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Web-based self-help for preventing mental health problems in universities: Comparing acceptance and commitment training to mental health education

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Abstract

Objective: This study sought to test the feasibility of a web-based Acceptance and Commitment Training (ACT) prototype prevention program called ACT on College Life (ACT-CL). **Method:** A sample of 234 university students was randomized to either the ACT-CL website or a mental health education (MHE) website. **Results:** Findings indicated lower user engagement and satisfaction ratings with the ACT-CL prototype relative to MHE. There were no significant differences between conditions on outcome measures at post or follow up. However, statistical trends suggested the MHE condition actually led to greater remission of severe symptoms than the ACT-CL condition among those with severe symptoms at baseline. There were no differences between conditions on ACT process of change measures. Changes in psychological flexibility were predictive of changes in mental health across conditions, but relations dissipated over time. Furthermore, greater engagement in some components of ACT-CL predicted improvements in psychological flexibility, though not on mental health outcomes. **Conclusions:** ACT-CL had largely equivalent effects relative to an education website on mental health outcomes and ACT process measures, although there was lower program engagement with ACT-CL. Findings are discussed in the context of feasibility issues and lessons learned for program revisions.

Keywords: Acceptance and Commitment Therapy; Mindfulness; College students; Self-help; Web-based; Telepsychology

Web-based self-help for preventing mental health problems in universities: Comparing acceptance and commitment training to mental health education

Psychological disorders are highly prevalent in the university population with estimates as high as nearly 50% of students having a diagnosable disorder in a given year (Blanco et al., 2008). With the prevalence of disorders, university and college counseling centers are struggling with meeting the mental health needs of their students. Surveys of college counseling center directors in the US indicate increasing demands for services coupled with a perceived increase in the complexity and severity of presenting problems (Gallagher, 2014). Resources for counseling centers are limited, with an estimated 1 counselor to every 1,459 students (AUCCD, 2014) and many directors note a lack of resources to meet increasing service demands (Gallagher, 2014). At the same time, many students who would benefit from psychological services never seek treatment (Blanco et al., 2008), including an estimated 90% of those who commit suicide (Gallagher, 2006). This combination of prevalent mental health issues, difficulty meeting demands with existing services/resources, and low rates of treatment seeking suggest that a variety of solutions are likely needed to address the mental health challenges in universities.

One key area is to develop and scale up programs that prevent mental health problems before they develop among students. Such an approach could serve to reduce the incidence and prevalence of mental health problems, while reducing the demands placed on counseling centers. Yet, this approach rests on the ability to provide prevention services at a large scale and in a format that students who are not necessarily in distress will be willing to engage in.

Web-based self-help is an ideal format for scaling up prevention services. Providing a prevention program online allows for a cost effective way to deliver a program across campuses. Simultaneously, the anonymity and convenience provided in completing a program at one's own

pace on a website might serve to increase student engagement. Consistent with this approach, multiple web-based self-help prevention programs have been tested among college students demonstrating efficacy in preventing alcohol use problems (e.g., Croom et al., 2015), eating disorders (e.g., Kass et al., 2014) and anxiety (e.g., Schmidt et al., 2007).

There is another challenge to effectively engaging campuses in prevention efforts, which is how to implement a range of programs to prevent the variety of different mental health problems students are actually at risk for. If students were expected to complete a problem-specific program for each issue, it would place a very large burden for engagement, not to mention the costs and complexity for universities to implement. This can be circumvented through transdiagnostic prevention programs that can target the range of disorders students are at risk for within a single program. Such a transdiagnostic approach could provide a cost effective, efficient means for institutions to address mental health issues within a unified intervention.

Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 2012) is one promising approach that has been proposed for transdiagnostic prevention efforts (Biglan, Hayes & Pistorello, 2008). ACT focuses on reducing psychological inflexibility, a pathological process in which behavior is rigidly governed by thoughts and feelings at the expense of more effective or valued action. There is a substantial research base indicating that psychological inflexibility is a transdiagnostic risk factor for a range of psychological disorders including depression, anxiety, substance abuse, eating disorders, and psychosis (Hayes, Luoma, Bond, Masuda & Lillis, 2006; Levin, MacLane et al., 2014; Ruiz, 2010). ACT seeks to reduce psychological inflexibility by increasing psychological flexibility, a therapeutic process of change in which individuals learn to engage in valued patterns of action while being willing to experience whatever thoughts and feelings might arise. Psychological flexibility is developed and supported by a range of sub-

processes including values, acceptance, present moment awareness, defusion, self-as-context, and committed action, each of which also correspond to the six specific treatment components in ACT protocols (Hayes et al., 2012). Research has consistently found that reductions in psychological inflexibility (the pathological process) and increases in flexibility (therapeutic process) through ACT are predictive of, and mediate, clinical outcomes for many of the disorders students are at risk of developing (Hayes et al. 2006; Ruiz, 2010).

Preliminary research has begun to examine whether self-help ACT interventions could be used to increase psychological flexibility (and reduce inflexibility) in a preventative format before disorders develop. Of note, in this non-treatment context, ACT is typically referenced as Acceptance and Commitment Training. Although not specifically tested with university students, ACT has been found to be effective as an indicated prevention approach using a self-help book among individuals with subthreshold depression (Fledderus et al., 2011). Another non-clinical study tested ACT in a self-help book format with a general sample of international university students, finding it not only reduced psychological symptoms, but also prevented the onset of clinically significant distress at follow up (Muto, Hayes & Jeffcoat, 2011).

Research has also begun to examine the efficacy of ACT in a web-based self-help format. Several recent randomized trials have demonstrated the efficacy of web-based self-help using ACT for depression (e.g., Lappalainen et al., 2014), chronic pain (e.g., Trompetter et al., 2015), smoking (e.g., Bricker et al., 2013), and tinnitus (e.g., Hesser et al., 2012). Research specifically with university students have found ACT in a web-based self-help format can improve academic performance (Chase et al., 2013) and can improve psychological symptoms as an adjunct to counseling services (Levin et al., 2015). Overall, this research suggests ACT may be feasible as a prevention approach and in a web-based self-help format, although only one study has

specifically tested ACT as a transdiagnostic web-based self-help prevention program (Levin, Pistorello et al., 2014).

