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Web-Based Acceptance and Commitment Therapy for Mental Health Problems in College Students: A Randomized Controlled Trial

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Abstract

There are significant challenges in addressing the mental health needs of college students. The current study tested an acceptance and commitment therapy (ACT) web-based self-help program to treat a broad range of psychological problems students struggle with. A sample of 79 college students were randomized to web-based ACT or a waitlist condition, with assessments at baseline and posttreatment. Results indicated adequate acceptability and program engagement for the ACT website. Relative to waitlist, participants receiving ACT improved on overall distress, general anxiety, social anxiety, depression, academic concerns, and positive mental health. There were no between group effects on eating concerns, alcohol use, or hostility or on some key ACT process of change measures. ACT participants improved more on mindful acceptance and obstruction to valued living, both of which mediated treatment outcomes. Results are discussed in the context of lessons learned with the website prototype, and areas for further research are presented.

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

Web-based acceptance and commitment therapy for mental health problems in college students: A

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Mental health problems are a significant issue among students at universities.

Epidemiological studies indicate up to almost 50% of students have a diagnosable psychological

disorder each year (Blanco et al., 2008). Possibly as a result of this prevalence, there are

challenges with mental health service delivery in universities. Surveys of counseling center

directors indicate that demands for services continue to increase along with growing

severity/complexity of cases seen (Gallagher, 2014). Yet, counseling center resources have not

increased to match these demands, with an approximate average of one counselor position per

1,459 students on campus (AUCCD, 2014). Further complicating matters, many students who

would benefit from treatment choose not to seek it, due to factors such as lack of time and stigma

(Blanco et al., 2008; Hunt & Eisenberg, 2010).

Web-based self-help interventions have the potential to improve mental health service

delivery in universities. Such interventions can be easily disseminated to an entire student body,

providing a practical and cost effective means to scale up services to help match the rates of

problems seen. Providing this additional treatment option may serve to reduce the high service

demands placed on counseling centers, while also increasing the overall numbers receiving

treatment. For example, students who are not willing to seek face-to-face counseling due to

issues such as lack of time, inconvenience, or perceived stigma, may be willing to use a self-help

program that can be accessed privately at a time that is convenient. Web-based self-help may

also increase access to students in rural settings where services are more limited (e.g., distance

education), students on the waitlist to receive counseling, and students who have completed

counseling but want additional support.

One particularly promising approach for providing web-based self-help to college students is acceptance and commitment therapy (ACT; Hayes, Strosahl & Wilson, 2011). ACT is a contextual cognitive behavioral therapy that focuses on a combination of acceptance, mindfulness, values, and traditional behavior change methods. These treatment methods are used in ACT to reduce a core pathological process called psychological inflexibility, in which behaviors are rigidly guided by thoughts, feelings and other psychological experiences, rather than one's values (what would be meaningful) or direct contingencies (what would be effective). By reducing psychological inflexibility, ACT seeks to treat a very broad range of psychological problems. Consistent with this, ACT has been found in over 100 randomized controlled trials (RCTs; Hooper & Larsson, 2015) to effectively treat problems relevant to college students including depression, anxiety, stress, substance abuse, eating disorders, test and public speaking anxiety, obsessive compulsive disorder, and coping with health-related problems, among many other areas (A-Tjak et al., 2015; Bluett et al., 2014; Lee et al., in press).

The transdiagnostic focus of ACT fits particularly well for the college setting (Hayes, Pistorello & Levin, 2012). Although students are likely to experience specific psychological disorders, counseling centers typically treat a broader range of problems and do not necessarily focus on treating specific diagnoses (AUCCD, 2014; Gallagher, 2014). This is due to the breadth of problems typically seen in the college setting, including academic challenges, relationship problems, family of origin concerns, subthreshold disorders, general stress, coping with discrimination and diversity concerns, and so on. A transdiagnostic approach such as ACT can help ensure broad coverage of psychological problems typically seen. This has the added benefit for implementation by providing "one stop shopping" for referring and accessing mental health services – rather than navigating a suite of programs based on one's specific presenting problem.

A series of recent studies have begun to evaluate the efficacy of ACT in web-based self-help formats. For example, RCTs have found ACT to be effective in a web-based self-help format for depression (e.g., Lappalainen et al., 2014), smoking (e.g., Bricker et al., 2013) and chronic pain (e.g., Trompetter et al., 2015). However, these studies have focused on testing ACT for more specific problem areas, rather than evaluating its transdiagnostic impact.

Three published studies have been conducted on web-based ACT for college students specifically (Chase et al., 2013; Levin et al., 2014; 2015). These studies found promising results suggesting web-based ACT may be acceptable and helpful to students for improving academic success (Chase et al., 2013), preventing mental health problems (Levin et al., 2014) and as an adjunctive treatment along with counseling (Levin et al., 2015). The two studies testing ACT as a transdiagnostic treatment found positive effects on depression and anxiety, but did not assess a broader range of problems (Levin et al., 2014; 2015). Furthermore, all of these studies tested more limited ACT programs that were brief (1-3 sessions) and did not target all of the key components of ACT (particularly leaving out some of the mindfulness-focused components such as cognitive defusion and present moment awareness). No studies to date have specifically evaluated a complete ACT web-based self-help program for treating the range of problems students might struggle with.

