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RESEARCH ARTICLE

Pilot evaluation of a web-based acceptance and commitment therapy program to promote mental health skills in university students

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Abstract

Objective This study evaluated a 4-week web-based acceptance and commitment therapy (ACT) mental health promotion program called YOLO (You Only Live Once) for university students.

Method A total of 130 participants were randomized to one of three intervention groups investigating varied program delivery methods. Primary outcomes assessed: depression, anxiety, stress, well-being, self-compassion, alcohol use, and life satisfaction. ACT processes assessed: acceptance, cognitive fusion, education values, valued living, and mindfulness.

Results Improvement on the primary outcomes and ACT processes did not differ among the three intervention groups. Analyses showed significant improvements on all primary outcomes (except alcohol use), and on all ACT processes. All ACT processes mediated changes on one or more primary outcomes in the intent-to-treat sample. Intervention effects were consistent on most primary outcomes and ACT processes across three sample groupings.

Conclusions These preliminary findings provide support for a web-based ACT mental health promotion program for university students.

KEYWORDS

acceptance and commitment therapy, mental health promotion, telepsychology, university students, web-based mental health

1 | INTRODUCTION

University student mental health is a serious public health concern (Bewick, Koutsopoulou, Miles, Slaa, & Barkham, 2010; Gallagher, 2012). An estimated 47% of North American university students in a given year have a diagnosable psychological disorder (Blanco et al., 2008) and up to 83.9% of Australian students report elevated psychological distress, with 19.2% experiencing severe mental health problems and 64.7% reporting subsyndromal mild to moderate

mental illness, regardless of university location (Stallman, 2010). Furthermore, a growing number of disciplines have been identified as being at high risk for elevated student distress (e.g., Regehr, Glancy, & Pitts, 2013). Students experience higher levels of distress compared to those of the same age in the general population, and help seeking is low, with only 11.7–18.45% of distressed students overall seeking help and 36.3–39.4% of students experiencing high to very high distress seeking help (Blanco et al., 2008; Stallman, 2008; Stallman & Shochet, 2009). Data from Australian and New Zealand on-campus counseling and health services indicate a lack of resources to meet student needs, with a counselor to student ratio of 1:4,340 (Stallman, 2012), 2.5 times higher than at American universities (Gallagher, 2014). If all students accessed the mental health assistance they need, services would not be able to meet the demand (Stallman & Kavanagh, 2016). This alarming trend of untreated elevated psychological distress in students highlights the need for university-wide transdiagnostic intervention programs targeting mental health skills training.

The increased prevalence of mental health problems in students signals an urgent need for universities to provide education on the management of well-being and mental health through programs promoting mental health skills for a wide range of issues. High levels of psychological distress interfere with many aspects of students' lives such as academic achievement, work, daily activities, physical and emotional health, and quality of life (Andrews & Wilding, 2004; Stewart-Brown et al., 2000; Vaez & Laflamme, 2008), as well as cause considerable long-term health and adjustment problems (Rickwood, Deane, Wilson, & Ciarrochi, 2005).

The typical age of university students (early adulthood) is a critical developmental period when unresolved mental health issues can impact social, emotional, and cognitive functioning, having lasting adverse ramifications into adult life (Rickwood et al., 2005). It is therefore important for university students to have easy and timely access to services that foster mental health awareness and skills, thus, potentially circumventing mental health problems later in life. One way to do this is via web-based mental health promotion training.

1.1 | Web-based mental health programs

The Internet has been increasingly investigated as a way of delivering mental health skills training at tertiary and primary prevention levels (Farrer et al., 2013). Web-based programs are cost effective, can accommodate large numbers of users, and allow participants to develop skills in their own time, without attending appointments or facing the stigma associated with help-seeking (Amstadter, Broman-Fulks, Zinzow, Ruggiero, & Cercone, 2009; Eisenberg, Golberstein, & Gollust, 2007). Web-based programs also appeal to university students with 47% reporting being "quite" or "very likely" to access web-based services, and 57% of highly distressed students preferring treatment in this format (Ryan, Shochet, & Stallman, 2010).

Young adults' high use of technology, together with their tendency to acquire their mental health information online, creates a need for web-based programs to engage and teach mental health skills, which students can access and use according to their personal needs (Burns, Davenport, Durkin, Luscombe, & Hickie, 2010; Christensen, Griffiths, Groves, & Korten, 2006; Escoffery et al., 2005). This approach is likely to benefit a larger number of users with varied mental health problems. For example, Stallman and Kavanagh (2016) in their large-scale web-based study of 118,000 university students found the majority of users only visited their program once with only 25% being repeat users. Self-rated participant well-being scores obtained once before access to the program were also higher than average, suggesting that web-based interventions may effectively target a wide variety of users and not only students with clinically significant levels of distress.

A notable limitation of web-based interventions is that effect sizes tend to be lower than face-to-face therapy or guided self-help, where participants have contact with a therapist, either in person, by e-mail, or telephone (Farrand & Woodford, 2013). Web-based interventions with some therapist contact have been found to produce similar results to face-to-face therapy with medium to large effect sizes, for ACT (Lappalainen et al., 2014) and Cognitive Behavioural Therapy (Cuijpers, Donker, van Straten, Li, & Andersson, 2010). However, standalone web-based interventions that are self-administered with no therapist support generally yield small effect sizes (Cuijpers, van Straten, & Andersson, 2008; Farrand & Woodford, 2013). Web-based interventions that target a specific mental health problems have demonstrated efficacy in student populations in preventing alcohol misuse (Croom et al., 2015), eating disorders (Beintner,

Jacobi, & Taylor, 2012), stress (Hintz, Frazier, & Meredith, 2015), and anxiety and depression (Christensen, Griffiths, & Jorm, 2004; Cukrowicz & Joiner, 2007). An intervention based on a transdiagnostic model would be the most effective in maximizing program reach and addressing a wider range of mental health skill deficits (Craske, 2012).