The current study sought to test the feasibility of a web-based ACT program for the prevention of mental health problems with university students using an initial prototype called ACT on College Life (ACT-CL; Levin, Pistorello et al., 2014). The ACT-CL prototype initially consisted of two interactive, multimedia online sessions focused on the values and acceptance components of ACT. This prototype was previously tested relative to a waitlist control group in a pilot randomized controlled trial (RCT) with 76 first-year university students (Levin, Pistorello et al., 2014). Results indicated ACT-CL was acceptable to students (i.e., high self-reported usability ratings, 92% completed both sessions) and students who used ACT-CL improved on program knowledge and education values relative to the students assigned to the waitlist condition. In addition, students with at least minimal distress at baseline reported significant improvements in both depression and anxiety in ACT-CL relative to the waitlist condition. However, participants in the waitlist did not demonstrate significant improvements in any outcome or process (i.e., process of change) measures besides program knowledge after receiving access to ACT-CL.

Overall, the initial pilot results suggest ACT-CL may be a promising web-based transdiagnostic prevention approach with university students. However, some results were less supportive including the failure to replicate effects in the waitlist condition (i.e., when waitlisted participants received access to ACT-CL they did not improve similarly on outcomes) and the lack of between group effects on psychological flexibility (as measured by the Acceptance and Action Questionnaire-II [AAQ-II]; Bond et al., 2011). As in any pilot trial, there were also methodological limitations that affected the ability to assess feasibility of the program, including

the short assessment period, small sample size, and use of only first-year students. Furthermore, although a waitlist condition provides a useful initial test for feasibility, it is likely that any credible intervention would outperform waitlist due to nonspecific intervention and method effects such as demand characteristics and participant expectancies. Thus, an important next step in evaluating the feasibility of ACT-CL is to determine whether it can improve psychological flexibility and mental health outcomes above and beyond nonspecific effects that would be produced by any credible intervention with a larger student sample and longer evaluation period. Finally, the initial pilot included monetary compensation for completing assessments (\$40-\$60 total) along with a brief, in-person orientation to the program by the researchers, which might have increased program engagement but may not be feasible when scaling the program to an entire student body. Thus, research testing ACT-CL in a more stand-alone format could further determine feasibility.

Such feasibility research is very important for developing successful prevention programs for university students. This not only determines what works in a prototype to support its further development, but can also provide valuable information to other developers seeking to create much needed, transdiagnostic prevention programs for universities. For example, results could help indicate what program features are acceptable (or not) to university students, what implementation methods may be more or less likely to be successful, and so on. In sum, a second feasibility trial could provide valuable information by testing ACT-CL against an active comparison condition, with a broader and larger sample, longer follow up assessments, and without intensive in-person contact or significant monetary compensation.

The current study sought to replicate and extend initial pilot results with the ACT-CL prototype by comparing it to a mental health education (MHE) website, which is a commonly

used method for general prevention on university campuses (e.g., Gallagher, 2014; ulifeline.org; jedfoundation.org). Given positive findings in the initial pilot (i.e., program acceptability, high usage, improvements in depression/anxiety), the ACT-CL prototype was hypothesized to demonstrate high levels of usability and acceptability with university students. In addition, the existing components of ACT-CL were hypothesized, relative to MHE, to reduce psychological symptoms and the onset of severe symptoms as well as increase positive mental health and psychological flexibility. Such a test provides important information regarding the feasibility of the ACT-CL prototype including whether an active effect is found above and beyond outcomes produced by a theoretically distinct credible intervention and whether the program is acceptable to a broader range of university students when implemented in a more stand-alone format.

METHODS

Participants

The sample consisted of 234 undergraduate university students from a mid-sized university. The study had minimal eligibility criteria; fluent in English, 18 years of age or older, and being an undergraduate university student (defined in US as a college/university student who has not obtained a Bachelor's or equivalent degree, often taking 4-5 years). The sample was 76.9% female with a median age of 20 ($M = 21.61$, $SD = 5.48$, Range = 18 – 58). In terms of racial distribution, 76.2% were White or Caucasian, 9.3% Asian, 3.5% Black or African American, 1.8% American Indian/Alaska Native, 1.3% Native Hawaiian or Other Pacific Islander, and 7.9% other racial background. In addition, 16.2% identified as being of Hispanic or Latino ethnicity. In terms of year in school at the university, 28.5% were in their first year, 15.8% second year, 20.4% third year, 23.1% fourth year, and 12.3% fifth year or higher.

Study Procedures

Students were recruited through an online psychology research platform, flyers posted on campus, and announcements made in classes. Interested students were directed to a website where they could review an online consent form and proceed with participation in the study. The consent form provided a very minimal, vague description of the two website conditions (i.e., “the web-based programs may focus on topics including learning about depression and anxiety, setting goals, how to deal with difficult experiences, and exploring your values”). Students who consented to participate were automatically directed to an online baseline survey. Survey completers were automatically randomized by the website to study conditions (ACT-CL $n = 114$; Education $n = 120$) and given directions to begin their respective program. Thus, the initial program consenting, assessment and enrollment procedures were typically conducted without any personal interactions with the researchers.

During the intervention period, reminder emails and phone calls were made every 3 to 6 days when a program session was available for completion until users completed the session or the 21-day intervention window passed. Participants were sent a post survey link 3 weeks after completing the baseline survey. Follow-up survey links were sent 1-month and 3-months after the post survey link was sent. Participants received research credits that could be used for extra credit in psychology courses if applicable as well as a \$10 gift card at the end of the study. The study was approved by the institution’s internal review board and complied with relevant requirements for protecting the privacy and confidentiality of participant data. Such steps included collecting the consent and contact information outside of other databases (besides program registration), using secure website platforms, and keeping personally identifiable information separate from participant data in relevant databases.

ACT on College Life (ACT-CL)

The ACT-CL prototype consisted of a 3-week program with two core multimedia sessions as well as supplementary emails, web-based resources and text messages to further strengthen and generalize program content (see Table 1 for further details). The multimedia sessions include a combination of audio narration, animation, text and graphic elements as well as interactive exercises. The program was designed using a “tunneled” format such that users had to complete the session in a pre-determined, sequential order. The first session of ACT-CL focused on values clarification and goal setting. The second session focused on acceptance and committed actions linked to acceptance and values. Participants were also automatically sent a series of follow-up tailored emails through the ACT-CL program to remind them to complete goals (tailored to include the goal they specifically set for the week) and for additional suggestions in applying values and willingness (which were not tailored to the user).

Two additional program features were added to prototype ACT-CL program that were not previously tested in the first pilot trial (Levin, Pistorello et al., 2014). First, after completing each session, participants were sent an email with a link to access supplementary materials related to practicing mindfulness. This included didactic information on what mindfulness is, presented through written resources and brief animations, and instructions to practice meditation exercises, including audio guided mindfulness exercises. Second, participants were given the option to receive text messages from the ACT-CL website. Those who agreed received brief text messages 3 days and 6 days after completing each session. These text messages encouraged participants’ to continue to examine ways to apply the program materials to their life. However, the text messages were not customized to the user at all and rather provided general content relevant to the session they had completed.