The current study, thus, sought to evaluate a transdiagnostic web-based self-help program that includes all of the components of ACT and is designed to treat a wide range of problems among college students. The program was evaluated in a pilot randomized trial relative to a waitlist condition. Predictions included that the ACT website would be acceptable to college students, would improve a wide range of outcomes and processes of change relative to waitlist, and that changes in ACT processes would mediate treatment outcomes.

Methods

Participants

The sample consisted of 79 college students who were 18 years of age or older and currently enrolled at a mid-size university in the Mountain West region of the US. The sample was 66% female with a mean age of 20.51 ($SD =2.73$, Mode = 18). The sample was predominantly White (88%) with 3% reporting being Asian, 3% Hispanic, 3% multiracial, 1% African American, and 1% Native Hawaiian or other Pacific Islander; 14% of the sample described themselves as Hispanic/Latino ethnicity. The majority of participants were in their first year of college (47%), with 20% in their second year, 15% in their third year, 17% in their fourth or fifth year, and 1% in graduate school. Participants were not excluded for being in other concurrent treatment, with 13% reporting seeing a therapist and 19% being on a psychological medication in the past 6 weeks (24% were receiving at least one of these treatments).

The study specifically sought to recruit those who self-identified as being in distress and interested in receiving web-based self-help, as emphasized in recruitment materials. However, no formal screening was provided on these variables. This was done to maximize the breadth of participants included in the study that might benefit from web-based self-help and those who would potentially be offered such services (i.e., anyone interested in going to such a website and using it). The Counseling Center Assessment of Psychological Symptoms (CCAPS-34; CCMH, 2012) provides validated cutoff scores for mildly severe and clinically significant problems across a range of areas students might struggle with. Based on this information at baseline, 87% of participants had at least mildly severe scores on at least one CCAPS subscale and 68% had scores in the range indicating a clinically significant problem on at least one subscale. The sample varied in terms of types of clinically significant problems: 45% were in the clinical range

for depression, 40% social anxiety, 30% general anxiety, 30% eating problems, 24% academic

concerns, 22% hostility, and 14% alcohol problems.

The study was run in two cohorts across the fall 2014 ($n = 30$) and spring 2015 semesters

($n = 49$). Measures were added in the spring cohort to further examine level of interest in web-

based self-help and reasons for participating (86% reported participating for extra credit, with

only 6% participating for help with a psychological problem/personal distress, and 8% for both

extra credit and help with distress). Consistent with this, 86% reported learning of the study

through the web-based research participant management platform, SONA Systems (for extra

credit assignments), and only one participant learned of the study from the counseling or student

health center (despite active attempts to recruit in these settings). Finally, the majority of

participants agreed with the statement "I am interested in using the self-help website being tested

in this study" (67% reported a 5 "slightly agree" or higher on a 7-point scale, $M = 5.13$, $SD =$

1.25), but 29% gave a neutral "neither agree nor disagree" response. Thus, the study appeared

generally successful with regards to recruiting at least a minimally distressed sample of students.

However, the participants primarily were recruited through the SONA research platform and

participated for extra credit rather than specifically for help with a psychological problem.

Procedures

Participants were recruited through an online research posting on the SONA research

platform, brief in-class presentations, and flyers posted throughout campus. Relevant student

service departments/offices (i.e., the health center and counseling center) were also informed of

the study and provided with recruitment materials.

All participation was completed remotely online through email and Qualtrics (a web-

based survey platform) in order to enhance external validity in testing a self-help website and to

increase feasibility for students to participate in rural settings. Interested students were provided with a link to the brief online screening, which asked if the individual was 18 years or older. Those who were over the age of 18 continued to an online consent form and baseline survey that included assessments of demographics, psychological symptoms, and ACT-related therapeutic processes of change.

After completing the baseline survey, participants were automatically randomized (in blocks of 10) through Qualtrics to either the waitlist or ACT condition. Participants in the ACT condition were directed to complete all 6 self-help sessions over the following 4 weeks, while those in the waitlist condition were asked to wait 4 weeks before completing the posttreatment assessment, after which they received unrestricted access to the ACT website. Program usage for participants in the ACT condition was regularly monitored by research assistants through the Qualtrics system to track progress in completing the self-help sessions. Research assistants gave reminder prompts via email and phone to those who were falling behind on completing a session every 4 days (i.e., 2 days late email, 4 days late phone call, 7 days late email, 10 days late phone call, 14 days late final email).

All participants completed an online posttreatment assessment 4 weeks after baseline, which included the same measures as baseline. Those in the ACT condition were also asked to complete measures of program usability and satisfaction. All participants enrolled in courses offering extra credit received 2 research credits as compensation for their time.

