

Evaluating the open and engaged components of acceptance and commitment therapy in an
online self-guided website: Results from a pilot trial

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Abstract

Online acceptance and commitment therapy (ACT) is promising for treating a range of psychological problems. Component research can further clarify which components are needed for optimal outcomes in what contexts. Online platforms provide a highly controlled format for such research. In this pilot trial, 55 adults were randomized to: ACT-Open (i.e., acceptance, defusion components), ACT-Engaged (i.e., values, committed action), or ACT-Combined (i.e., acceptance, defusion, values, committed action). Each condition was 12 sessions over six weeks, with assessments at baseline, posttreatment, and four-week follow-up. ACT-Open, ACT-Engaged, and ACT-Combined all significantly improved from pre- to post-treatment on mental health, psychosocial functioning, and components of psychological flexibility. Compared to ACT-Combined, ACT-Open improved less on psychosocial functioning at posttreatment, and ACT-Engaged worsened on functioning at follow-up. The platform was acceptable with high satisfaction ratings. Results support the feasibility of conducting online ACT component research, which will be tested in a fully powered non-inferiority trial.

Keywords: Acceptance and Commitment Therapy, mindfulness, self-help, components, dismantling.

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Acceptance and Commitment Therapy (ACT) is a modern cognitive behavioral treatment that combines acceptance, mindfulness, values, and behavior change methods to target psychological flexibility. Broadly speaking, psychological flexibility is a transdiagnostic factor reflecting the ability to engage in valued patterns of activity, while being aware of and open to whatever internal experiences arise (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). This transdiagnostic framework makes ACT useful for a wide range of difficulties including depression, anxiety disorders, obsessive-compulsive and related disorders, eating disorders, substance abuse, psychosis, burnout and stress, chronic pain, stigma, weight management, and coping with physical health problems, among other populations and outcomes (e.g., ACBS, 2019; A-Tjak et al., 2015).

Online self-guided ACT has shown increasing promise for the prevention and treatment of a variety of mental health problems (O'Connor et al., 2018). Self-guided ACT websites have been repeatedly found to outperform control groups on measures of anxiety, depression, stress, and psychosocial functioning, among other populations and outcomes (Ivanova et al., 2016; Lappalainen, Langrial, Oinas-Kukkonen, Tolvanen, & Lappalainen, 2015; Ly, Asplund, & Andersson, 2014). Online ACT programs can increase the reach of services for those who otherwise might not receive treatment due to practical or psychological barriers (e.g., transportation, cost, stigma), while minimizing the costs in delivering services per end user. In addition to the public health benefits of such online interventions, this provides new opportunities to feasibly evaluate the components of ACT without the substantial resources required for face-to-face clinical component and dismantling trials.

The psychological flexibility model specifies a set of processes of change closely linked to treatment components that are theorized to work in combination to improve psychological flexibility and meaningful behavior change (Hayes et al., 2011). ACT is comprised of six treatment components based on this psychological flexibility model (Hayes et al., 2006), which has been further categorized into various larger groupings or “pillars” such as open, aware and active (Hayes et al., 2011; Strosahl, Robinson, & Gustavsson, 2012; Villatte et al., 2016). The *open* component includes the ACT processes of acceptance and cognitive defusion (Hayes et al., 2011). These two processes aim to reduce behavior that is excessively governed by internal experiences such as thoughts (fusion) and avoidance of aversive states (experiential avoidance). The second grouping, *aware*, includes flexible attention to the present and self-as-context (Hayes et al., 2011). Lastly, the *active* or *engaged* grouping of ACT includes values and committed action components that aim to build patterns of activity linked to personal values (Hayes et al., 2011). The present study focused on evaluating the “open” and “engaged” components of ACT.

Component research is needed to empirically test whether these ACT components function as theorized and if/when combinations of treatment components are needed to be efficacious. Findings from this research can further support the underlying theory, but also identify areas for refinement, and empirical guidance for when to use what combination of treatment components with clients in a process-based care approach (Hayes & Hofmann, 2018). To-date, most ACT component research has focused on testing the isolated effects of ACT components relative to inactive or theoretically distinct control conditions, primarily in laboratory-based paradigms. A meta-analysis of 66 laboratory-based studies found positive effective sizes for acceptance, defusion, present moment, and values components of ACT when compared to control conditions (Levin, Hildebrandt, Lillis, & Hayes, 2012). A few clinical

component studies with longer interventions for distressed samples have similarly found positive results for cognitive defusion when compared to waitlist, cognitive restructuring, and supportive therapy (Hinton & Gaynor, 2010; Levin, Haeger, An, & Twohig, 2018). These component studies indicate that the individual components of ACT are effective and work through targeted processes of change. Determining which components of ACT are needed in order to alter various outcomes would help clarify if all three components are needed for change and when to target which component.