It is important to note that this prototype only included a subset of ACT components, with an eventually more comprehensive program planned for development based on feasibility findings. The current ACT-CL primarily targeted the acceptance and values components of ACT, although with some additional mindfulness resources included as secondary content in order to provide more comprehensive coverage of ACT components. The prototype focused on acceptance and values because a) values was hypothesized to help engage non-distressed students in why they would learn ACT skills and use the program, b) acceptance is a particularly key component often targeted early in ACT, and c) both of these components have been heavily researched in laboratory-based studies demonstrating they can impact clinically relevant outcomes (Levin et al., 2012).

Mental Health Education (MHE) Website

The MHE website was similarly a 3-week program involving two web-based sessions which focused on providing basic educational information about the symptoms and causes of depression and anxiety as well as brief information on coping strategies. This website was designed to control for nonspecific and method effects related to accessing a credible web-based intervention discussing mental health issues. The program was consistent with the information typically provided by universities for mental health education, while avoiding content specifically related to psychological flexibility therapeutic processes. Studies outside the university context suggest that MHE programs can improve self-identification of disorders, positive beliefs about treatment and treatment seeking (Jorm, 2012) as well as improve symptoms of depression (Christensen, Griffiths & Jorm, 2004). Research has been more limited in university settings, but one study found that MHE improved identification of depression and attitudes towards treatment among university students (Merritt et al., 2007).

The MHE sessions were primarily text-based, but also included supplementary illustrations and knowledge test questions. The session content was taken primarily from two MHE websites designed for university students and adolescents, ulifeline.org and halfofus.com. The first session focused on depression and the second session on anxiety and stress. A link to the second session was emailed to participants one week after the completion of the first session. The sessions included basic and brief information on how to cope with depression and anxiety/stress (e.g., goal setting, extracurricular activities, physical activity, seeking support from others, relaxation methods, time management, positive thinking, seeking treatment). However, the information was a) very brief (about 1-5 sentences per strategy), b) educational rather than focused on training skills, c) taken from existing MHE websites for college students, and d) purposefully selected to not overlap with components of ACT.

The two MHE website sessions were designed to match the two sessions of ACT-CL in terms of number of pages and amount of content. However, participants could much more easily skip through pages in the control website due to having much fewer multimedia/interactive elements that require completion to proceed (which were used heavily in ACT-CL). Furthermore, the control condition did not include a comparative set of email and text messages outside of session (besides those prompting completion of the next session) and did not include a comparative secondary resource to the mindfulness resources provided in ACT-CL.

Measures

Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1995). The 21-item DASS consists of three distinct subscales assessing depression, anxiety and stress symptoms. Participants rate how much each statement applied to them over the past week on a 4-point scale ranging from 0 “Did not apply to me at all” to 3 “Applied to me very much, or most of the time” with higher scores indicating greater distress. Recommended cutoff scores for severe depression

(> 20) and severe anxiety symptoms (> 14) have been developed for the DASS (Lovibond & Lovibond, 1995). DASS scores have been found to have adequate reliability and validity in past studies (Lovibond & Lovibond, 1995) as well as being sensitive to detecting treatment effects from self-guided ACT interventions with student samples (e.g., Muto et al., 2011). In the current study the Cronbach's alpha for the depression, anxiety and stress subscales were .89, .84 and .87 respectively.

Mental Health Continuum – Short Form (MHC-SF; Keyes, 2005). The MHC-SF is a 14-item measure of positive mental health. Items assess theoretically meaningful dimensions of wellbeing including positive affect, satisfaction with life, social integration, social contribution, autonomy, personal growth, purpose in life, and self-acceptance. Scores on the MHC-SF have been found to have adequate reliability and validity in past research (Keyes, 2005), with higher scores indicating greater positive health. In the current sample, the Cronbach's alpha for the MHC-SF was .93.

Avoidance and Fusion Questionnaire for Youth (AFQ-Y; Greco, Lambert & Baer, 2008). The AFQ-Y is a 17-item measure of psychological inflexibility and flexibility developed initially for use with children and adolescents. The AFQ-Y was used as the primary process of change measure rather than the AAQ-II because the AAQ-II was not found to be sensitive to the intervention effects of ACT-CL in the first pilot trial (Levin et al., 2014). The AAQ-II has typically found to be less sensitive to detecting effects in specific domains relative to more targeted psychological flexibility measures (e.g., Gifford et al., 2004). It was hypothesized that the AFQ-Y might thus be more relevant given it was designed specifically for younger populations, with items more relevant to this context (e.g., “I can't be a good friend when I feel upset”). Scores on the AFQ-Y have been found to have adequate reliability and validity in both

child and adolescent (Greco et al., 2008) as well as university student samples (Schmalz & Murrell, 2010). Responses on the AFQ-Y are given on a 5-point scale ranging from 0 “Not at all true” to 4 “Very true” with higher scores indicating greater inflexibility/lower flexibility. The AFQ-Y had a Cronbach’s alpha of .90 in the current study.

Personal Values Questionnaire-Relationship and Education Subscales (PVQ; Ciarrochi, Blackledge & Heaven, 2006). The relationship and education subscales of the PVQ were used to assess values, a key psychological flexibility sub-process involving clarifying and connecting with verbally described, personally meaningful patterns of action. A series of 5 questions assessed appetitive and aversive reasons for their values in each of these domains on a 5-point scale ranging from 1 (“Not at all for this reason”) to 5 (“Entirely for this reason”). Appetitive reasons refer to those under the control of positive reinforcers (e.g., “I value this because doing these things makes my life better, more meaningful, and/or more vital.”), which ACT seeks to increase contact with through values work. Conversely, aversive reasons refer to those focused more on avoiding/escaping unwanted thoughts and feelings (e.g., “I value this because I would feel ashamed, guilty, or anxious if I didn’t.”), which ACT seeks to diminish. A ratio can be calculated examining aversive reasons divided by appetitive reasons for a total score of values reasons (lower scores indicating the value is more due to aversive than appetitive reasons). For example, valuing being a caring friend because it makes one’s life fun and meaningful rather than because one wants to avoid feeling guilty would result in a low ratio score (e.g., if aversive reasons $M = 1$ and appetitive reasons $M = 5$; $1/5 =$ ratio score of .2).