The participant flow diagram outlines the number of participants completing each of these study steps (see Figure 1). Note that one participant was removed after completing baseline several times and being assigned to both conditions (due to repeated random assignments), which reduced the sample size from 80 to the reported 79 participants.

ACT Self-Help Website

The web-based ACT program was developed and hosted on Qualtrics, a flexible and secure web-based survey development program. The program content was adapted from empirically validated ACT and self-help protocols, which provide a host of therapeutic exercises, metaphors, and techniques that translate well into a web-based format. The website format and content was refined based on initial usability testing and think aloud feedback collected from college students viewing earlier iterations of the program.

Participants completed a series of six web-based sessions in a tunneled sequence (i.e., sessions had to be completed in a particular order). Each session focused on a specific ACT component: session 1 (costs of experiential avoidance), session 2 (defusion), session 3 (mindfulness), session 4 (acceptance of difficult emotions), session 5 (clarifying personal values), and session 6 (committed action and goal setting). A transdiagnostic approach was taken in which sessions taught core ACT skills found to be helpful for a range of disorders rather than focusing on more disorder-specific issues and applications. A range of examples were provided in each session to help clarify how these skills might apply to specific problems students encounter. The program also heavily emphasized reflecting on personal experiences and applying skills in one's life to support generalization of these transdiagnostic ACT skills.

After completing each session, participants were provided a brief therapeutic homework assignment (e.g., practicing a breathing mindfulness exercise) and were directed to wait 4 days before moving on to the next session. Follow up emails were sent with the link for the next session along with the download links for any multimedia or worksheets provided within the previous session.

The program sessions were primarily text-based, but also made heavy use of multimedia (e.g., images, audio recordings, and videos for experiential exercises) and interactive features (e.g., worksheets, assessments with tailored feedback, expandable text/popup features). These multimedia and interactive features were implemented throughout each session, in an aim to maintain engagement levels and provide experiential training in ACT skills.

Of note, this study used Qualtrics, an existing web-based platform, for developing the intervention. This provides a highly cost effective and efficient method for prototyping web-based self-help interventions, while minimizing the notable technical expertise, development costs, and time typically taken to create even relatively short web-based interventions. Although Qualtrics is designed for survey administration, it provides a host of key features and tools that are often costly to implement in a secure and stable website (e.g., a range of interactive questions/tools, database integration for tracking user behavior, ability to tailor information and carry data forward in a session, stable and consistent performance across browsers and devices including mobile phones). If such an approach is acceptable to participants, it could highlight a very feasible method for behavioral scientists to test prototype web-based interventions relatively quickly and at little to no cost.

Measures

Counseling Center Assessment of Psychological Symptoms (CCAPS-34; CCMH, 2012). The 34-item version of the CCAPS served as the primary outcome for this study. The CCAPS was developed specifically to assess a broad range of mental health problems among college students with subscales for depression, general anxiety, social anxiety, academic concern, eating concerns, hostility, alcohol use, and an overall total score of distress. Items are rated on a 5-point scale ranging from 0 "not at all like me" to 4 "Extremely like me." The CCAPS has been found

to have good reliability and validity in past studies with distressed college students (CCMH, 2012). The CCAPS had adequate internal consistency in the current study: distress total score α = .92, depression α = .91, eating concerns α = .91, alcohol α =.88, social anxiety α = .83, general anxiety α = .79, hostility α = .79, and academic concern, α = .73.

Mental Health Continuum – Short Form (MHC-SF; Keyes, 2005). The MHC-SF is a 14-item measure of positive mental health, composed of three subscales assessing emotional, psychological, and social wellbeing. Items assess dimensions of wellbeing including positive affect, satisfaction with life, social integration, social contribution, autonomy, personal growth, purpose in life, and self-acceptance. This was a key secondary measure given the focus in ACT on positive functioning outcomes. Items are rated on a 6-point scale ranging from "never" to "every day." The MHC-SF has been found to have adequate reliability and validity in past research (Keyes, 2005) and to be sensitive to detecting the effects of ACT (Bohlmeijer, Lamers & Fledderus, 2015). The internal consistency of the MHC was adequate in the current study: MCH total score α = .93, MHC Emotional Wellbeing α = .89, MHC Social Wellbeing α = .84, MHC Psychological Wellbeing α = .85.

Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011). The 7-item AAQ-II served as the primary process measure. This is the most frequently used measure of psychological inflexibility, the key process targeted in ACT. Items are rated on a 7-point scale ranging from 1 "never true" to 7 "always true." The AAQ-II has been found to have adequate reliability and validity in past studies with college students (Bond et al., 2011). The internal consistency of the AAQ-II in the current study was α = .93.

Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The CFQ is a 7-item measure of cognitive fusion, an important sub-process that contributes to psychological

inflexibility. Items are rated on a 7-point scale ranging from 1 "never true" to 7 "always true." The CFQ is a new measure, but the initial validation study found adequate reliability and validity with populations including college students (Gillanders et al., 2014). The internal consistency of the CFQ in the current study was $\alpha = .95$.