Only a few studies have directly compared components of ACT. A clinical component study using in-person therapy directly compared ACT OPEN (acceptance and cognitive defusion) and ACT ENGAGED (values) in a multiple-baseline design (Villatte et al., 2016). ACT OPEN improved symptoms, acceptance, and defusion more than ACT ENGAGED, while ACT ENGAGED improved quality of life more than ACT OPEN. Another study tested the effects of adding a values component to an online goal-setting intervention for college students; participants who received values and goal-setting training significantly improved their GPAs compared to the waitlist, while goal-setting alone had no effect compared to the waitlist (Chase et al., 2013). Two studies have evaluated the additive effects of combining engaged and open ACT components. One laboratory-based study compared acceptance with and without a values component on pain tolerance, finding the addition of values to acceptance significantly increased pain tolerance (Branstetter-Rost, Cushing, & Douleh, 2009). However, another study found that the addition of a values activity to mindfulness meditation for anxiety did not produce any meaningful differences when compared to mindfulness meditation alone (Berghoff, Forsyth, Ritzert, Eifert, & Anderson, 2018).

Overall, component research suggests that ACT components have different functions and combining components can improve their efficacy, but results are preliminary with one study failing to find an additive effect combining engaged and open components (Berghoff et al., 2018). Furthermore, treatment components are particularly challenging to evaluate, given that components may interact differently with varied presenting problems. Testing such component questions, particularly in dismantling trials, have been resource-intensive and prohibitively expensive except with large grants. However, these methods may now be more feasible through online self-guided studies, which test real-world effects of components while providing a high degree of experimental control and replicability. As a first step, pilot research is needed to evaluate whether developed online component programs are feasible and potentially effective, prior to conducting a more extensive, fully powered dismantling trial.

The current pilot study examined the preliminary isolated and combined effects of the open (i.e., defusion, acceptance) and engaged (i.e., values, committed action) components of ACT in a dismantling design delivered through a newly developed online ACT program. This study focuses on the open and engaged components of ACT in order to extend previous research demonstrating the impact of these components (Villatte et al., 2016) into an online format. Furthermore, the open and engaged components were selected for initial examination because they are conceptually and procedurally clearer to operationalize and more distinct to differentiate from each other relative to the awareness component, which overlaps more directly with other components (Villatte et al., 2016).

In the current study, a sample of 55 adults interested in using online self-help were randomized to one of three versions of a twelve-session online ACT program targeting only the open components of ACT, engaged components of ACT, or combining the open and engaged

components. Given the pilot nature of this study, we sought to evaluate the feasibility and acceptability of the isolated and combined ACT component websites that were developed. We also sought to conduct a preliminary examination of the potential efficacy of the ACT component websites, predicting all three versions would lead to improvements in psychological flexibility and mental health over time. Although the pilot trial had limited power to compare active conditions, we predicted a pattern of results suggesting the combined ACT condition would produce stronger effects on mental health than the open or engaged conditions and that the open and engaged conditions would differ based on relevant missing ACT components (i.e., engaged having strong effects on valued action, open having stronger effects on cognitive fusion).

Methods

Participants

The sample consisted of 55 adults 18 years of age or older who were interested in receiving web-based self-help. A general sample was recruited given the transdiagnostic applicability of ACT to a range of mental health problems (Hayes, Pistorello & Levin, 2012), the heterogeneity in presenting problems among users seeking help through online resources (e.g., Levin et al., 2017; Carlbring et al., 2013; Bricker et al., 2014), and the broad emphasis of many popular online self-guided resources (e.g., Headspace, Pacifica, ACT Coach, MoodGym). Recruitment consisted of flyers, emails, social media, and professional referrals, including the ACT for Professionals and ACT for the Public email listservs.

On the whole, participants were primarily white (92.6%) and female (76.4%), with an average age of 35.71 ($SD = 16.68$). Most participants (80%) were at least moderately depressed, anxious, and/or stressed at baseline according to the cutoffs established for the Depression,

Anxiety, and Stress Scales-21 (Lovibond & Lovibond, 1995). There were no significant differences found between conditions on demographics at pretreatment. See Table 1 for a more comprehensive breakdown of demographics by condition.

Procedures

All procedures were completed online, primarily through the Qualtrics research platform. After completing an online screening and consent form, participants were directed to a baseline questionnaire. Participants were then randomized to one of three website conditions: ACT-Combined, ACT-Open, or ACT-Engaged. Participants were instructed to use their assigned website condition for the following six weeks with content focusing on the relevant ACT components but matched on number and length of sessions (i.e., ACT-Open included acceptance and cognitive defusion; ACT-Engaged included values and committed action; ACT-Combined included all four components). Program usage was monitored regularly by a research assistant over the 6 weeks; participants were notified via reminder emails to complete a session if they were inactive on the site for more than seven days. After six weeks, an online post questionnaire was completed by participants, consisting of the same baseline measures and additional measures of program usability and satisfaction. Four weeks later, participants completed a follow-up online questionnaire, including a similar set of questionnaires as the post-questionnaire.