1.2 | Acceptance and commitment therapy

Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 2011) is a transdiagnostic approach showing promise in fostering mental health skills and preventing mental health problems (Biglan, Hayes, & Pistorello, 2008; Levin, Pistorello, Seeley, & Hayes, 2014). A third-wave behavioral approach and recent variant of cognitive behavior therapy, ACT is underpinned by the pragmatic philosophy of functional contextualism and a theory of the function and use of language, known as relational frame theory (Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

ACT is based on the framework of psychological flexibility, which is defined as the ability to contact the present moment as a conscious human being and to change or persist in behavior when it is in the service of values (Hayes et al., 2006). Psychological flexibility is attained through the development of six ACT processes: (a) acceptance—the active and aware embrace of internal experiences without changing their frequency or form; (b) cognitive defusion—observing thoughts rather than taking them literally; (c) contact with the present moment—ongoing nonjudgmental and responsive awareness of the present moment; (d) self-as-context—flexible perspective taking; (e) values—freely chosen, verbally constructed, and personally meaningful life directions; and (f) committed action—values guided effective action. The inverse, psychological inflexibility is the primary source of psychopathology (Hayes et al., 2006). The six ACT processes are teachable therapeutic skills that have been related to improved mental health outcomes in a variety of populations in experimental, intervention, and field research (Powers, Zum Vorde Sive Vording, & Emmelkamp, 2009; Ruiz, 2010). Therefore, developing psychological flexibility skills in students may help promote mental health and prevent mental health problems later in life.

A growing body of research has indicated psychological flexibility as a protective factor in a wide range of mental health disorders and physical health conditions (e.g., depression, anxiety, stress, eating disorders, smoking, psychosis, chronic pain and substance abuse), highlighting its transdiagnostic nature (Powers et al., 2009; Ruiz, 2010). Additionally, there are over 200 randomized controlled trials of ACT with adult and student populations, with numerous reviews and meta-analyses indicating ACT is effective in improving mental health and well-being compared to control groups (A-Tjak et al., 2015).

Recent randomized clinical trials have tested web-based ACT interventions to promote mental health university students. For example, Levin et al. (2014) tested their two-session, 3-week web-based program, ACT on College Life (ACT-CL), with pre- and postintervention and 3-week follow-up assessments. The ACT-CL group ($n = 37$) evidenced greater improvements on education values and motivation, and depression compared to a waitlist group ($n = 39$). In a subsequent pre- and postintervention open trial study, Levin, Pistorello, Hayes, Seeley, and Levin (2015) updated ACT-CL from two to three online sessions targeting the ACT processes values, acceptance and mindfulness, and added four training sessions for counselors ($n = 30$) so the program could be offered as an optional counseling adjunctive for students already receiving face-to-face treatment ($n = 82$) with counselors in university counseling centers. Most participants improved on depression, anxiety, stress, psychological flexibility, mindfulness, and education values. Most recently, Levin, Hayes, Pistorello, and Seeley (2016) compared their initial two-session, 3-week ACT-CL program with additional supplementary e-mails and material ($n = 114$) to a mental health education website ($n = 120$) with pre- and postintervention, and 1- and 3-month follow-up assessments. The ACT-CL group did not differ from the mental health education group on any primary outcomes or ACT processes; however, analyses on the combined ACT-CL and waitlist groups showed increases in psychological flexibility were related to improvements on depression, anxiety, and stress at postintervention and follow-up.

A further two studies have tested web-based ACT interventions. Rasanen, Lappalainen, Muotka, Tolvanen, and Lappalainen (2016) tested their 7-week web-based ACT intervention with two face-to-face sessions with pre- and postintervention and 12-month follow-up assessments. The ACT group ($n = 33$) showed significantly higher gains in well-being, life satisfaction, mindfulness, lowered self-reported stress, and symptoms of depression compared to the

waitlist group ($n = 35$). Finally, Chase et al. (2013) investigated whether a brief (30–45 min) web-based, values focused goals intervention increased academic achievement. The study compared three groups: goal setting ($n = 48$), goal setting plus values ($n = 51$), and waitlist ($n = 33$). The goal setting plus values group evidenced higher academic performance over the next semester compared to the goal setting and waitlist groups.

ACT-based group interventions and ACT training for university students also show promise. For example, an ACT-based stress management intervention for clinical psychology students showed that compared to a comparison group, intervention participants improved on acceptance, cognitive fusion, mindfulness, values, stress, distress, and life satisfaction (Pakenham & Stafford-Brown, 2013; Stafford-Brown & Pakenham, 2012). Similarly, integrating self-care into a university ACT training curriculum for clinical psychology students was associated with improvements in self-care practices, distress, and self-compassion (Pakenham, 2015a, 2015b). ACT has also been used in bibliotherapy to improve mental health and decrease anxiety and depression in international university students (Muto, Hayes, & Jeffcoat, 2011).