Participants were also asked on the PVQ to rate their degree of success in living consistently with their values over the past 3 weeks (with higher scores indicating that they engaged in actions that were in line with their values). The values ratio and success variables

were assessed separately in the context of education and in relationships with others. Past studies have supported the construct validity of the PVQ values reasons and success item scores in samples including university students (Ciarrochi et al., 2006; Ferssizidis et al., 2010)

Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The 8-item Acting with Awareness and 7-item Nonreactivity subscales of the FFMQ were used to assess features of mindfulness, which reflect key sub-processes of psychological flexibility. The Acting with Awareness subscale assesses the tendency to *not* attend to present moment experiences while engaging in activities (i.e., present moment awareness). The Nonreactivity subscale assesses the capacity to notice thoughts and feelings without acting on or otherwise getting entangled with them (i.e., defusion and acceptance). Only these two FFMQ subscales were included to reduce measurement burden. The Nonreactivity and Acting with Awareness subscales were specifically selected because they assess key therapeutic processes of change that were not measured by other scales in the study (as opposed to the Observing subscale which sometimes does not perform as expected [Baer et al., 2006] or the Nonjudgmental subscale which overlaps more substantially with the AFQ-Y).

Each FFMQ item is rated on a 5-point scale ranging from 1 (“Never or very rarely true”) to 5 (“Very often or always true”) with higher scores indicating greater mindfulness. Scores on the FFMQ have been found to be a reliable and valid measure of mindfulness in past research with university student samples (Baer et al., 2006). In the current sample, the Cronbach’s alpha was .91 for the Acting with Awareness subscale and .86 for the Nonreactivity subscale.

ACT Knowledge Questionnaire (Levin, Pistorello et al., 2014). A 16-item ACT knowledge questionnaire was used to assess changes in participants’ understanding of ACT core concepts before and after completing the ACT-CL and MHE programs. The questionnaire

involves a series of multiple choice and true/false questions related to ACT concepts presented in the two multimedia sessions, with higher scores indicating greater knowledge. The ACT knowledge questionnaire was developed and tested in the pilot RCT with the ACT-CL prototype (Levin, Pistorello et al., 2014). In the pilot RCT, the questionnaire appeared to be sensitive to detecting increases in ACT knowledge before and after completing the ACT-CL program (paired samples t -test: $t = 5.52$, $p < .001$, Cohen's $d = 1.64$; Levin, Pistorello et al., 2014).

System Usability Scale (SUS; Tullis & Albert, 2008). The SUS is a 10-item scale designed to assess program usability and acceptability. Each item is rated on a 5-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"). Research summarized across 206 studies indicates that the SUS items load onto a single latent factor, have a high level of internal consistency (Cronbach's alpha = .91) and can distinguish between more and less usable programs (Bangor, Kortum & Miller, 2008). The Cronbach's alpha for the SUS in the current study at post was .87.

Program Usage. The ACT-CL and MHE website programs both automatically collected data on participants' use of the program including sessions completed, time spent on pages, and specific responses to exercises. This data was used to examine program usage across the two sessions in both conditions. In addition to providing data regarding the usability of the program, usage variables such as time spent on pages and word count in written exercises were used to examine program engagement.

Data Analysis Plan

A criterion of $p = .05$ was used for determining the significance of all analyses. Due to the exploratory nature of the study in examining null results, statistical trends between p values of .05 and .10 are also reported, which might highlight other potential study findings. However,

these trends should be interpreted with notable caution due to the number of analyses performed and failure to reach statistical significance ($p < .05$).

Program usage and satisfaction data were compared using *t*-tests and chi square analyses between ACT-CL and the MHE condition as well as relative to ACT-CL results in the pilot RCT (Levin, Pistorello et al., 2014). Mixed model repeated measures (MMRM) analyses using unstructured covariance models were conducted to examine between group effects on outcome and process (i.e., process of change) measures from pre to post and from pre to post to 1-month to 3-month follow up. An intent-to-treat (ITT) analytic approach was taken such that all participants were included in analyses. MMRM provides a powerful method for conducting analyses with the full ITT sample because this approach can model change even with participants who are missing data on one or more post and follow up time points. Due to low program completion rates in ACT-CL (i.e., only 55% completed both sessions, see figure 1), analyses were repeated with only program completers (i.e., completed both sessions).

Additional chi square analyses examined between group differences on the rate of participants with severe depression and/or anxiety symptoms based on recommended DASS cutoff scores at post, 1-month and 3-month follow up. Analyses were conducted with the full sample as well as separately among those with or without severe depression/anxiety at baseline. This allowed for the separate examination of prevention (i.e., preventing the onset of severe symptoms) and treatment effects (i.e., reducing existing symptoms). An ITT approach was taken such that all participants who completed the baseline assessment were included in the analyses. In cases where there was missing data for later time points, the participant's most recent available data was carried forward and used for the missing data point(s).

Since ACT-CL was not found to differentially impact psychological flexibility (see results below), partial correlations were conducted with the full sample (combining both conditions) to examine the relationship of pre to post changes in psychological flexibility processes with outcomes at post, 1-month and 3-month follow up, controlling for their respective baseline score. This allowed for the examination of whether changes in process measures (as assessed by the AFQ-Y, FFMQ, and PVQ) were predictive of improvements in outcomes irrespective of condition, which would be broadly supportive of the psychological flexibility model. This could provide some evidence to at least support the benefits of targeting psychological flexibility in these students, while suggesting that ACT-CL simply might have failed to impact psychological flexibility.

Additional analyses explored the relationship of engagement in the ACT-CL program to improvements in psychological flexibility at post. Partial correlations examined the relationship of time spent in each session as well as word count in key exercises to post process measures, controlling for their respective baseline score. Analysis of covariance (ANCOVA) were conducted to compare post process measures, controlling for respective baseline scores, between participants who did or did not request to receive text messages from the ACT-CL program. A similar series of ANCOVAs were conducted between participants who did or did not access the mindfulness resources and those who did or did not complete program sessions.

RESULTS

Participant Flow and Preliminary Analyses

The rate of participants in each condition who were screened out of analyses and who completed each step of the study is listed in Figure 1. Of note, there was significantly lower survey completion rates in ACT-CL relative to education condition at post ($\chi^2 = 9.12, p = .003$,

$OR = 2.73$), but not at 1-month follow up ($\chi^2 = 2.26, p = .13, OR = 1.54$) or 3-month follow up ($\chi^2 = 2.25, p = .13, OR = 1.53$).

Independent t -tests and chi square analyses were conducted to test for between group differences at baseline. There were no significant differences on any outcome, process or key demographic variables between conditions at baseline ($p > .10$).

Program Usage and Satisfaction

There were significantly lower program completion rates for ACT-CL for session 1 (ACT-CL = 85%, Education = 100%, $\chi^2 = 18.46, p < .001, OR = 41.38$) and for session 2 (ACT-CL = 55%, Education = 86%, $\chi^2 = 25.14, p < .001, OR = 4.77$). The ACT-CL completion rate for both sessions was also significantly lower than the pilot study rate of 92% ($\chi^2 = 15.51, p < .001, OR = 9.10$). In ACT-CL, only 36.4% requested to receive text messages and only 16.4% accessed the additional mindfulness resources.