ACT Website Conditions

Each condition consisted of a website containing 12 brief sessions, which participants were expected to complete over a six-week period (approximately two per week). Sessions were organized in a specific order and participants were encouraged to access them in order; however, the sessions were not tunneled (that is, participants could choose to access any session in their assigned condition at any time). Given the twice-weekly schedule, sessions were designed to

only require approximately 15-20 minutes to complete. This design was used to break longer weekly sessions into shorter segments that are spread throughout the week and to increase flexibility in how participants use the program based on feedback in previous trials (*CITATION REMOVED FOR BLIND REVIEW*).

Each online session was developed and delivered through the Qualtrics research platform. Although Qualtrics is primarily designed for survey administration, it includes a wide array of sophisticated features and elements that are also ideal for delivering online self-guided interventions. These include a library of multimedia and interactive elements (e.g., text entry, multiple choice, drag and drop, heat map), display and branching logic, carrying forward user responses, responsive design for ideal viewing across devices (including mobile phones), and tools to customize visual design. We have found Qualtrics to be an effective, engaging platform for delivering online self-guided interventions across several previous trials (*CITATION REMOVED FOR BLIND REVIEW*). The website content was written by an ACT expert with experience in translating ACT exercises to an online format and was based on previous online ACT programs found to be effective (*CITATION REMOVED FOR BLIND REVIEW*). Website sessions included a combination of text, multimedia, and interactive elements, with an emphasis on practicing and applying the ACT component being targeted in the given session. Each session concluded by allowing participants to choose and commit to a brief practical exercise applying what was learned in the session (see Table 2 for an overview of session content; full content can be obtained by contacting the authors).

ACT-Open Condition. This condition included six acceptance sessions and six defusion sessions. Acceptance sessions included common ACT metaphors and exercises such as “dropping the rope” (practicing just letting thoughts and feelings be instead of struggling in a

tug-of-war match with them) and “passengers on the bus” (noticing the costs of trying to fight with one’s “passengers” [thoughts and feelings] and choosing to drive with them instead) to help participants notice the workability of experiential avoidance and practice an accepting stance towards their internal experiences. Defusion sessions included metaphors and exercises such as “noticing hooks” (recognizing responding to thoughts as if literally true) and “singing a thought” (practicing singing the contents of a thought aloud) in order to help participants notice when cognitive fusion was present and view thoughts less literally.

ACT-Engaged. This condition included six values sessions and six committed action sessions. Values sessions incorporated, for example, the “sweet spot” exercise (recalling a sweet memory and reflecting on what values it represents; Wilson & DuFrene, 2009) and the “compass metaphor” (learning to use personal values as a compass in guiding actions) to help participants identify and connect with personal values and understand how values can guide choices. The committed action sessions included the “gardening” metaphor (treating one’s values like a garden and committing to cultivating them over time) and an overview of SMART goals to help participants understand qualities of commitment and learn to take action effectively.

ACT-Combined. This condition included three acceptance sessions, three defusion sessions, three values sessions, and three committed action sessions. The acceptance and defusion sessions were selected from among the ACT-Open sessions, while the values and committed action sessions were selected from among the ACT-Engaged sessions. This condition introduced all the core skills described previously, but more briefly compared to the other conditions.

Outcome Measures

Depression, Anxiety, and Stress Scale-21 (DASS-21, Lovibond & Lovibond, 1995). The DASS-21 was included as the primary outcome measure of mental health. The DASS includes subscales assessing depression, anxiety, and general stress, which can be added together for a total distress score. Participants are asked to rate 21 items on a 4-point Likert scale (1 = *did not apply to me*, 3 = *applied to me very much or most of the time*) over the past week. Previous research has demonstrated the DASS total score is consistent with higher order aspects of distress; higher scores represent greater distress (Henry & Crawford, 2005). The DASS-21 has well-established reliability and validity in both clinical and non-clinical samples (Henry & Crawford, 2005) and has been found to be sensitive to detecting the effects of online ACT interventions (Levin, Haeger & Cruz, in press). The Cronbach's alpha for the current sample was 0.94.

General Health Questionnaire (GHQ; Goldberg, 1972). The GHQ was included as a secondary measure of general psychological distress. Participant are asked to rate 12 items on a 4-point Likert scale, with higher scores indicating better mental health. The GHQ has been found to have adequate reliability and validity in past studies (Banks, 1980). The Cronbach's alpha for the current sample was 0.80.