Valuing Questionnaire (VQ; Smout et al., 2014). The VQ, is a 10-item measure of values, another key sub-process related to psychological inflexibility. The VQ includes two subscales assessing progress in valued living and obstruction to valued living. Each item is rated on a 7-point scale ranging from 0 "not at all true" to 6 "completely true." The VQ is also a relatively new measure, but initial validation results indicate adequate reliability and validity (Smout et al., 2014). The internal consistency for the VQ was adequate in the current study: VQ Progress $\alpha = .89$ and VQ Obstruction $\alpha = .84$.

Philadelphia Mindfulness Scale (PHLMS; Cardaciotto et al., 2008). The PHLMS is a 20-item measure of mindfulness with two subscales assessing present moment awareness and acceptance. Deficits in awareness and acceptance are key sub processes that contribute to psychological inflexibility. Items are rated on a 5-point scale ranging from 1 "never" to 5 "very often." The PHLMS has been found to have adequate reliability and validity in past studies (Cardaciotto et al., 2008). The internal consistency for the PHLMS was adequate in the current study: PHLMS Acceptance $\alpha = .87$, PHLMS Awareness $\alpha = .84$.

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 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). Additional program satisfaction items were used to assess features such as whether participants liked the program, found it helpful and would recommend it to others as well as how to further improve the program, based on items used in previous studies (Levin et al., 2014). The internal consistency of the SUS in the current study was $\alpha = .84$.

Program Usage. Qualtrics automatically collected data on participants' use of the ACT website intervention including time spent on pages, overall time spent within a session, and number of pages viewed. These data were utilized to examine program engagement and usage across all 6 sessions.

Analysis plan

A total of 62 participants completed the posttreatment survey (78%), with 32 (80%) completing posttreatment in the ACT condition and 30 (77%) completing posttreatment in the waitlist condition. There was no difference in completion rates between conditions, chi square = .111, $p = .74$. An intent to treat approach was taken in which all participants were included in analyses. Missing data was modeled using mixed model repeated measures analyses (MMRM; for between group effects) and maximum likelihood estimation (ML; for mediational analyses).

MMRM analyses were conducted using unstructured covariance matrices to examine time by condition effects on outcome and process measures. This method models missing data such that the full intent to treat sample is included, irrespective of missing data for some participants and time points. MMRM analyses involve a specific form of maximum likelihood estimation that accounts for correlations among repeated measurements within-subjects. ML relies on the multivariate distribution of observed variables to arrive at a hypothetical covariance structure for the full dataset. ML is preferred over traditional imputation techniques for missing

data, such as last observation carried forward or multiple imputation under normal assumptions (Black, Harel, & McCoach, 2010; Enders, 2012).

The cross product of coefficient test with bootstrapping was used to test mediators of treatment effects. Analyses were conducted separately for each process measure that significantly improved in the ACT condition relative to waitlist. These analyses were conducted with each outcome measure in which there was a between group effect. Mediation analyses used posttreatment outcome and posttreatment mediator scores controlling for both baseline outcome and baseline mediator as covariates. For mediational analyses, the ML algorithm in MPlus (Version 7.0; Muthén & Muthén, 2012) was used to estimate the covariance structure in the context of missing data.

Results

Preliminary analyses

Independent sample *t*-tests compared baseline scores on all outcome and process of change measures between conditions (total scores and subscales for the CCAPS, MHQ, AAQ-II, CFQ, PHLMS, VQ). Of 18 comparisons a statistically significant difference was found on one measure, CCAPS academic concern subscale, $t(76) = 2.21$, $p = .03$, such that those in the ACT condition had higher academic concerns at baseline (ACT $M = 2.01$, ACT $SD = 1.00$, Waitlist $M = 1.57$, Waitlist $SD = .72$). The baseline academic concern measure was included as a covariate for MMRM analyses to control for this baseline difference between conditions (of note, results are very similar with or without the inclusion of this covariate). There were no other significant differences between conditions on subscale or total scores.

Each outcome and process of change measure was examined for assumptions of normality through skewness and kurtosis statistics. Only the CCAPS alcohol subscale had a

notable nonnormal distribution (baseline skewness = 2.34, kurtosis = 5.26; posttreatment

skewness = 2.02, kurtosis = 2.86), which was addressed using an exponential transformation.

ACT program usage and satisfaction

The majority of participants completed at least one session (83% completed session 1)

and at least half of the ACT program (75% completed session 3). However, only 55% completed

all six self-help sessions. Participants spent on average 73.58 minutes in the ACT program (SD =

83.28). The average time spent in each session that a participant completed was 17.19 minutes

(SD = 16.20), with the longest time spent in session 1 (M = 24.83, SD = 18.63) and the shortest

time spent in session 3 (M = 10.50, SD = 12.10).