The aim of the current study was to pilot a web-based ACT mental health promotion program for university students called YOLO (You Only Live Once). This study aims to extend previous research on web-based mental health promotion/self-help programs by including all six ACT processes in the program across four modules completed over 4-weeks. Inclusion of all ACT processes is reflective of the whole psychological flexibility model, which may enhance intervention potency. In addition, unlike prior web-based ACT intervention research, the present study will not include face-to-face contact, or participation incentives, and participants will be recruited from a wide range of disciplines within the university, and from all degree levels.

A significant issue with web-based interventions is attrition from the intervention and from postintervention assessment (Melville, Casey, & Kavanagh, 2010). Attrition may be alleviated by a delivery method that best fits the target population. A novel design feature of the present study is the investigation of this issue through exploring three different intervention delivery modes to ascertain a method that yields the lowest attrition and highest user satisfaction rates.

We hypothesized that participants would show significant improvements from pre- to post-intervention on the primary outcomes (depression, anxiety, stress, alcohol and drug consumption, well-being, self-compassion, and life satisfaction) and the ACT processes (acceptance, cognitive fusion, mindfulness, and values). It was also hypothesized that the ACT processes would mediate the changes on the primary outcomes.

2 | METHOD

2.1 | Participants, recruitment, and procedure

Participants were 134 university students from an Australian university. Eligibility criteria were enrollment at the university, fluent in English, and 18 years old or above. Recruitment occurred through university services, university Facebook posts, flyers posted around campus, and class announcements. Recruitment material contained the name of the study (YOLO) and described the program broadly as helping students learn life skills that will enhance their university experience. Interested students accessed a website that provided an overview of the 4-week program and study, and clicked “enroll now” to participate. Students were manually randomized to one of three intervention groups and provided unique log-in details and instructions on how to proceed. The three intervention groups were devised with varying levels of flexibility in completing the four modules to ascertain a method that produced the lowest attrition and highest user satisfaction rates. Therefore, all groups had access to the program, but with different recommendations for completion. Group 1 participants were given a recommendation of completing one module per week for 4 weeks, but with flexibility to complete as desired. Group 2 participants were given 4 weeks to complete the intervention at their own discretion with no recommended completion. This delivery format provided the most flexibility for completing the program. Finally, Group 3 accessed a module after completion of each prior module, and an enforced gap of 3 days between modules.

TABLE 1 YOLO program content

| Module | Content |
|---|---|
| Module 1: Cognitive fusion | Thought evolution, defusion exercise (e.g., leaves on a stream), defusion task (e.g., observing thoughts), defusion exercise (e.g., hands as thoughts). |
| Module 2: Acceptance | Definition of acceptance, willingness video, metaphor (e.g., passengers on the bus) and related task, acceptance exercise (e.g., struggle switch), metaphors (e.g., unwanted party guest), benefits of practicing acceptance. |
| Module 3: Mindfulness and the observer self | Mindfulness definition, formal and informal mindfulness task, video on presence, tasks (e.g., practicing mindfulness), metaphor (e.g., classroom metaphor), observing self-video, observer self-exercise (e.g., relaxation observation exercise). |
| Module 4: Values and committed action | Definition of values, working toward values video, values exercises (e.g., contemplating what is important in your life, 80-year-old birthday speech, values drop), committed action exercise (e.g., SMART goal training), troubleshooting (e.g., FEAR and DARE). |

After consenting online to participate, students were automatically directed to complete the online preintervention assessment. Participants were able to complete the preintervention assessment at any time after consent and once complete, they had 4 weeks to complete the intervention. Participant progress was monitored online through the YOLO administrator portal during the intervention period and reminder e-mails or SMS messages were sent every 3–7 days to prompt program engagement, until the 4-week completion window expired. E-mails were also sent when a participant completed a module, providing a short video recap and instructions for the next module completion. After the 4-week period, the program exercises became unavailable and a link opened on the website allowing participants to complete the postintervention survey. No incentive was provided for participation in the study, and the study received ethics approval by the university's internal review board.

Participant characteristics are summarized in Table 2. The majority of participants were female (75.4%), with a mean age of 26.3 years ($SD = 7.96$, range = 18–62). Most participants were undergraduate students (54.6%), followed by research and higher degree students (32.3%) and master's students (13.1%). Participants were mostly Caucasian (50.8%), followed by Asian (14.6%) and South American (3.1%). Using normative data on the Depression Anxiety and Stress Scale Short Form (Lovibond & Lovibond, 1995), the following preintervention rates of mild and moderate distress were found: 43.9% ($n = 57$) depression, 36.9% ($n = 48$) anxiety, and 31.5% ($n = 41$) stress. Rates of severe and extremely severe symptoms were as follows: 13.1% ($n = 17$) depression, 21.5% ($n = 28$) anxiety, and 16.9% ($n = 22$) stress.

2.2 | YOLO program

YOLO is a purpose built 4-week web-based program for university students. It consisted of four 30- to 40-min modules, each targeting one or two of the six ACT processes (see Table 1). Program exercises were 5–15 min duration, allowing participation in the context of busy academic schedules. Modules could only be completed in sequential order. Previous exercises could be repeated, but participants could not progress forward until completing the previous module. The program consisted of animated presentations, video clips, audio files, and written exercises based on ACT. No face-to-face contact occurred during the study; however, semipersonalized engagement and module recap e-mails (e.g., using the participant's name and a semi-formal tone) were used.