Mental Health Continuum – Short Form (MHC-SF; Keyes, 2005). The 14-item MHC-SF was included as a secondary measure of positive mental health. The MHC-SF assesses a range of dimensions of positive mental health, including emotional, psychological, and social well-being. Items are ranked on a 6-point Likert scale ranging from 1 (*never*) to 6 (*every day*), with higher scores indicating greater positive mental health. The MHC-SF has established adequate reliability and validity in past research (Keyes, 2005). The Cronbach's alpha for the current sample was 0.94.

Work and Social Adjustment Scale (WSAS; Mundt et al., 2002). The 5-item WSAS was included as a secondary measure of psychosocial functioning. More specifically, the WSAS assesses the degree to which psychological challenges interfere with functioning in domains such as work or home life. Participants are asked to rank each item on a 9-point Likert scale (0 = *no impairment at all*, 8 = *very severely impaired*), with greater total scores meaning greater impairment. The WSAS has established good reliability and validity. The Cronbach's alpha for the current sample was 0.91.

Process of Change and Acceptability Measures

Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The 7-item CFQ was included as a measure of cognitive fusion, the process most relevant to the Open group of ACT components. Items are rated on a 7-point Likert scale (1 = *never true*, 7 = *always true*). Higher scores represent greater cognitive fusion. The CFQ has adequate reliability and validity (Gillanders et al., 2014). The Cronbach's alpha for the current sample was 0.95.

Valuing Questionnaire (VQ; Smout et al., 2014). The VQ was included as a measure of valued action, the process most relevant to the Engaged group of ACT components. The VQ includes a 5-item obstruction subscale and a 5-item progress subscale. Higher scores on the progress subscale indicate higher valued living, while higher scores on the obstruction subscale indicate greater interference of valued living. Participants are asked to rate on a 7-point Likert scale (0 = *not at all*, 6 = *completely true*). The VQ has established adequate reliability and validity (Smout et al., 2014). The Cronbach's alpha for the current sample was .88 for VQ progress and .87 for obstruction.

Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). The 7-item AAQ-II was included as a measure of general psychological inflexibility, relevant to the range of ACT components, with an emphasis on experiential avoidance. Participants are asked to rate each item on a 7-point Likert scale, 1 (*never*) to 7 (*always true*). Higher scores indicate greater psychological inflexibility. The AAQ-II has established adequate reliability and validity (Bond et al., 2011). The Cronbach's alpha for the current sample was 0.93.

Comprehensive Assessment of ACT (CompACT; Francis et al., 2016). The 23-item CompACT was included as an additional measure of general psychological flexibility. The CompACT can be calculated as a total score, combining subscales assessing openness to experience, behavioral awareness, and valued action. Participants rated each item on a 7-point Likert scale (0 = *strongly disagree*, 6 = *strongly agree*). Higher scores indicate greater psychological flexibility. Previous research has shown the CompACT to be reliable and valid (Francis et al., 2016). The Cronbach's alpha for the current sample was 0.91.

System Usability Scale (SUS; Tullis & Albert, 2008). The SUS is a 10-item scale measuring program usability and acceptability. Each item is ranked on a 5-point Likert scale, 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater usability. Previous research has found the SUS to be reliable and valid (Bangor, Kortum, & Miller, 2008). The Cronbach's alpha for the current sample was 0.90.

Data Analysis Plan

Descriptive statistics were examined by condition for program usage data and program satisfaction ratings in order to assess program feasibility. ANOVA and chi-square analyses tested for any potential baseline differences between conditions. A series of mixed model repeated measures (MMRM) analyses tested for differences between conditions over time (time *

condition effects) as well as general improvements over time across conditions (time effects) for each outcome and process measure. Significant time * condition or time effects in models including all three conditions (Engaged, Open, Combined) and time points (pre, post, follow up), were further examined through post hoc tests. MMRM analyses included all available data, irrespective of whether participants completed the post or follow up assessment, consistent with an intent-to-treat (ITT) approach. Restricted maximum likelihood (REML) estimation was used in MMRM analyses. REML allows all available data to be used in the estimation of model parameters (Little, Jorgensen, Lang, & Moore, 2014).

Although the sample was too small to test for differences between conditions on processes of change, preliminary analyses were conducted combining *across* conditions through a series of partial correlation analyses. The partial correlation between the pre-to-post change score on each ACT process variable and each posttreatment outcome variable was calculated, controlling for the baseline score on that outcome variable.

Results

Preliminary analyses

Overall, 73% of participants completed the postquestionnaire and 56% completed the follow up questionnaire, with no significant differences between conditions on completion rates (see Figure 1). Results from ANOVAs and chi-square analyses indicated there were no differences between conditions at baseline on outcome and process measures or demographics (see Table 3). All outcome and process measures were normally distributed based on skewness and kurtosis.