System usability ratings were in the adequate range (M = 71.13, SD = 16.78). Individual

satisfaction items indicated adequate satisfaction: "overall I was satisfied with the quality of the

program" (M = 4.52, SD = 1.06, 90% rated 4 or higher), "the program was easy to use" (M =

5.00, SD = 1.00, 90% rated 4 or higher), "the program was helpful to me" (M = 4.26, SD = 1.26,

77% rated 4 or higher), "I felt the program was made for someone like me" (M = 3.94, SD =

1.32, 74% rated 4 or higher), "I would like to use the program again in the future" (M = 3.87, SD

= 1.18, 61% rated 4 or higher), "I think the program would be helpful for distressed college

students" (M = 4.81, SD = 1.22, 87% rated 4 or higher), and "I would recommend the program to

other college students who are distressed and/or struggling" (M = 4.68, SD = 1.14, 90% rated 4

or higher).

Participants in the ACT condition were asked at posttreatment "what did you like least

about the program?" These open responses were reviewed for common themes. The most

frequent negative comment was that the program was too long and/or too repetitive (60%

reported this). Other concerns included that they did not have the time or privacy to use the

program (7%), that there was inadequate coverage for certain, specific mental health problems

(7%) and that they did not like the web-based and self-help format for receiving services (3%).

Mental health outcomes

Does ACT improve mental health outcomes? Descriptive data for each condition and time

point on mental health outcomes are provided in table 1. MMRM analyses examined time by

condition effects when including baseline academic concern as a covariate (to control for

differences between conditions at baseline). Analyses indicated significant time by condition

interactions on outcome measures including CCAPS total distress, $F(1, 60.18) = 6.62$, $p = .013$,

Cohen's $d = .66$, CCAPS social anxiety, $F(1, 59.79) = 9.12$, $p = .004$, Cohen's $d = .78$, CCAPS

academic concern, $F(1, 60.25) = 5.75$, $p = .020$, Cohen's $d = .62$, MHC total score, $F(1, 61.72) =$

5.16, $p = .027$, Cohen's $d = .58$, and MHC social wellbeing, $F(1, 62.27) = 7.36$, $p = .009$,

Cohen's $d = .69$. In addition, there were trends for a time by condition interaction on CCAPS

depression, $F(1, 64.12) = 3.95$, $p = .051$, Cohen's $d = .50$, and CCAPS general anxiety, $F(1,$

$60.81) = 3.38$, $p = .071$, Cohen's $d = .47$.

Post hoc analyses of each time by condition interaction indicated that outcomes only

improved from pre to post treatment in the ACT condition: CCAPS total distress, slope estimate

$= -.28$, $t(60.24) = -2.93$, $p = .005$, Cohen's $d = .52$, CCAPS depression, slope estimate $= -.29$,

$t(64.29) = -2.32$, $p = .024$, Cohen's $d = .40$, CCAPS general anxiety, slope estimate $= -.28$,

$t(60.92) = -2.21$, $p = .031$, Cohen's $d = .39$, CCAPS social anxiety, slope estimate $= -.39$,

$t(59.84) = -3.85$, $p < .001$, Cohen's $d = .69$, CCAPS academic concern, slope estimate $= -.29$,

$t(60.30) = -2.54$, $p = .014$, Cohen's $d = .45$, MHC total score, slope estimate $= 5.90$, $t(61.67) =$

3.45, $p = .001$, Cohen's $d = .60$, and MHC social wellbeing, slope estimate $= 2.97$, $t(62.23) =$

3.66, $p = .001$, Cohen's $d = .64$. There were no significant pre to post improvements on outcome

measures in the waitlist condition ($p > .10$).

There were no significant time by condition interactions for CCAPS eating concerns,

CCAPS hostility, CCAPS alcohol, MHC emotional wellbeing subscale, or MHC psychological

wellbeing ($p > .10$).

Processes of change

Does ACT improve psychological flexibility processes? Another series of MMRM

analyses examined time by condition interactions on ACT process of change measures (Table 1).

Significant time by condition interactions were found for PHLMS acceptance, $F(1, 64.52) =$

4.49, $p = .038$, Cohen's $d = .53$, and VQ obstacles, $F(1, 62.50) = 6.64$, $p = .012$, Cohen's $d = .65$.

In both cases, post hoc analyses indicated that ACT processes only improved from pre to

posttreatment in the ACT condition: PHLMS acceptance, slope estimate $= -3.44$, $t(64.45) = -$

3.56, $p = .001$, Cohen's $d = .62$, and VQ obstacles, slope estimate $= -4.34$, $t(62.45) = -4.68$, $p <$

.001, Cohen's $d = .82$. There were no significant time by condition interactions on the AAQ,

CFQ, PHLMS awareness or VQ progress subscale ($p > .10$).

Are treatment effects mediated by psychological flexibility? Mediation analyses were

conducted using the cross product of coefficients test with each psychological inflexibility

process and mental health outcome that was found to improve with ACT relative to the waitlist

condition (see Table 2). Significant mediation effects were found with both the PHLMS

acceptance and VQ obstacles scales for CCAPS total distress, depression, general anxiety and

social anxiety. VQ obstacles was also a significant mediator of CCAPS academic concern, MHC

total positive mental health and MHC social wellbeing, but PHLMS acceptance did not mediate

these outcomes.