2.3 | Measures

All observed Cronbach's alphas for primary outcome and ACT process measures at pre- and postintervention for the total sample were above 0.70. Cronbach's alpha for each sample for all primary outcomes and ACT processes can be found in Table 3.

2.4 | Primary outcomes

2.4.1 | Depression, anxiety and stress

The 21-item Depression Anxiety and Stress Scale Short Form (Lovibond & Lovibond, 1995) is a widely used, reliable, and valid measure of depression, anxiety, and stress, used in ACT intervention studies with student samples (Levin et al., 2016). Participants rate how much each statement applied to them over the past week on a 4-point scale (0 *did not apply to me at all* to 3 *applied to me very much or most of the time*) with higher scores indicating higher depression, anxiety, or stress. Items are summed for each subscale and multiplied by two for comparison to the 42-item parent measure.

2.4.2 | Well-being

The 14-item Mental Health Continuum Short Form (Keyes, 2009) is a widely used, reliable, and valid measure of emotional, social, and psychological well-being (Westerhof & Keyes, 2010). Participants rate the frequency of various experiences over the past month (e.g., satisfied with life, happy) on a 6-point scale (0 *never* to 5 *every day*). A mean score was calculated with higher scores indicating higher levels of well-being.

2.4.3 | Self-compassion

The 12-item Self-Compassion Scale Short Form (Raes, Pommier, Neff, & Van Gucht, 2011) is a widely used, reliable, and valid measure of self-compassion (Yadavaia, Hayes, & Vilardaga, 2014). Participants rate how they typically act toward themselves in difficult times on a 5-point scale (1 *almost never* to 5 *almost always*). A mean score was calculated with higher mean scores indicating higher self-compassion.

2.4.4 | Alcohol consumption

The Daily Drinking Questionnaire Revised (Collins, Parks, & Marlatt, 1985) is sensitive to drinking variability, and has demonstrated validity and reliability with university student samples (Simpson et al., 2007). Number of drinks consumed is measured plus hours spent drinking for a typical week over the last month providing total weekly alcohol consumption and total hours spent drinking.

2.4.5 | Drug consumption

The Daily Drug Taking Questionnaire (Parks, 2001) is a reliable and valid measure for levels and types of drug taking over an average week (Simpson et al., 2007). Participants select what days they consumed listed drugs, or indicate that they did not consume this drug at all, in a typical week providing a total weekly drug consumption of a variety of substances.

2.4.6 | Life satisfaction

The 5-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) is a widely used measure of global life satisfaction in university students, and has been shown to be reliable, valid, and sensitive to change (Pakenham, 2015b). Participants rate level of agreement on a 7-point scale (1 *strongly disagree* to 7 *strongly agree*). Scores are totaled with higher scores indicating higher global life satisfaction.

2.5 | ACT processes

2.5.1 | Acceptance

The 7-item Acceptance and Action Questionnaire II (Bond et al., 2011) is a widely used, reliable, and valid measure of experiential avoidance, which is the reverse process of acceptance (Yadavaia et al., 2014). Responses are recorded on a 7-point scale (1 *never true* to 7 *always true*). Scores are totaled with higher scores indicating lower acceptance.

2.5.2 | Cognitive fusion

The 7-item Cognitive Fusion Questionnaire (Gillanders et al., 2014) is a reliable and valid measure of cognitive fusion with thoughts, which is the reverse of defusion (McCracken, DaSilva, Skillcorn, & Doherty, 2014). Responses are recorded on a 7-point scale (1 *never true* to 7 *always true*). A mean score was calculated with higher scores indicating higher cognitive fusion.

2.5.3 | Values

Two values domains were measured: values specific to education and general values based living.

Education values

The 9-item education values subscale of the Personal Values Questionnaire II (Blackledge, Ciarrochi, & Bailey, n.d.) was used to assess education values. Participants are asked for a written response regarding their education values, combined with questions that assess three areas of education values: values success, intrinsic/appetitive values motivation (e.g., positively reinforced by making their life meaningful), and extrinsic/aversive values motivation (e.g., used to avoid/escape unwanted thoughts and feelings). Items are rated on a 5-point scale and a mean is created for values success as well as a ratio score that is calculated by dividing scores on extrinsic/aversive motivation by intrinsic/appetitive motivation, with lower scores indicating the value is more intrinsic/appetitive. Previous ACT studies have found this measure to be reliable and valid (Levin et al., 2014, 2016).

Value-based living

The 16-item Engaged Living Scale (Trompetter et al., 2013) is a reliable and valid instrument measuring values based living (Trompetter, Bohlmeijer, Veehof, & Schreurs, 2015). Responses are recorded on a 5-point scale (1 *completely disagree* to 5 *completely agree*). A total score and subscale scores can be calculated with higher scores indicating higher valued living.

2.5.4 | Mindfulness

The 15-item Mindful Attention Awareness Scale (Brown & Ryan, 2003) is a widely used, reliable, and valid instrument for measuring mindfulness (Newsome, Waldo, & Gruszka, 2012). Responses are recorded on a 6-point scale (1 *almost always* to 6 *almost never*). A mean score was calculated with higher scores indicate higher levels of mindfulness.