Program usage

Out of the 12 sessions available to them, participants in the Open condition completed an average of 7.22 sessions ($SD = 4.65$) compared to 5.63 ($SD = 5.06$) in the Engaged condition and

6.17 ($SD = 5.37$) in the Combined condition. The three conditions did not differ significantly in their rates of session completion according to a one-way ANOVA ($p > 0.1$). The number of sessions completed tended to be bimodal, with 36.4% of participants completing all 12, and 29.1% of participants completing 2 or fewer sessions, with the remaining 34.5% completing between 3 and 11 sessions. Chi square tests indicated that the conditions did not differ significantly in the rate of participants completing all 12 sessions, or in the rate of participants completing 2 or fewer sessions.

Participants who completed the postassessment ($n = 40$) were asked to report why they did not complete the program if relevant. Of the 17 who reported not completing the program, the most common reason was not having enough time (76%). Other reasons included difficulty accessing the program (12%), the program not seeming helpful (12%), the program being too long or boring (12%), and not being interested in using the program (12%).

Program satisfaction

Participants in each condition reported equally high program usability ratings based on the SUS (Open $M = 87.50$, $SD = 17.87$; Engaged $M = 84.62$, $SD = 15.06$; Combined $M = 89.17$, $SD = 11.84$), with no differences between conditions ($p > .10$). These ratings are in the “excellent” range based on previous SUS research (Bangor et al., 2008) and are in the upper bound of SUS ratings we have received for online ACT programs in previous studies (*CITATION REMOVED FOR BLIND REVIEW*).

Participants provided equally high satisfaction rates, with no differences between conditions, on individual satisfaction items. This included overall satisfaction with the program (Open $M = 5.00$, $SD = 1.47$; Engaged $M = 5.08$, $SD = 1.19$; Combined $M = 5.00$, $SD = 1.35$), ease of use (Open $M = 5.43$, $SD = 1.16$; Engaged $M = 5.46$, $SD = .97$; Combined $M = 5.42$, $SD = 1.17$),

perceived helpfulness (Open $M = 5.00$, $SD = 1.41$; Engaged $M = 4.64$, $SD = 1.74$; Combined $M = 4.75$, $SD = 1.14$), and if they would recommend the program to others (Open $M = 5.21$, $SD = 1.37$; Engaged $M = 5.00$, $SD = 1.16$; Combined $M = 5.00$, $SD = 1.35$). Each item was rated on a 6-point scale with 4 (*slightly agree*) or higher indicating some degree of satisfaction.

MMRM analyses on outcome and process variables

A series of MMRM tested for time and time by condition effects on each outcome and process measure (see Tables 3 and 4). The only time by condition effect was for the WSAS psychosocial functioning outcome. Large improvements in functioning were found for the Engaged and Combined conditions from pre- to post-treatment, but only a medium effect size for the Open condition. However, the Engaged significantly worsened on functioning from posttreatment to follow-up, with follow up scores approaching baseline scores. Thus, only the Combined condition demonstrated large effect sizes from pre- to post-treatment, which were maintained from post to follow-up.

There were no time by condition effects on other outcome or process measures, but there were significant time effects indicating participants generally improved following each intervention. Generally, all conditions had significant large effect sizes for improvements from pre to post, but no significant changes from posttreatment to follow up (see Table 4).

Processes of change analyses

A series of partial correlations examined the relations between pre- to post-treatment improvements in psychological flexibility processes and posttreatment outcome variables, controlling for their respective baselines scores (see Table 5). Overall, significant moderate correlations were generally found between pre- to post-treatment improvements in psychological flexibility and improvements in outcomes at posttreatment. The main exception was for the

AAQ-II, which did not significantly correlate with improvements in any outcomes. In addition, the CompACT and VQ Obstruction subscale did not correlate with improvements in the DASS, but did correlate with improvements in other outcomes.

Discussion

This pilot study sought to examine the feasibility and potential efficacy of online ACT component websites in a preliminary dismantling trial. On the whole, ACT-Open, ACT-Engaged, and ACT-Combined all appeared efficacious, with significant improvements from pre- to post-treatment for most mental health outcome and psychological flexibility process measures, and improvements generally maintained at four-week follow-up. While there were mostly no differences between conditions, there was one preliminary between-group effect with ACT-Combined producing the only large effect size from pre- to post-treatment on psychosocial functioning that was maintained at follow-up (ACT-Open had only a medium pre-post effect and ACT-Engaged significantly worsened from posttreatment to follow-up). With regards to processes of change, improvements in psychological flexibility predicted improvements in mental health outcomes with the exception of the AAQ-II. Overall, participants reported the platform as usable and acceptable with high satisfaction ratings. There were no differences between conditions on program usage and satisfaction, indicating the potential for the implementation of online component ACT trials. In sum, all component websites in this pilot trial were found to be effective and well-received. These results more broadly demonstrate the acceptability of online ACT interventions without including all the processes.