Although the completion rates were higher for the MHE website, this may be an artifact of allowing participants to quickly skip through each session in the control condition.

Participants spent significantly more time on the ACT-CL website than the control website for both the first session ($t(215) = 19.68, p < .001, \text{Cohen's } d = 2.77, \text{ACT-CL } M = 29.05, SD = 8.98; \text{Control } M = 8.13, SD = 6.16$) and second session ($t(163) = 19.00, p < .001, \text{Cohen's } d = 3.06, \text{ACT-CL } M = 42.07, SD = 11.30; \text{Control } M = 10.33, SD = 9.87$). Of note, 42% and 45% of participants went through session 1 and session 2 of the MHE website respectively in under 5 minutes, suggesting many completed the sessions, but with minimal actual program engagement.

System usability ratings were equivalent for the two websites (ACT-CL $M = 73.41, SD = 19.72; \text{Education } M = 72.63, SD = 17.54, t(173) = .28, p = .78$). Of note however, the SUS

ratings for ACT-CL in the current study were significantly lower than the previous pilot (Pilot $M = 84.97$, $SD = 9.89$, $t(108) = 3.27$, $p < .001$, Cohen's $d = .61$).

Treatment Outcomes

MMRM analyses examined treatment effects on outcome measures from pre to post and pre to 3-month follow up with the full ITT sample (descriptive statistics for outcome and process measures over time by condition are provided in Table 2). There were no significant differences between conditions on any outcome measures ($p > .10$).

Recommended DASS cutoff scores were used to examine rates of severe depression and/or anxiety over time between conditions. Although there were no significant differences ($p < .05$), there was a *trend* such that students who were severely depressed and/or anxious at baseline (ACT-CL $n = 19$, Education $n = 24$) were more likely to continue to have severe symptoms in ACT-CL at post (ACT-CL = 79%, Education = 50%, $\chi^2 = 3.80$, $p = .051$) and 3-month follow up (ACT-CL = 63%, Education = 38%, $\chi^2 = 2.79$, $p = .095$). There were no significant differences in rates of severe symptoms among students who did not have severe symptoms at baseline.

Analyses were repeated only among participants who completed both sessions (ACT-CL $n = 61$, Education $n = 101$). The MMRM results were nearly identical except that there was no trend for differences between groups on rates of severe depression and/or anxiety symptoms at any time point among program completers ($p > .10$).

Treatment Process of Change Analyses

MMRM analyses also examined treatment effects on process measures from pre to post and pre to 3-month follow up with the full ITT sample. The only significant time by condition interaction was for ACT knowledge, $F(1, 196.43) = 59.05$, $p < .001$, Cohen's $d = 1.10$, such that participants in ACT-CL improved more in knowledge from pre to post relative to the education

condition. There was a *trend* for a time by condition interaction for education values success from pre to 3-month follow up, $F(3, 168.81) = 2.22, p = .088$, Cohen's $d = .23$. Post hoc analyses indicated significantly higher education values success at 3-month follow up in the Education condition compared to ACT-CL (estimate = $-.35, t(158.05) = -1.99, p = .049$, Cohen's $d = .32$). There were no significant time by condition interactions for any of the other outcome or process measures ($p > .10$).

Analyses were repeated only among participants who completed both sessions (ACT-CL $n = 61$, Education $n = 101$). The MMRM results were nearly identical except that there was no longer a trend for a time by condition interaction on education values success ($p > .10$).

Testing the Psychological Flexibility Model

Although the results suggest a failure of the prototype ACT-CL program to effectively target psychological flexibility processes, it does not necessarily challenge the psychological flexibility model (the theoretical model underlying ACT), which assumes that students who improve in processes of change targeted in ACT would subsequently improve on mental health outcomes. This can be tested in a preliminary way by examining whether changes in the measures of psychological flexibility are predictive of changes in outcomes over time, irrespective of treatment condition. Partial correlation analyses were conducted to examine the relationship between changes in psychological flexibility processes and subsequent improvements in outcomes at post and follow up across both conditions combined (see Table 3).

Results indicated that improvements in psychological flexibility on the AFQ from pre to post were related to improvements at post and 1-month follow up on most of the outcome variables. The results were more mixed for the other psychological flexibility processes with processes most consistently relating to depression and stress. There was also a pattern of greater

values success variables being related to greater mental health except anxiety at post, but not follow up. In each case, significant correlations were such that improvements in psychological flexibility processes from pre to post were related to improvements in outcomes at post and 1-month follow up, controlling for baseline scores. Improvements in ACT knowledge were not related to improvements in any outcomes.

Analyses also examined pre to post improvements in psychological flexibility in relation to improvements at 3-month follow up on outcome variables. However, these correlations were non-significant in all but one case ($p > .05$). There was one counterintuitive finding in which pre to post improvements in FFMQ nonreactivity were actually related to worse anxiety at 3-month follow up, $r(138) = .19, p = .026$.

Examining Relations between Program Engagement and Changes in Process Measures

Given the low program engagement with ACT-CL, it is unclear if results are due to a lack of user engagement and, if students had been more engaged, whether there would have been a greater impact on psychological flexibility processes. Conversely, it may be that the program content itself simply fails to impact psychological flexibility, even if students were highly engaged. To further explore this issue, a series of analyses examined the relationship of program usage to changes in process measures at post. A similar, but more limited set of analyses were also conducted with the MHE condition, which focused on time in the program (other metrics of program engagement were not available due to the simpler program design with this website).

Word Count and Time on Session. Partial correlations examined the relationship of time on each program session and word count in key exercises to process measures at post, controlling for respective baseline scores (see Table 4). Greater engagement on each variable, except time on session 2, was found to relate to improvements on one or more process measures at post,

although the pattern of relationships was not consistent across process measures. Of note, greater time spent on the *MHE website* was only related to worsening education values success and improvements in ACT knowledge. These results suggest that the more participants engaged in the ACT-CL program including spending more time on the first ACT-CL session and writing more in key exercises, the more they improved on at least some aspects of psychological flexibility at post.