Of note, most of these effects demonstrated full mediation (such that there was no longer a significant relationship of intervention on outcome after including the mediational path). The main exception was for social anxiety for which VQ obstacles and PHLMS acceptance were both only partial mediators. Proportion mediated effect sizes for significant mediation effects ranged between 16.05% and 57.94%.

Discussion

This study sought to evaluate the acceptability and efficacy of a transdiagnostic web-based ACT program for college students. Results indicated that the ACT website was reasonably acceptable to students: most completed at least half of the program and satisfaction ratings were relatively high. The ACT website was found to improve a range of outcomes relative to a waitlist condition, although significant effects were not found on all outcomes (hostility, eating concerns, alcohol problems). Although the ACT website did not lead to improvements on all psychological flexibility measures, those processes that did improve significantly mediated treatment effects.

This study found transdiagnostic effects for the ACT website with improvements relative to waitlist on general distress, social anxiety, academic concerns, positive mental health, depression, and general anxiety. A transdiagnostic web-based approach such as this could provide a central resource for students struggling with a range of problems. This could help simplify triaging and referral to web-based self-help, providing a single website that students can visit and faculty/staff could refer to. Furthermore, such a program could provide greater flexibility in addressing the range of psychological problems, subthreshold disorders, and comorbid issues students might struggle with, all within the same intervention.

However, research on such a broadly transdiagnostic ACT approach is still too preliminary to clearly indicate whether it would actually be helpful for the range of problems

students might seek treatment. For example, the current study did find some limiting areas

where there were no between group differences: eating concerns, hostility, alcohol, and some

aspects of positive mental health. These null findings tended to occur with rarer problems,

suggesting potential floor effects for detecting changes (e.g., eating concerns, alcohol problems

in a predominantly religious culture that prohibits drinking). Alternatively, problem areas such as

eating concerns and alcohol use might represent issues that require a more tailored approach to

treatment and that cannot be effectively treated using a more general transdiagnostic method.

Further research is needed to determine whether a transdiagnostic ACT approach focused on

more general skills training does effectively treat each of a range of problems. For example,

including larger sample sizes with adequate representation of each problem area to conduct

moderation analyses and to test effects with specific subgroups on relevant outcome measures.

The transdiagnostic ACT approach is based on the theory that psychological inflexibility

contributes to a very broad range of problems, and that ACT can reduce psychological

inflexibility to improve these outcomes. Thus, the process of change analyses are key to

determining the potential efficacy of the ACT program. Results for processes of change were

somewhat mixed. The AAQ-II did not significantly change relative to the waitlist. Some

previous web-based ACT research with college students has similarly found a lack of effect with

the AAQ-II suggesting it may be less sensitive to detecting treatment effects in this context

(Levin et al., 2014). Some other process measures also did not improve including mindful

awareness, progress in valued living, and cognitive fusion. In contrast, the obstruction in valued

living and mindful acceptance both improved significantly from ACT. One advantage of using

these more specific measures of psychological inflexibility sub-processes is that they may

highlight areas for revision to the web-based intervention. It may be that the program's content

targeting present moment awareness, cognitive fusion/defusion, and following one's values was relatively weak. However, the fact that acceptance and obstructions in living values both improved and mediated outcomes, suggests the website did have an active impact on at least some aspects of psychological inflexibility which led to improvements on a range of outcomes.

The study also sought to evaluate the acceptability of an ACT web-based self-help program for college students, particularly using the cost effective prototyping strategy with Qualtrics. Although a program completion rate of around 50% is less than ideal for a website, it does fall within the range typically found in non-guided self-help websites (e.g., Calear et al., 2009; Richards & Richardson, 2012). This in part represents a choice in implementation strategy between maximizing program retention/effect size versus maximizing cost effectiveness and scaleability. It is known that research including guided support from a paraprofessional or professional leads to higher engagement rates and treatment effects (Andersson, 2014; Richards & Richardson, 2012). However, this approach also significantly increases the complexity of large scale implementation and the resource cost per end user, which is particularly a concern in universities given limited resources. Although the current program did not effectively engage every student, it does provide a very cost effective alternative service option for those willing to complete it. The fact that over half of the students finished the program suggests this is a treatment option that many (though certainly not all) would be willing to use and complete.

The program engagement rates and satisfaction ratings are also notable given the prototype development approach that was taken. The ACT website was developed through Qualtrics, which allowed for rapid development and refinement of the self-help sessions, without requiring grant funding or significant resources. Content management systems and website survey platforms such as Qualtrics provide a variety of readily available features that a

behavioral scientist can then use to create a session without requiring programming experience.

Some of these features can be quite costly and time consuming if done outside of a pre-built

solution such as database integration, skip and carry forward logic, cross platform compatibility,

database security and hosting, and so on. Although there are advantages to more custom built

websites, they take much more time and resources. These costs become even more significant

when initial research identifies problems and areas requiring revision to the program (which is

likely to occur especially in early development and pilot research). This study demonstrates a

more cost effective and efficient method to start testing and refining web-based self-help

prototypes much more quickly. Such an approach can ultimately inform development of a more

sophisticated, custom website, but avoids the significant delays often encountered when trying to

begin with a more costly and time consuming development process.