On the whole, the components generally had equivalent positive impacts, which is broadly consistent with positive findings related to web-based ACT and component research to date (Berghoff et al., 2018; O'Connor et al., 2018; Levin, Hildebrandt, Lillis, & Hayes, 2012). This

may be due to the low sample size, which limited power to detect differences between active conditions and would be important to address in a follow up, fully powered dismantling trial. However, it also suggests that ACT could be efficacious in some contexts with a limited subset of components. This is consistent with online ACT trials including only a subset of ACT components (e.g., Chase et al., 2013; Levin et al., 2014) as well as the broader literature in which modern CBTs that vary in their inclusion of these components are found efficacious (e.g., mindfulness-based stress reduction, behavioral activation; Hayes et al., 2011). These findings and broader literature suggest delivering a subset of ACT components could still be efficacious, which is relevant to online and mobile formats where more streamlined interventions may be necessary in some contexts.

However, there was also some initial evidence that some components may be more important for specific types of outcomes and that combining components could have stronger effects. The ACT-Open intervention was less effective at improving psychosocial functioning from pre to post-treatment, emphasizing the particular importance of including values to improve functioning in relevant life domains. Similarly, the ACT-Engaged intervention did not maintain improvements in psychosocial functioning at follow-up, emphasizing the importance of acceptance and defusion for maintaining functioning. In contrast, the ACT-Combined intervention that included all four components achieved large effect size improvements from pre- to post-treatment that were maintained at follow-up. This finding adds to previous research suggesting different combinations of ACT components have different functions (e.g., Villatte et al., 2016). One future direction for such component research is to begin exploring how to match necessary ACT components to participants in-the-moment rather than a broad comparison of some or all of the components (Levin et al, in press). This would more directly answer the

pragmatic clinical decision making question of what treatment strategy to use when with clients, rather than the broader dismantling question of whether to completely exclude components from treatment.

Overall, this pilot trial supports the feasibility and potential efficacy of the developed ACT component websites for conducting a fully powered dismantling trial. However, areas for revision were also identified regarding the ACT online platform. Most (76%) of participants who did not complete the program reported not having enough time. This may seem obvious given the expectation of completing twelve sessions over six weeks, but this approach was based on the request from participants in previous trials to split up longer weekly sessions into smaller, more frequent modules (*CITATION REMOVED*). Although the briefer, twelve session format received high usability ratings, it seems participants were unable to keep up with a format of completing two brief sessions a week. In the future, participants should be allowed a longer window to use the program. In the ACT Open program feedback, other participants described the program as being too wordy, structured, and impersonal. With this in mind, future revisions of this program will focus on enhancing the user experience by making the interface more welcoming, succinct, and flexible. Therefore, the modules will be edited to cut down on the text and include more open-ended activities.

The use of a web-based transdiagnostic approach in ACT component research has broader benefits. This approach allows for a precise and reliable delivery of treatment components. In this way, it is ensured that participants are receiving only the components being tested. Exploring interventions from a transdiagnostic approach allows for a broader reach and easier dissemination of the intervention, matching the heterogeneous set of concerns that individuals may seek help for online with a single program. In the present study, the

transdiagnostic approach in particular demonstrates the potential for online ACT modules as an intervention for a broad range of mental health conditions and people. Additionally, researching online ACT, as components or a whole, is extremely important for dissemination efforts. Further research on web-based ACT will allow for implementation of interventions in difficult-to-reach populations that may not otherwise have access to care due to cost, stigma, transportation, etc. Lastly, gaining a better understanding of the effectiveness of ACT components will allow for more refined treatment delivery, ultimately saving resources during a time when mental health care is expensive and in high demand. For example, if certain components of ACT are not necessary and only a few of the six are needed for symptom improvement, this information could potentially cut down treatment time and cost.

The small sample size and lack of control group in the present study are significant limiting factors. Although this pilot study suggests the potential feasibility of online ACT dismantling research, trials are now needed with greater statistical power and methodological control to fully test the additive and isolated effects of these ACT components. A larger trial with more power may provide greater insight into whether there is an additive or differential effect of the components. Future research should use an initial power analysis to estimate the target sample needed to detect possible, meaningful differences between conditions. Additionally, the lack of power could have caused meaningful between-condition differences on demographics to be overlooked; conducting a fully powered trial could help to increase confidence that there were no confounding factors between conditions. Furthermore, the lack of control group limits the attribution of the positive effects to the online program alone. It is unclear whether the ACT component conditions would have outperformed a condition controlling for other effects that

could account for change over time (e.g., demand characteristics, regression to the mean, measure reactivity).