2.6 | Program performance measures

2.6.1 | System usability

The 10-item system usability scale (Brooke, 1996) is a highly robust and versatile instrument with high internal consistency for measuring program usability (Bangor, Kortum, & Miller, 2008). It provides a global view of subjective assessments of usability of a program. Each item is rated on a 5-point scale (1 *strongly disagree* to 5 *strongly agree*) with total score ranging between 50 and 100. Higher scores indicate higher system usability. Cronbach's alpha at postintervention 0.86.

2.6.2 | Participant satisfaction

Three questions (two forced choice and one open-ended) obtained feedback on the device used and difficulties in using the device. Two open-ended questions obtained feedback on what participants liked and disliked about the program. Two questions (one forced-choice and one open-ended) obtained feedback on the program length and preferred program length. Two open-ended questions obtained feedback on whether participants accessed reminders and whether they found them useful. Lastly, one forced-choice question obtained feedback on preferred program delivery and one open-ended question asked for a reason for this preference.

2.7 | Data analysis approach

All variables were examined for accuracy of data entry, missing values, and the assumptions of multivariate analyses. Preliminary analyses compared postintervention assessment completers and noncompleters on preintervention primary outcomes, ACT processes, and sociodemographics. To check the randomization procedure, potential differences on preintervention study variables among the three intervention groups were examined using one-way ANOVAs with continuous variables (primary outcomes, ACT processes, and age), and chi-square analyses with categorical variables (gender, ethnicity, and degree level). Repeated measures ANOVAs with group as a factor were conducted to investigate whether changes on the primary outcomes and ACT processes differed across the three intervention groups. To check for any differences between the three intervention groups on postintervention scores, a one-way ANOVA was conducted on the T1T2 sample using condition as a factor and all postintervention primary outcomes and ACT processes as dependent variables.

In order to provide an accurate and conservative estimate of intervention effects compared to other methods, such as list wise deletion and last observation carried forward, an intent-to-treat (ITT) approach was used for repeated measures ANOVAs that examined changes from pre- to postintervention on primary outcomes and ACT processes. All participants who completed the preintervention assessment ($n = 130$) were included in the analyses regardless of how much of the program they completed. Multiple imputation in SPSS was used to impute the data due to their robustness and reduced error rates compared to other methods (Rubin, 1996). Variables included in the model were all pre- and postintervention primary outcomes and ACT processes, with the exception of alcohol and drug use scores. Scores for alcohol and drug use were not imputed due to large levels of missing data and potential underreporting. Due to the high level of missing data, 40 imputations were requested (Graham, Olchowski, & Gilreath, 2007) and pooled results are reported. The original results were compared against the imputed results for consistency. Trends were consistent; therefore, the pooled imputed results are presented.

Pre- to postintervention changes on primary outcomes and ACT processes were also examined with two subsamples: participants who completed both time assessments and at least started the program (time 1 time 2 [T1T2] sample $n = 49$), and participants who completed the entire program and completed both assessments (per protocol [PP] sample $n = 29$). Effect sizes were calculated for all significant pre- to postintervention findings using the following formula for Cohen's $d = (M_2 - M_1)/SD_{\text{pooled}}$.

The SPSS macro MEMORE for repeated measures bootstrap analysis with multiple proposed mediators (Montoya & Hayes, 2016) was used to examine pre- to postintervention changes on the ACT processes as mediators of significant pre- to postintervention primary outcomes. MEMORE estimates the total, direct, and indirect effects of X (time) on Y (primary outcome) through one or more mediators M (ACT processes) in a repeated measures design as well as providing confidence intervals (CIs) for the indirect effect using bootstrapping. Bias-corrected and accelerated (BCa) bootstrap CIs were used for the ITT sample, and due to the smaller size of the T1T2 and PP samples, percentile bootstrap CIs were used, because they are more reliable for smaller samples (Creedon & Hayes, 2015). Mediation is significant if the 95% BCa or percentile CIs for the indirect effects does not include zero (Preacher & Hayes, 2004).

Three sets of analyses were conducted to examine factors associated with intervention completion. First, chi-square analyses were conducted on the T1T2 sample to ascertain if group randomization was associated with variations in program completion. Second, multivariate ANCOVAs on the ITT and T1T2 samples were used to ascertain if postintervention scores on primary outcomes and ACT processes could be predicted by level of intervention completion, controlling for preintervention scores. Finally, univariate ANOVAs and chi-square analyses in the T1T2 sample examined whether preintervention primary outcomes, ACT processes, and sociodemographics were associated with intervention completion. Responses to open-ended participant feedback questions were analyzed according to Braun and Clarke (2006) steps for thematic analysis. Forced-choice participant feedback items were subjected to descriptive analysis. Due to the exploratory nature of the study, the $P < 0.05$ significance level was used.