Overall, the pattern of findings highlight some potential areas for revisions to the ACT

website. For example, program content related to process of change measures that did not

improve might be revised to see if these changes can lead to stronger effects (i.e., defusion,

mindful awareness, and committed action in valued living). In addition, many participants

requested that the intervention be shorter and less repetitive, which if revised may lead to greater

program retention. These and other revisions can be completed quickly and with minimal

resources when using a prototype approach with an existing web-based platform like Qualtrics.

In contrast, such changes could be prohibitively costly without additional funding when testing a

more sophisticated, custom website solution. Thus, this project highlights the benefits of using

existing development platforms to rapidly create a web-based program, test it, and then revise the

program, all prior to engaging in much more costly and time consuming efforts to create a highly

refined website.

Due to the pilot nature of this study, there were some notable limitations. First, although the sample reported at least some distress, most students reported participating for psychology course credits, rather than seeking psychological help per se. This might have led to lower engagement rates, satisfaction ratings, and outcome/process findings than would be expected in a more direct treatment sample. The limitations with the sample may have also reduced power to detect intervention effects due to more restricted variances in this sample on some of the outcome measures (e.g., alcohol problems).

These characteristics of students who chose to participate raises questions regarding how an ACT self-help website might be best delivered in a college setting and whether web-based self-help will ultimately be successful for improving student services. Arguably, the most likely explanation for recruiting a sample consisting of participants seeking extra credit is the recruitment methods used, which relied heavily on the SONA research platform and class announcements targeting students seeking course credit. This means that the current study has not yet determined whether college students would be willing to participate in a self-help ACT website for purely mental health reasons, without additional incentives. It is unclear how best to motivate and inform students to use web-based self-help. There are many promising directions due to the wealth of access points universities provide including dorms, residential advisers, word of mouth from peers, health services, student service programs and events, instructors, counseling center outreach events, and so on. Future studies should ensure a more "real world" implementation method is used that goes beyond undergraduate research pools in order to test whether such methods are adequate at engaging students and to identify the most effective outreach methods. This is also critical in testing whether findings generalize to students who specifically participate for the purposes of receiving psychological help. There are likely barriers

to seeking self-help that will need to be overcome, but research to-date is limited on what might interfere with students seeking web-based self-help. Preliminary research suggests some barriers may be similar to those we know are present in seeking face-to-face care, such as self-stigma (Lannin et al., in press). Further research is needed that identifies and attempts to overcome barriers to engaging in web-based self-help among college students in need of services. Until such research is conducted, it is reasonable to be cautious with regards to the degree to which students will truly use such self-help resources absent receiving incentives like course credits.

The study was limited with regards to testing the transdiagnostic impact of ACT. This was due in part to a low sample size, which minimized statistical power to study less frequent problems such as eating concerns. Furthermore, although seeing an impact on a range of CCAPS outcomes helps support the transdiagnostic model, it does not specifically test whether the program is helpful across a broad range of clinical populations. Research with larger samples is needed to examine moderation and subgroups to determine if the program is equally helpful for those who struggle with specific problems.

The pilot study was structured to rapidly test the potential efficacy, acceptability and areas for revision in an ACT self-help website. This led to some limitations in evaluating efficacy including the lack of follow up assessments and the use of a waitlist control condition. The use of a waitlist is a relatively low bar for determining efficacy as it does not control for demand characteristics, expectancy, and other effects from accessing any type of materials intended to help students. Web-based research is promising in part because it allows for much more feasible and well controlled RCTs using active comparison conditions. Further research is needed to test the impact of a transdiagnostic ACT self-help website relative to such an active comparison program and on long term outcomes.

In summary, this study found that an ACT self-help website was adequately acceptable to college students and led to improvements in a range of, but not all, outcomes. Furthermore, results were supportive of targeting key ACT processes of change, with improvements in mindful acceptance and obstructions to valued living mediating outcomes. The study also found some areas requiring further revision, which are particularly feasible given the prototyping approach that was taken to develop the website. One particularly key challenge that was identified for future research is how to best motivate and engage students to participate in web-based self-help outside of receiving course extra credit. Overall, transdiagnostic ACT appears to be a promising approach for web-based self-help and providing mental health support to college students.

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Table 1. Means and standard deviations with available data between conditions on process and outcome measures.