The study is also limited by the validity of the components. Although the components were delivered in a highly controlled and reliable manner in a web-based platform, there is limited knowledge of whether these components are received by participants in the same way as in-person ACT components. Furthermore, the lack of moderators and use of a transdiagnostic approach presents a slightly oversimplified presentation of dismantling and component research. It is possible that different components work better with different types of disorders or people, but this would require a substantially larger sample to conduct moderation analyses. Thus, a transdiagnostic approach to a component study may be lacking in specificity necessary to understand how each component of ACT works. Indeed, it is an oversimplification to conclude that each component is effective. This is particularly relevant because the present study is missing the “aware” component of ACT, thereby presenting an incomplete dismantling of ACT. Therefore, it is important to view these results as preliminary and a starting point for a larger dismantling trial of ACT.

In summary, the present study demonstrates the successful implementation of ACT components as a web-based, transdiagnostic treatment. Future research with greater power is needed for a fuller understanding of the separate and combined impact of ACT components, particularly to determine which components may work best for which people or disorders. Lastly, online ACT provides great promise and resources for those out of reach of mental health care services due to the many societal barriers present today.

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Table 1. *Demographics for the total sample and each condition.*

	Total sample (n=55)	ACT-Mindful (n=18)	ACT-Value (n = 19)	ACT-Full (n=18)
Age (SD)	35.71 (16.68)	39.00 (17.48)	32.74 (14.22)	35.56 (18.51)
Gender (%)				
<i>Female</i>	76.4	61.1	89.5	77.8
<i>Male</i>	23.6	38.9	10.5	22.2
Ethnicity (%)				
<i>Hispanic/Latinx</i>	3.6	0	5.3	5.6
<i>Not Hispanic/Latinx</i>	96.4	100	94.7	94.4
Race ¹ (%)				
<i>White</i>	92.6	100	84.2	94.1
<i>Asian</i>	9.4	0	9.1	20.0
<i>Black</i>	6.5	0	18.2	0
Median household income	\$20,000- 39,999	\$20,000- 39,999	\$40,000- 59,999	\$20,000- 39,999
Access to treatment (%)				
<i>Seeing a therapist</i>	36.4	33.3	42.1	33.3
<i>Receiving psychiatric medication</i>	36.4	27.8	52.6	27.8

¹Participants were allowed to choose multiple categories, therefore categories add up to more than 100%.

Table 2. *Overview of website sessions*

ACT-Open	ACT-Engaged	ACT-Combined
1. Defining experiential avoidance and exploring its workability	1. Identifying personal values	1. Defining experiential avoidance and exploring its workability
2. Noticing how control attempts increase suffering	2. Exploring values as qualities of action (i.e., <i>how you do things</i>)	2. Noticing how control attempts increase suffering
3. Listening to emotions (i.e., how to learn from and respond to emotions)	3. Connecting experientially with personal values	3. Taking action while opening up to unwanted internal experiences
4. Practicing acceptance of emotions	4. Using values to guide choices	4. Defining cognitive fusion and exploring its effects
5. Taking action while opening up to unwanted internal experiences	5. Finding new values	5. Practicing defusion meditation exercises
6. Practicing acceptance with bold actions	6. Focusing on values in the moment	6. Practicing brief defusion skills
7. Defining cognitive fusion and exploring its effects	7. Connecting values to action	7. Identifying values
8. Noticing how your mind works	8. Setting goals	8. Exploring values as qualities of action (i.e., <i>how you do things</i>)
9. Defusing from judgments	9. Overcoming external barriers	9. Finding new values
10. Practicing defusion mediation exercises	10. Making commitments.	10. Setting goals
11. Practicing brief defusion skills	11. Building valued habits	11. Making commitments
12. Defusing from self-stories	12. Returning to commitments	12. Returning to commitments

Table 3. *Estimated descriptive statistics based on MMRM analyses for ITT sample.*