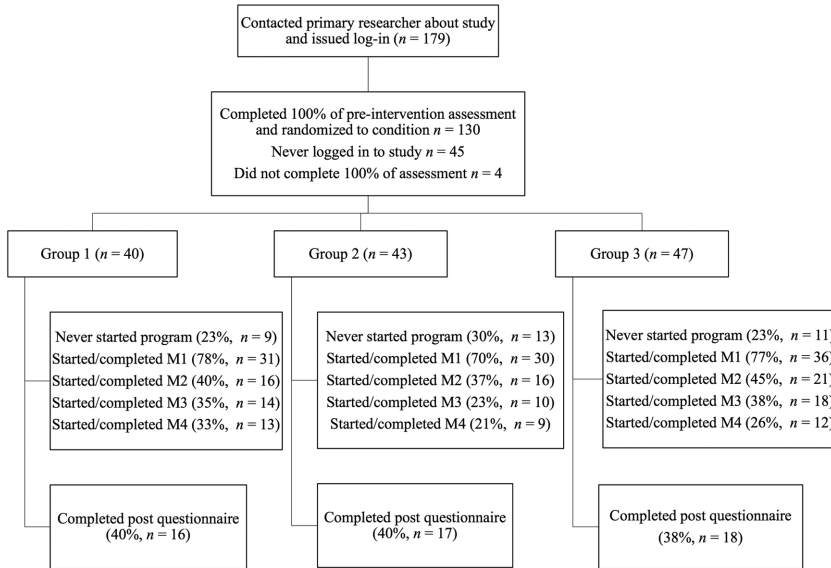


FIGURE 1 Participant flow diagram for entire pre-intervention sample

Note. Group 1: Recommendation of one module per week for 4 weeks, but with flexibility to complete as desired. Group 2: Four weeks to complete at their own discretion with no recommended completion. Group 3: access to each module after completion of each prior module and an enforced gap of 3 days between modules. M: module.

3 | RESULTS

3.1 | Participant flow and characteristics

Figure 1 shows the flow of participants through the study procedure. A total of 179 participants were issued log-in and 130 completed the preintervention assessment and were randomized to one of the three intervention conditions. A total of 51 participants completed the postintervention assessment with 49 completing varied levels of the program and two not completing any of the programs. Participant characteristics for both samples are summarized in Table 2. Program engagement was similar across groups with approximately 25% not completing any of the program, 75% completing the first module, 41% completing the first and second module, 32% completing the first, second, and third modules and 27% completing the entire four modules.

3.2 | Preliminary analyses

Completers and noncompleters did not differ significantly at preintervention on primary outcomes or ACT processes; however, they differed significantly on degree level, with more undergraduate and master's students being noncompleters than research degree students, and undergraduate students completing more than master's students.

One-way ANOVAs on the ITT sample showed that the three intervention groups did not differ on preintervention primary outcomes or ACT processes; however, groups differed on age, $F(2, 127) = 3.31, P = 0.04$, due to three of the oldest participants being randomized to the same group. Results of repeated measures ANOVAs showed that pre- to postintervention changes on the primary outcomes and ACT processes did not differ among the three intervention groups. Given that variations in program delivery were unrelated to study outcomes, the data were combined across the three groups to form a total sample. Results of the one-way ANOVA on the T1T2 sample on postintervention scores showed no group differences for any primary outcomes or ACT processes across the three intervention conditions.

TABLE 2 Participant characteristics of the intention-to-treat (ITT) sample, time 1 and time 2 (T1T2) sample and per protocol (PP) sample

| Characteristic | ITT sample (<i>n</i> = 130) | | T1T2 sample (<i>n</i> = 49) | | PP sample (<i>n</i> = 29) | |
|--------------------------|---------------------------------|----------|---------------------------------|----------|-------------------------------|----------|
| | % | <i>n</i> | % | <i>n</i> | % | <i>n</i> |
| Gender | | | | | | |
| Male | 24.6 | 32 | 26.5 | 13 | 27.6 | 8 |
| Female | 75.4 | 98 | 73.5 | 36 | 72.4 | 21 |
| Degree level | | | | | | |
| Undergraduate | 54.6 | 71 | 40.8 | 20 | 44.8 | 13 |
| Masters | 13.1 | 17 | 10.2 | 5 | 13.8 | 4 |
| Research and higher | 32.3 | 42 | 49 | 24 | 41.4 | 12 |
| Ethnicity | | | | | | |
| Caucasian/Australian | 53.1 | 69 | 55.1 | 27 | 58.6 | 17 |
| Asian | 14.6 | 19 | 16.3 | 8 | 17.2 | 5 |
| European | 2.3 | 3 | 4.1 | 2 | 3.4 | 1 |
| Aboriginal/Torres Strait | 0.8 | 1 | - | - | - | - |
| Islander | | | | | | |
| African | 3.1 | 4 | 6.1 | 3 | 3.4 | 1 |
| Other | 6.2 | 8 | 2.1 | 1 | 3.4 | - |
| Prefer not to say | 16.9 | 22 | 16.3 | 8 | 17.2 | 5 |
| Mean age in years | <i>M(SD)</i> range | | <i>M(SD)</i> range | | <i>M(SD)</i> range | |
| | 26.34 (7.96); 18–62 | | 27.06 (8.48); 18–62 | | 28.28 (10.11); 18–62 | |

3.3 | Changes in primary outcomes and ACT processes

Results of the repeated measures ANOVAs on the ITT, T1T2, and PP samples, the means (*SDs*) and repeated measures ANOVA statistics are summarized in Table 3. Alcohol use is only reported in the T1T2 and PP samples using original data. Drug use is not reported due to less than eight participants admitting drug use. ITT analyses showed that participants significantly improved from pre- to postintervention on six primary outcomes (depression, $d = 0.36$; anxiety, $d = 0.32$; stress, $d = 0.48$; well-being, $d = 0.25$; self-compassion, $d = 0.58$; and life satisfaction, $d = 0.45$), and five ACT processes (acceptance, $d = 0.37$; cognitive fusion, $d = 0.40$; education values ratio, $d = 0.25$; engaged living, $d = 0.40$; and mindfulness, $d = 0.68$). The analyses on the T1T2 and PP samples showed significant changes on the same variables, except the education values ratio was not significant in the T1T2 sample. The consistency of results across these three samples indicates the robustness of the findings.