	ACT-CL		Waitlist	
	Pre $M(SD)$	Post $M(SD)$	Pre $M(SD)$	Post $M(SD)$
Outcome Measures				
CCAPS-Total	1.68 (.81)	1.52 (.91)	1.50 (.76)	1.60 (.78)
CCAPS-Depression	1.63 (1.13)	1.51 (1.16)	1.51 (1.05)	1.59 (1.00)
CCAPS-Anxiety	1.66 (.88)	1.49 (.91)	1.53 (.91)	1.63 (.97)
CCAPS-Social Anxiety	2.20 (.94)	1.88 (1.13)	2.15 (1.04)	2.23 (.91)
CCAPS-Academic	2.01 (1.00)	1.80 (.97)	1.57 (.73)	1.69 (.82)
CCAPS-Eating	1.09 (1.26)	.98 (1.26)	1.18 (1.18)	1.12 (1.11)
CCAPS-Hostility	.78 (.73)	.83 (.82)	.75 (.58)	.79 (.73)
CCAPS-Alcohol	.46 (.93)	.59 (1.05)	.33 (.65)	.34 (.78)
MHC-Total	51.13 (13.34)	56.34 (17.25)	55.95 (12.65)	55.77 (13.23)
MHC-Emotional	12.68 (3.13)	12.97 (4.05)	13.62 (2.83)	13.43 (3.21)
MHC-Social	15.80 (5.53)	18.59 (7.54)	17.85 (5.26)	17.50 (5.36)
MHC-Psychological	22.66 (5.98)	24.78 (6.80)	24.49 (5.96)	24.83 (5.88)
Process Measures				
AAQ-II	26.83 (9.51)	24.44 (9.02)	25.97 (10.70)	24.47 (10.47)
PHLMS-Acceptance	35.23 (8.07)	31.59 (7.43)	33.28 (6.68)	32.47 (6.89)
PHLMS-Awareness	33.23 (6.83)	34.02 (6.90)	34.70 (6.31)	35.17 (6.46)
CFQ	29.45 (10.65)	25.38 (9.90)	28.44 (10.19)	26.83 (10.06)
VQ-Obstacle	20.98 (6.92)	17.13 (6.00)	19.64 (6.20)	18.80 (6.60)
VQ-Progress	20.05 (6.27)	22.06 (6.33)	22.13 (6.09)	22.33 (5.76)

Note: This table only reports non-missing baseline and posttreatment data, but MMRM analyses also modeled the missing data. CCAPS = Counseling Center Assessment of Psychological Symptoms, MHC = Mental Health Continuum, AAQ-II = Acceptance and Action Questionnaire-II, PHLMS = Philadelphia Mindfulness Scale, CFQ = Cognitive Fusion Questionnaire, VQ = Valuing Questionnaire.

Table 2. Mediation analysis results for process and outcome measures that significantly improved in the ACT vs. waitlist condition

	a path	b path	c path	c' path	Products of coefficients			Proportion
	X-M	M(X)-Y	X-Y	X(M)Y	Point estimate	SE	Bootstrapping 95% CI	mediated (1-c'/c)
PHLMS Acceptance Mediation Model								
CCAPS-Total	1.88†	3.14**	2.28*	1.90†	.07	.04	.007, .168	20.06%
CCAPS-Depression	1.88†	2.68**	2.03*	1.71†	.08	.06	.009, .242	22.13%
CCAPS-Anxiety	1.88†	3.12**	1.67†	1.39	.09	.06	.006, .235	28.57%
CCAPS-Social Anxiety	1.88†	3.82***	3.00**	2.87**	.07	.04	.007, .170	16.05%
CCAPS-Academic	1.88†	1.12	1.72†	1.58	.03	.04	-.016, .151	
MHC	1.73†	1.85†	1.83†	1.57	.78	.70	-.029, 2.980	
MHC-Social	1.73†	1.69†	2.19*	2.04*	.32	.31	-.027, 1.336	
VQ Obstacles Mediation Model								
CCAPS-Total	2.67*	4.37***	2.28*	1.25	.16	.07	.049, .327	48.61%
CCAPS-Depression	2.67*	5.25***	2.03*	0.97	.21	.10	.053, .419	57.94%
CCAPS-Anxiety	2.67*	3.69***	1.67†	1.02	.17	.08	.052, .367	50.44%
CCAPS-Social Anxiety	2.67*	3.96***	3.00**	2.60**	.14	.06	.042, .275	29.18%
CCAPS-Academic	2.67*	1.96*	1.72†	0.96	.11	.07	.008, .320	38.99%
MHC	2.32*	3.88***	1.83†	0.92	2.48	1.34	.219, 5.680	53.19%
MHC-Social	2.32*	4.07***	2.19*	1.57	1.04	.55	.118, 2.343	37.84%

†*p < .10, *p < .05; **p < .01; ***p < .001.* X-M = treatment condition and mediator, M(X)-Y = Mediator and outcome controlling for treatment condition, X-Y = treatment condition and outcome, X(M)Y = Treatment condition and outcome controlling for mediator. *t*-test values are reported for paths tested.

Figure caption

Figure 1. Participant flow diagram.

Assessed for eligibility (n = 80)
No participants were screened ineligible.

Completed Baseline (n = 80)

Excluded (n = 1)
- Completed baseline three times and assigned to both conditions by error.

Randomized and included in final analyses (n = 79)

Assigned to ACT (n = 40)
- Completed all 6 sessions (n = 22)
- Completed at least 3 sessions (n = 30)
- Did not complete any sessions (n = 7)

Assigned to waitlist (n = 39)

Completed post assessment (n = 32)

Completed post assessment (n = 30)