus contributes to a growing movement away from brand named treatment packages to the study of specific treatment components and therapeutic processes of change, relevant to a wide range of therapies, which over time can guide clinical decision making from a process-based therapy approach.

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Table 1. Predicting posttreatment CCAPS mental health symptoms controlling for baseline CCAPS in ACT conditions.

Model	Pre-Post AAQ $\beta$	Pre-Post CFQ $\beta$	Pre-Post PHLMS $\beta$	Pre-Post VQ-O $\beta$	Pre-Post VQ-P $\beta$	Pre-Post CAQ $\beta$	$\Delta R^2$
1	-.40***						.16***
2		-.45***					.19***
3			-.40***				.16***
4				-.39***			.15***
5					-.32***		.11***
6						-.32***	.10***
7	-.17*	-.18*	-.19**	.02	-.16*	-.03	.28***

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .  $\Delta R^2$  = change in proportion of variance accounted for by adding the process of change to a model already controlling for baseline CCAPS. Negative regression coefficients represent the expected relation between improvements in processes and reductions in mental health symptoms. AAQ = Acceptance and Action Questionnaire (global psychological inflexibility); CFQ = Cognitive Fusion Questionnaire (cognitive fusion); PHLMS = Philadelphia Mindfulness Scale – Acceptance (acceptance); VQ-O = Valuing Questionnaire – Obstruction (obstruction to values); VQ-P = Valuing Questionnaire – Progress (progress in values); CAQ = Committed Action Questionnaire (committed action).

Table 2. Mediation analysis results for ACT components versus waitlist on mental health.

	<u>a path</u> X-M	<u>b path</u> M(X)-Y	<u>c path</u> X-Y	<u>c' path</u> X(M)Y	<u>Products of coefficients</u>		Proportion mediated (1-c'/c)
				Point estimate (SE)	Bootstrapping 95% CI		
<i>Full Vs. Waitlist</i>							
AAQ	2.96**	-5.60***	-3.49***	-2.08*	-.19 (.07)	-.345, -.067	40%
CFQ	4.14***	-5.57***	-3.49***	-1.35	-.26 (.07)	-.402, -.135	61%
PHLMS	5.19***	-4.46***	-3.49***	-1.08	-.27 (.07)	-.422, -.147	69%
VQ-O	3.42**	-4.93***	-3.49***	-1.92	-.19 (.06)	-.334, -.077	45%
VQ-P	2.45*	-3.96***	-3.49***	-2.60*	-.12 (.06)	-.244, -.022	16%
CAQ	2.08*	-3.57***	-3.49***	-2.82**	-.09 (.04)	-.188, -.007	19%
Multiple Mediator Model			-3.49***	-.28	-.37 (.09)	-.574, -.214	92%
<i>Engaged Vs. Waitlist</i>							
AAQ	2.47*	-6.55***	-3.17*	-2.01*	-.18 (.07)	-.331, -.042	37%
CFQ	3.07**	-6.00***	-3.17**	-1.62	-.21 (.07)	-.328, -.043	49%
PHLMS	3.30**	-5.41***	-3.17**	-1.56	-.21 (.06)	-.344, -.086	51%
VQ-O	2.62*	-5.95***	-3.17**	-1.94	-.18 (.07)	-.328, -.043	39%
VQ-P	2.52*	-3.70***	-3.17**	-2.26*	-.12 (.06)	-.254, -.015	29%
CAQ	2.25*	-2.56*	-3.17**	-2.54*	-.08 (.05)	-.185, -.005	20%
Multiple Mediator Model			-3.17**	-.75	-.31 (.09)	-.481, -.135	76%
<i>Open Vs. Waitlist</i>							
AAQ	1.37	-4.70***	-3.38**	-3.04**	-.07 (.05)	-.172, .033	
CFQ	2.83**	-3.13**	-3.38**	-2.44*	-.10 (.04)	-.200, -.030	28%
PHLMS	4.77***	-4.11***	-3.38**	-1.31	-.21 (.06)	-.348, -.100	61%
VQ-O	2.81**	-4.17***	-3.38**	-2.28*	-.13 (.05)	-.230, -.032	33%
VQ-P	2.23*	-2.24*	-3.38**	-2.82**	-.06 (.03)	-.128, .002	
CAQ	1.34	-2.13*	-3.38**	-3.29**	-.03 (.03)	-.112, .010	
Multiple Mediator Model			-3.38**	-1.64	-.21 (.08)	-.365, -.064	51%

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . X-M = treatment condition and mediator, M(X)-Y = Mediator and outcome controlling for treatment condition, X-Y = treatment condition and outcome, X(M)Y = Treatment condition and outcome controlling for mediator. *t*-test values are reported for paths tested. Each row is a separate mediation model with pre to post change score on mediator predicting post outcome controlling for baseline outcome.