Receiving Text Messages. ANCOVAs were conducted to compare participants who did and did not receive text messages from the ACT-CL program on process measures at post, controlling for baseline scores. There were significant between group effects on psychological flexibility, $F(1, 76) = 5.19, p = .03$, partial $\eta^2 = .07$, Acting with Awareness, $F(1, 72) = 4.43, p = .04$, partial $\eta^2 = .06$, relationship values reasons, $F(1, 73) = 4.93, p = .03$, partial $\eta^2 = .07$, and ACT knowledge, $F(1, 76) = 4.81, p = .03$, partial $\eta^2 = .06$, as well as a *trend* for relationship values success, $F(1, 75) = 3.64, p = .06$, partial $\eta^2 = .05$. In each case, those who received text messages improved more on post measures relative to those who did not receive texts in the ACT-CL condition. Partial η^2 effect sizes were in the small ($.01 \leq \eta^2 < .06$) to medium range ($.06 \leq \eta^2 < .14$) (Cohen, 1988). There was no significant difference on Nonreactivity, education values reasons or education values success ($p > .10$).

Other Usage Variables. There were no significant differences on post process measures between participants who did or did not access the additional mindfulness resources ($p > .10$). There were also no differences on post measures between participants who completed or did not complete the two sessions in the ACT-CL program ($p > .10$).

Outcome Variables. All of the program engagement analyses were also repeated to see if they correlated with mental health outcomes at post, controlling for respective baseline scores.

However, none of these correlations with outcomes in either treatment condition were significantly related to any program engagement variables.

DISCUSSION

Overall, the study found that the brief ACT-CL prototype had largely similar effects to a MHE website in targeting psychological symptoms and improving psychological flexibility. Although these were only statistical trends and only in the ITT analyses, some results suggested that MHE may have outperformed ACT-CL in reducing symptoms among those with severe depression and/or anxiety at baseline and in improving education values success. Program completion rates were significantly lower in ACT-CL relative to the education website as well as in comparison to the first pilot RCT (Levin, Pistorello et al., 2014). A pattern of results suggested that those who engaged more in major interactive exercises within ACT-CL (e.g., values writing exercise, goal setting) had greater improvements in psychological flexibility (although it was not related to improvements in mental health). Results were somewhat supportive of the psychological flexibility model with improvements in psychological flexibility predicting improvements in mental health across conditions, although effects dissipated over time.

From a feasibility perspective, the main findings from this study were that the ACT-CL prototype failed to adequately engage university students or outperform a MHE control website, and in fact a few trends suggested ACT-CL could be less effective in remitting symptoms and improving educational values success. Although these null results raise questions regarding the potential feasibility of a transdiagnostic web-based self-help program, they also highlight a number of methodological questions and lessons learned for future development of web-based self-help prevention programs in university settings.

The MHE website represented an active intervention commonly used on campuses and some past studies have similarly found cognitive behavioral websites to have equivalent effects to psychoeducation (e.g., Christensen et al., 2004). However, ACT-CL would still be expected to outperform MHE at least on the targeted mechanism of change. One explanation for the lack of effects may have been the use of an incomplete prototype, which primarily included two sessions targeting a subset of ACT components and without others critical to the approach (e.g., defusion, self-as-context, mindfulness). Although secondary mindfulness resources were added to this trial to improve coverage of ACT components, they were largely unused by participants.

The initial pilot results suggested even this more limited intervention might have a positive impact on psychological flexibility and mental health alone (Levin, Pistorello et al., 2014). Such a brief intervention has advantages for broad implementation with university students. In fact even the two session program was rated as too long by about one third of the current sample in the ACT condition (dropouts and program completers) based on qualitative data collected at post. The promise of a brief ACT approach is also consistent with positive findings from other brief, ACT component intervention studies (e.g., Chase et al., 2014; Levin et al., 2012) and other transdiagnostic prevention programs for students (e.g., a 40-minute anxiety sensitivity program, Schmidt et al., 2007). A failure of an incomplete ACT-CL prototype relative to an active education website does not suggest the proof-of-concept failed, but it does highlight areas needing revision. These findings highlight the challenges in balancing intervention brevity with adequate dosage when implementing web-based prevention with university students..

Results were still somewhat supportive of the theoretical application of ACT broadly to university students, with changes in psychological flexibility predicting changes in mental health at post and 1-month follow up. These relationships largely disappeared, and in one case

surprisingly switched (nonreactivity predicting worsening anxiety) at 3-month follow up. This might be interpreted as a waning impact of psychological flexibility on mental health outcomes over time, which if true, would raise concerns about whether targeting this therapeutic process of change would lead to long term prevention effects. However, survey research on psychological flexibility more broadly appears to demonstrate long term impact on mental health outcomes up to 4 years later (e.g., Spinhoven et al., 2014). In either case, it is clear that ACT-CL needs to be revised in order to effectively target psychological flexibility.

The main area for revision is likely improving participant engagement. Those who engaged more in ACT-CL (i.e., receiving text messages, more time in session 1, writing more in key exercises) appeared to improve more on relevant processes of change (although not on outcome measures). Furthermore, the few statistical trends supporting MHE over ACT-CL were no longer present when only focusing on program completers. It was clear based on program completion rates and usability scores that ACT-CL was less successful in this second pilot trial in which the program was implemented with a broader range of university students (instead of just first-year students), with less incentives for participating (\$10 versus \$60), and with less interactions with the researchers (passive enrollment through online subject pool vs. in-person consenting/orientation with researcher). However, many of these features are likely to remain if such a program was implemented at a large scale on campuses. Alternative strategies for providing incentives and social support in using the program are needed such as by integrating the program within face-to-face orientation or first year experience courses or alternatively developing peer mentoring/support systems. Such strategies could be implemented from a supportive accountability approach in which a professional/paraprofessional provides ongoing guidance and support in using the program, which is an effective and standard way intervention

developers have typically improved program engagement/adherence (Mohr, Cuijpers & Lehman, 2011). Consistent with this, initial research suggests ACT-CL could be effective, at least for more acute treatment, in an adjunctive guided self-help format with counselors providing guidance (Levin et al., 2015). Thus, ACT-CL might be improved in part by adjusting how the program is implemented, including more supportive accountability to users. This is likely to also apply to other web-based self-help programs seeking to engage students in prevention efforts.

Besides implementation issues, qualitative data from participants highlighted key usability concerns for ACT-CL that can be revised to improve engagement (and may be relevant to other program development efforts). Identified issues included a highly restrictive navigation system based on a tunneled design, animations giving the impression that the program is targeted to a younger audience, and a preference for text rather than audio delivery of content. Thus, engagement in ACT-CL might also be improved by providing greater user flexibility in how the program is completed, using a more text-driven approach, and revising animations to better fit this population. These factors should also be considered for others seeking to implement web-based self-help with university students.