	<u>Combined Condition</u>			<u>Open Condition</u>			<u>Active Condition</u>		
	Pre <i>M</i> (<i>SE</i>)	Post <i>M</i> (<i>SE</i>)	FU <i>M</i> (<i>SE</i>)	Pre <i>M</i> (<i>SE</i>)	Post <i>M</i> (<i>SE</i>)	FU <i>M</i> (<i>SE</i>)	Pre <i>M</i> (<i>SE</i>)	Post <i>M</i> (<i>SE</i>)	FU <i>M</i> (<i>SE</i>)
<i>Outcome Measures</i>									
DASS	52.78 (6.72)	35.49 (5.69)	37.71 (5.99)	45.11 (6.72)	26.54 (5.57)	23.16 (5.13)	53.79 (6.54)	32.20 (5.46)	31.03 (5.25)
WSAS	27.07 (3.16)	17.32 (2.76)	17.11 (3.06)	19.14 (2.90)	16.57 (2.52)	14.42 (2.58)	22.58 (2.96)	14.94 (2.59)	19.35 (2.73)
GHQ	31.39 (1.70)	22.27 (1.32)	23.47 (1.83)	28.28 (1.70)	21.43 (1.24)	21.08 (1.44)	32.47 (1.66)	23.26 (1.23)	25.13 (1.52)
MHC	51.11 (3.70)	55.44 (3.95)	57.09 (4.17)	50.50 (3.70)	57.04 (3.80)	63.40 (3.69)	48.00 (3.60)	56.70 (3.75)	54.79 (3.74)
<i>Process Measures</i>									
AAQ	28.78 (2.44)	23.29 (2.40)	23.35 (2.66)	27.89 (2.44)	23.23 (2.34)	19.73 (2.34)	30.16 (2.37)	23.90 (2.30)	24.10 (2.42)
CFQ	32.28 (2.23)	26.39 (2.49)	23.68 (3.05)	32.94 (2.23)	25.42 (2.40)	23.79 (2.53)	34.05 (2.17)	26.01 (2.37)	25.46 (2.69)
CompACT	94.33 (5.65)	76.86 (6.67)	74.56 (7.22)	88.28 (5.65)	69.86 (6.44)	63.03 (6.18)	94.11 (5.49)	73.36 (6.34)	72.25 (6.47)
VQ-Obs	21.94 (1.67)	16.61 (1.76)	15.83 (2.19)	20.22 (1.67)	14.76 (1.69)	13.36 (1.75)	21.26 (1.63)	16.37 (1.67)	16.61 (1.90)
VQ-Pro	19.44 (1.75)	23.25 (1.76)	21.49 (2.08)	21.22 (1.75)	24.32 (1.69)	24.21 (1.62)	19.63 (1.71)	25.57 (1.67)	24.60 (1.78)

DASS = Depression, Anxiety, and Stress Scale-21; WSAS = Work and Social Adjustment Scale; GHQ = General Health Questionnaire; MHC = Mental Health Continuum; AAQ = Acceptance and Action Questionnaire-II; CFQ = Cognitive Fusion Questionnaire; CompACT = Comprehensive assessment of Acceptance and Commitment Therapy; VQ Obs = Valuing Questionnaire – Obstruction; VQ Pro = Valuing Questionnaire - Progress.

Table 4. *MMRM results for outcome and process measures with ITT sample.*

	Time * Condition F	Time F	<u>Combined Condition</u>		<u>Open Condition</u>		<u>Active Condition</u>	
			Pre to Post d	Post to FU d	Pre to Post d	Post to FU d	Pre to Post d	Post to FU d
<i>Outcome Measures</i>								
DASS	.44	47.55***	1.32***	-.16	1.41***	.25	1.64***	.09
WSAS	4.97**	40.91***	1.90***	.03	.57*	.40	1.59***	-.78*
GHQ	.48	45.73***	1.44***	-.23	1.08***	.07	1.46***	-.36
MHC	1.93	14.10***	.41	.19	.62*	.75*	.83**	-.22
<i>Process Measures</i>								
AAQ	.79	31.61***	1.02**	-.01	.87**	.60*	1.17***	-.03
CFQ	.27	31.01***	.94**	.39	1.20***	.23	1.28***	.08
CompACT	.28	36.93***	1.09**	.14	1.15***	.42	1.29***	.07
VQ Obs	.19	24.55***	1.06***	.14	1.09***	.25	.97**	-.04
VQ Pro	.70	14.69***	.72*	-.28	.59*	-.02	1.13***	-.15

* $p < .05$; ** $p < .01$; *** $p < .001$. Time * Condition test includes all three conditions (Open, Active, Combined) and three time points (pre, post, follow up).

Table 5. *Partial correlations between post outcomes and pre to post changes on processes, controlling for baseline outcomes.*

Outcome	pre-post AAQ	pre-post CompACT	pre-post CFQ	pre-post VQ-Obs	pre-post VQ-Pro
DASS	.28	.06	.33*	.25	.39*
WSAS	.27	.41*	.51**	.33*	.35*
GHQ	.30	.41**	.45**	.46**	.34*
MHC	.18	.49**	.44**	.54***	.55***

* $p < .05$; ** $p < .01$; *** $p < .001$. Variables were scored such that positive correlations indicate expected relation between pre to post improvements in processes and improvements in outcomes.

Figure 1. Consort diagram of participant flow.