3.4 | Mediation analyses

Scores for each significant ACT process measure in the ITT sample (acceptance, cognitive fusion, education values ratio, valued living, and mindfulness) were examined as potential mediators of change on each significant outcome measure (depression, anxiety, stress, well-being, self-compassion, and life satisfaction). Pre- and postintervention scores for each significant primary outcome measure (*Y*) and each ACT process measure (*M*) were entered with (*X*) representing the interval of time between measurements. Table 4 presents the indirect effects of the intervention on each outcome for the ITT, T1T2, and PP samples. Mediation analyses on the ITT sample ($n = 130$) indicated that acceptance mediated the changes in depression, anxiety, stress, well-being, self-compassion, and life satisfaction; valued living mediated changes in depression, well-being, and life satisfaction; education values ratio mediated the changes in

TABLE 3 Means and standard deviations for primary outcomes and ACT processes at pre- and postintervention, Cronbach's alpha, and repeated measures ANOVA *F* values and effect sizes for intention-to-treat (ITT) sample, time 1 and time 2 (t1t2) sample, and per protocol (PP) sample

| Outcomes | Time 1 | | Time 2 | | Cronbach's <i>F</i> -value <i>Alpha</i> (<i>df</i>) | <i>P</i> | <i>d</i> |
|--------------------------|------------------------|---------------------|------------------------|--------------|--|-----------|--------------------|
| | <i>M</i> (<i>SD</i>) | Cronbach's α | <i>M</i> (<i>SD</i>) | <i>Alpha</i> | | | |
| ITT sample | | | | | | | |
| Primary outcomes | | | | | | | |
| Depression | 12.11 (8.76) | 0.89 | 9.49 (5.21) | 0.90 | 14.58 (129) | 0.000**** | 0.36 ^a |
| Anxiety | 9.48 (6.57) | 0.77 | 7.75 (3.96) | 0.77 | 10.64 (129) | 0.001*** | 0.32 ^a |
| Stress | 16.23 (8.33) | 0.84 | 12.95 (5.06) | 0.86 | 20.47 (129) | 0.000**** | 0.48 ^a |
| Well-being | 2.85 (1.06) | 0.94 | 3.08 (0.67) | 0.95 | 8.09 (129) | 0.005** | -0.25 ^a |
| Self-compassion | 2.77 (0.64) | 0.87 | 3.09 (0.45) | 0.91 | 39.35 (129) | 0.000**** | -0.58 ^b |
| Drinks per week | - | - | - | - | - | - | - |
| Life satisfaction | 20.85 (7.50) | 0.90 | 23.69 (4.91) | 0.92 | 26.00 (129) | 0.000**** | -0.45 ^a |
| ACT processes | | | | | | | |
| Acceptance | 25.72 (9.03) | 0.91 | 23.00 (0.51) | 0.91 | 14.24 (129) | 0.000**** | 0.37 ^a |
| Cognitive fusion | 29.6 (9.74) | 0.95 | 26.32 (5.76) | 0.93 | 15.74 (129) | 0.000**** | 0.40 ^a |
| Education values success | 3.91 (0.62) | - | 3.95 (0.51) | - | 0.49 (129) | 0.49 | -0.07 |
| Education values ratio | 0.68 (0.34) | - | 0.61 (0.25) | - | 5.59 (129) | 0.02* | 0.25 ^a |
| Valued living | 55.06 (11.51) | 0.92 | 59.01 (7.91) | 0.94 | 21.49 (129) | 0.000**** | -0.40 ^a |
| Mindfulness | 3.48 (0.78) | 0.87 | 3.87 (0.52) | 0.89 | 45.96 (129) | 0.000**** | -0.68 ^b |
| T1T2 sample | | | | | | | |
| Primary outcomes | | | | | | | |
| Depression | 12.08 (9.19) | 0.91 | 8.65 (8.25) | 0.90 | 14.46 (48) | 0.000*** | 0.39 ^a |
| Anxiety | 8.82 (5.90) | 0.74 | 6.57 (6.10) | 0.78 | 12.93 (48) | 0.001*** | 0.37 ^a |
| Stress | 15.92 (7.08) | 0.78 | 12.78 (8.00) | 0.87 | 9.25 (48) | 0.004** | 0.42 ^a |
| Well-being | 2.82 (1.01) | 0.93 | 3.02 (1.06) | 0.95 | 6.09 (48) | 0.02* | -0.19 |
| Self-compassion | 2.72 (0.65) | 0.87 | 3.03 (0.67) | 0.91 | 15.71 (48) | 0.000**** | -0.48 ^a |
| Drinks per week | 3.82 (4.70) | - | 4.86 (10.99) | - | 0.45 (48) | 0.50 | 0 |
| Life satisfaction | 20.55 (7.42) | 0.90 | 23.45 (7.76) | 0.93 | 23.33 (48) | 0.000**** | -0.38 ^a |
| ACT processes | | | | | | | |
| Acceptance | 24.86 (8.51) | 0.91 | 23.67 (7.56) | 0.90 | 1.70 (48) | 0.20 | 0.15 |
| Cognitive fusion | 29.45 (8.51) | 0.93 | 26.94 (8.11) | 0.94 | 7.34 (48) | 0.009** | 0.30 ^a |
| Education values success | 3.88 (0.68) | - | 3.96 (0.60) | - | 0.79 (48) | 0.38 | -0.12 |
| Education values ratio | 0.61 (0.34) | - | 0.62 (0.32) | - | 0.37 (48) | 0.85 | 0 |
| Valued living | 53.70 (12.28) | 0.93 | 58.96 (11.87) | 0.94 | 27.23 (48) | 0.000**** | -0.44 ^a |
| Mindfulness | 3.52 (0.72) | 0.86 | 3.82 (0.73) | 0.90 | 13.92 (48) | 0.001*** | -0.41 ^a |
| Per protocol sample | | | | | | | |
| Primary outcomes | | | | | | | |
| Depression | 12.83 (10.55) | 0.94 | 8.69 (8.55) | 0.91 | 14.25 (28) | 0.001*** | 0.43 ^a |
| Anxiety | 8.48 (6.47) | 0.79 | 6.41 (7.18) | 0.87 | 12.25 (28) | 0.002** | 0.30 ^a |
| Stress | 15.38 (7.41) | 0.78 | 11.86 (6.41) | 0.78 | 13.85 (28) | 0.001*** | 0.51 ^b |
| Well-being | 2.80 (1.08) | 0.93 | 3.08 (1.03) | 0.95 | 8.10 (28) | 0.008** | -0.27 ^a |
| Self-compassion | 2.68 (0.71) | 0.89 | 3.09 (0.72) | 0.92 | 12.18 (28) | 0.002** | -0.57 ^b |