It is important to note that this is one of the first web-based ACT studies examining the relation of specific program usage variables to changes in psychological processes. A key methodological advantage of web/mobile intervention research is that it provides detailed usage data, which can be included in tests of program acceptability but also processes of change. Demonstrating how engagement in specific program components relates to improvements in targeted processes can provide a highly detailed level of understanding for how ACT impacts outcomes. Such an understanding can also guide important program revisions and innovations. For example, the current study suggests that spending more time in the first session, writing

more in specific exercises, and receiving text messages all improve treatment effects. The next step might be to randomize participants to conditions that manipulate these features to rule out alternative hypotheses (e.g., wanting to please the researcher), but if results are supportive they could then inform a strongly empirically-based revision. Most notably, the findings with text messages suggests the potential utility of integrating mobile technologies which can prompt and support use of ACT skills throughout a user's day. Similarly, other web-based developers might consider integrating even simple prompting features (e.g., text messaging) with students.

As in all pilot trials, there were notable limitations in the methods. The use of a prototype program limited the ability to determine the degree to which a lack of differential efficacy was due to an incomplete ACT intervention versus issues with the overall web-based ACT approach to prevention with university students. Thus, although the feasibility trial did identify areas for revision, it was not clear the degree to which a full ACT prevention website could improve effect sizes relative to existing education programs. The lack of a no treatment control condition adds to this issue as it is not clear whether ACT-CL performed equivalently well in improving mental health outcomes and mechanisms of change or if both programs were inert or even iatrogenic.

The MHE condition was also limited in not controlling for treatment dosage. Participants completed both MHE sessions much more quickly and did not receive additional emails, text messages, or secondary resources as they did in ACT-CL. This could mean that MHE would have been more effective with a comparable dosage of materials, although it might be argued too that MHE had positive responses *because* it was shorter and easier to complete (leading to higher program engagement/completion rates). It was also unclear whether the MHE condition might have unintentionally impacted psychological flexibility processes, despite efforts to leave out any explicit material targeting acceptance, mindfulness or values. For example, one of the results

found that more time spent in MHE session 2 was related to greater scores on the ACT quiz. In addition, coping strategies were taught in MHE that, although designed to be very brief and relatively inert, might have impacted psychological flexibility.

Of note, many of the DASS-21 items focus more on internal psychological symptoms of depression and anxiety, rather than behavioral functioning items. In contrast, ACT seeks to improve behavioral functioning while accepting the difficult thoughts and feelings that might arise, rather than reducing these internal “symptoms” per se. This leads to another alternative explanation for the trends found with MHE on symptom remission. These findings might simply reflect the different messages and approaches taken with ACT and MHE. This is made less plausible by past research showing the DASS to be sensitive to the effects of ACT with students (e.g., Levin et al., 2014). In either case, it highlights a measurement limitation given the lack of items focusing specifically on behavioral functioning, which is more directly targeted by ACT.

A final major issue was that although this study included a much larger sample of over 200 participants, this still provided low power for detecting preventative effects with a universal sample, which requires notably large samples (Munoz et al., 2010). Furthermore, a large number of analyses were conducted in order to explore the null results and feasibility questions, which might have further raised concerns for Type I error, and further highlighting the need to interpret reported statistical trends with noted caution.

Overall, the study found that an initial ACT-CL prototype for preventing mental health problems in university students did not outperform typical MHE content that is provided online. The results of this study have implications not just for how ACT-CL might be revised, but broader challenges and “lessons learned” for developing and implementing web-based prevention programs in university settings. At a methodological level, this study highlights the

importance of including an active comparison condition relatively early in development given the ease with which results may seem promising with a waitlist condition (e.g., Levin et al, 2014). Conversely, there are challenges in developing adequate control conditions, which in the case of this study might have inadvertently helped highlight major limitations in the program design (e.g., a simpler and shorter program actually seems to do better than an expensive, in-depth program that limits user flexibility). This study highlights additional analyses that can help elucidate study findings and guide revisions; most notably examining how program usage and engagement in specific exercises relates to improvements in putative processes of change (for another example see Heffner et al., 2015). Such an approach is best served by keeping a focus on putative processes of change such as psychological flexibility. This allows researchers to efficiently test whether the intervention impacts what it is designed to impact (e.g., psychological flexibility) and if that target is actually relevant to the problem(s) of interest.

This study highlights the challenge and importance of actively engaging university students in web-based prevention efforts. Although a stand-alone self-help approach may have appeal due to efficiency and cost effectiveness, it is important to note that such an approach may not lead to adequate engagement. Innovative implementation models that can scale up guided self-help might be more effective, such as having peer support models or classes that provide supportive accountability for program completion. Another lesson learned is that while high quality multimedia elements may seem intrinsically better for web-based self-help, these features may actually reduce engagement for users who prefer greater flexibility and ease of completion.

There is a clear need for innovative, cost effective solutions to the mental health challenges faced by universities. This study helps highlight one promising area for further work, developing web-based self-help programs that can prevent a range of psychological problems

and can be efficiently disseminated across a campus. At the same time, this study, also highlights the significant challenges to implementing such programs in an engaging way with university students. Further work is needed in developing web-based prevention programs for university students that are engaging and target a broad set of disorders by focusing on core pathological processes such as psychological inflexibility.

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Table 1. *ACT-CL Content and Features Outline*

| Program Component | Content |
|---|--|
| Session 1: Exploring your values | Defining values (e.g., values as a direction animation), clarifying personal values (e.g., card sort), reflecting on values (e.g., journaling), defining SMART and values-based goals, setting a values-based goal for the week, summary of session |
| <i>Post session 1 texts</i> | Reflect on actions consistent with values (day 3 text); Reflect on important value and a goal for the day (day 6 text) |
| <i>Post session 1 emails</i> | Reminders to work on session 1 goal and to practice reflecting on values you admire in others (day 2 email) or on values engaged in that day (day 4 email) |
| <i>Post session 1 mindfulness resources</i> | Intro and definition of mindfulness, mindful breathing exercise, instructions to practice mindful breathing |
| Session 2: Dealing with barriers | Review of session 1, identifying internal barriers, problems with control strategies (e.g., passengers on the bus animation), defining willingness (e.g., and vs. but exercise), practicing willingness (e.g., breath holding exercise), setting a willingness goal for the week, summary of session |
| <i>Post session 2 texts</i> | Prompts to practice willingness (day 3 and day 6 texts) |
| <i>Post session 2 emails</i> | Reminders to work on session 2 goal and to practice the NAME acceptance technique (day 2 email) or future ways to practice ACT skills (day 4 email) |
| <i>Post session 2 mindfulness resources</i> | Mindfulness of internal experiences, labeling mindfulness exercise, resources for practicing other exercises (leaves on a stream, tin can monster). |

Table 2. *Descriptive statistics of raw means with available data for measures by condition and time point in the ITT sample.*

| <i>Outcomes</i> | <u>ACT-CL</u> | | | | <u>MHE</u> | | | |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Pre | Post | 1-Month | 3-Month | Pre | Post | 1-Month | 3-Month |
| Depression | 8.38 (9.69) | 8.79 (11.59) | 7.91 (9.34) | 7.67 (9.90) | 7.31 (8.60) | 7.31 (9.60) | 7.65 (9.54) | 5.83 (7.56) |
| Anxiety | 7.27 (9.00) | 7.05 (9.34) | 7.74 (9.42) | 5.40 (7.39) | 7.07 (7.39) | 6.94 (8.68) | 6.42 (8.25) | 4.82 (7.09) |
| Stress | 12.84 (10.16) | 12.69 (10.61) | 12.46 (10.62) | 9.88 (9.61) | 11.78 (9.28) | 10.69 (9.26) | 11.54 (8.79) | 9.02 (8.35) |
| MHC | 62.32 (13.26) | 64.81 (12.93) | 65.06 (12.99) | 61.38 (15.96) | 62.67 (12.34) | 65.80 (11.90) | 66.17 (12.26) | 64.06 (13.62) |
| <i>Processes of change</i> | | | | | | | | |
| AFQ | 37.60 (12.36) | 35.37 (12.27) | 37.39 (14.51) | 33.18 (12.62) | 36.58 (11.85) | 36.11 (13.51) | 35.11 (12.91) | 32.18 (11.79) |
| FFMQ-NR | 21.67 (5.72) | 23.13 (5.53) | 22.66 (6.89) | 23.21 (6.74) | 21.45 (5.30) | 22.57 (5.88) | 22.96 (6.16) | 22.97 (6.02) |
| FFMQ –Aw | 25.58 (6.80) | 25.96 (7.14) | 26.03 (7.42) | 25.74 (7.56) | 24.90 (6.59) | 25.36 (7.35) | 25.77 (7.13) | 25.68 (7.12) |
| PVQ-Rel. Ratio | .46 (.31) | .37 (.24) | .44 (.31) | .41 (.29) | .43 (.27) | .41 (.28) | .45 (.27) | .43 (.26) |
| PVQ-Ed. Ratio | .45 (.28) | .43 (.39) | .52 (.33) | .47 (.64) | .53 (.48) | .52 (.35) | .50 (.29) | .49 (.31) |
| PVQ-Rel. Success | 3.96 (1.11) | 4.22 (.93) | 4.15 (1.01) | 4.11 (.99) | 4.16 (.95) | 4.28 (.83) | 4.36 (.87) | 4.23 (.95) |
| PVQ-Ed. Success | 3.83 (.99) | 3.86 (1.00) | 4.00 (.90) | 3.59 (1.15) | 3.73 (.97) | 3.91 (.95) | 3.99 (1.04) | 3.94 (1.07) |
| ACT Quiz | 6.28 (3.11) | 9.79 (3.37) | - | - | 6.91 (2.80) | 7.11 (3.24) | - | - |

MHC = Mental Health Continuum; AFQ = Avoidance and Fusion Questionnaire; FFMQ=NR = Five Facet Mindfulness Questionnaire – Nonreactivity; FFMQ-Aw = FFMQ Acting with Awareness; PVQ-R = Personal Values Questionnaire – Relationship subscale; PVQ-Ed. = PVQ – Education subscale

Table 3. *Partial correlation with the full sample between pre to post changes in process measures and outcomes at post/1-month follow up controlling for baseline scores.*

| | Depression | | Anxiety | | Stress | | MHC | |
|----------|------------|---------|---------|---------|--------|---------|-------|---------|
| | Post | 1-month | Post | 1-month | Post | 1-month | Post | 1-month |
| AFQ | .49*** | .26** | .38*** | .18* | .56*** | .25** | -.13† | -.15† |
| FFMQ-NR | -.12 | -.17* | .09 | -.00 | -.15† | -.08 | .17* | .20* |
| FFMQ-Aw | -.25** | -.22** | -.13† | -.09 | -.20** | -.20* | -.02 | .01 |
| PVQ-Rel. | .14† | .18* | .15* | .08 | .20* | .18* | .02 | -.09 |
| Ratio | | | | | | | | |
| PVQ-Ed. | .08 | .21* | -.15† | .18* | .03 | .22** | .00 | -.09 |
| Ratio | | | | | | | | |
| PVQ-Rel. | -.28*** | -.02 | -.04 | .12 | -.19* | .10 | .17* | .22** |
| Success | | | | | | | | |
| PVQ-Ed. | -.22** | -.09 | .02 | -.06 | -.16* | -.13 | .19* | .27** |
| Success | | | | | | | | |
| ACT Quiz | .11 | -.05 | .10 | .03 | .00 | -.04 | .00 | .03 |

† $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$. Note: Analyses combined participants in ACT-CL and MHE conditions. Partial correlations with 3-month follow up outcomes were non-significant ($p > .05$) except for one relationship (see primary text).

Table 4. *Partial correlations between ACT-CL/MHE program engagement and post process measures controlling for baseline scores.*

| | ACT-CL Values writing word count | ACT-CL Lesson 1 goal setting word count | ACT-CL Lesson 2 goal word count | ACT L1 Time | ACT L2 Time | MHE L1 Time | MHE L2 Time |
|------------------|--|---|---------------------------------------|-------------|-------------|-------------|-------------|
| AFQ | -.13 | -.15 | -.30* | -.22† | -.07 | -.04 | -.06 |
| FFMQ-NR | .13 | -.04 | .02 | .25* | .18 | .10 | .10 |
| FFMQ –Aw | .31** | .10 | .41** | .22† | .00 | -.03 | .07 |
| PVQ-Rel. Ratio | -.36** | -.20† | -.24† | -.08 | .18 | -.07 | -.10 |
| PVQ-Ed. Ratio | -.17 | -.09 | -.26† | -.12 | .17 | -.04 | .06 |
| PVQ-Rel. Success | -.05 | .05 | .12 | .21† | -.05 | -.01 | -.07 |
| PVQ-Ed. Success | -.17 | -.02 | .24† | .26* | .02 | -.19† | -.21* |
| ACT Quiz | .22† | .20† | .31* | .08 | -.17 | .18† | .22* |

† $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$. ACT L1 Time = Total Time on ACT-CL Lesson 1; ACT L2 Time = Total Time on ACT-CL Lesson 2; MHE L1

Time = Total time on mental health education website lesson 1; MHE L2 Time = Total time on mental health education website lesson 2. Note there were no significant correlations ($p < .05$) with outcome measures (depression, anxiety, stress or positive mental health).

Figure caption

Figure 1. Participant flow diagram

ACT FOR COLLEGE STUDENTS