(Continues)

TABLE 3 (Continued)

| Outcomes | Time 1 | | Time 2 | | Cronbach's Alpha | F-value | |
|--------------------------|---------------|---------------------|---------------|-------|------------------|-----------|--------------------|
| | M (SD) | Cronbach's α | M (SD) | Alpha | | (df) | P |
| Drinks per week | 3.54 (4.87) | – | 3.05 (5.50) | – | 1.37 (28) | 0.25 | 0.09 |
| Life satisfaction | 20.28 (8.16) | 0.90 | 23.62 (8.80) | 0.95 | 18.75 (28) | 0.000**** | –0.39 ^a |
| ACT processes | | | | | | | |
| Acceptance | 24.76 (9.66) | 0.93 | 23.52 (8.48) | 0.92 | 0.93 (28) | 0.32 | 0.14 |
| Cognitive fusion | 28.69 (9.03) | 0.94 | 26.00 (8.57) | 0.94 | 4.39 (28) | 0.045** | 0.31 ^a |
| Education values success | 3.87 (0.76) | – | 4.03 (0.60) | – | 2.00 (28) | 0.17 | –0.23 ^a |
| Education values ratio | 0.64 (0.36) | – | 0.53 (0.24) | – | 4.96 (28) | 0.035** | 0.38 ^a |
| Valued living | 52.76 (13.52) | 0.94 | 59.34 (12.47) | 0.94 | 28.06 (28) | 0.000**** | –0.51 ^b |
| Mindfulness | 3.61 (0.65) | 0.81 | 3.96 (0.63) | 0.85 | 11.06 (28) | 0.002** | –0.55 ^b |

Note. ITT sample, $n = 130$. T1T2 sample, $n = 49$. PP sample, $n = 29$. Higher scores on acceptance indicate lower acceptance.

* $P < 0.05$, ** $P < 0.01$, *** $P = 0.001$, **** $P = 0.000$.

Effect sizes ^asmall, ^b medium.

depression and stress; and cognitive fusion mediated changes in self-compassion. In the T1T2 sample ($n = 49$), cognitive fusion mediated changes in well-being and self-compassion, and valued living mediated changes in life satisfaction. In the PP sample ($n = 29$) valued living mediated the changes in life satisfaction.

3.5 | Analysis of intervention completion

Intervention completion analyses used a variable detailing four levels of intervention completion for the T1T2 sample (started/completed module 1, started/completed module 2, started/completed module 3, and started/completed module 4) or five levels for the ITT sample (did not start the program, started/completed module 1, started/completed module 2, started/completed module 3, and started/completed module 4). The T1T2 and ITT samples differed in that the T1T2 sample did not contain any participants who did not start the program; therefore, a four-level variable was used for the T1T2 sample and a five-level variable for the ITT sample.

Chi-square analyses using the four-level variable in the T1T2 sample examined whether intervention completion varied as a function of group randomization. Analyses indicated that the three intervention groups did not differ on intervention completion level.

Multivariate ANCOVAs examined if postintervention scores could be predicted from level of intervention completion in both the ITT and T1T2 samples. Participants' postintervention scores were entered as dependent variables, preintervention scores were entered as covariates, and the four (T1T2 sample) or five (ITT sample) level intervention completion variable as the factor. Results for the ITT sample indicated a significant main effect for intervention completion level for anxiety $F(4, 129) = 2.54, P = 0.043$. Contrasts revealed a significant difference for anxiety for completion of four modules compared to completing none of the program $t(4) = 2.16, P = 0.021$, and completing four modules compared to completing the first module only $t(4) = 2.08, P = 0.011$. Those completing four modules reported lower mean scores for anxiety than those in the other two groups (completed none $M = 8.48$ [SD 1.81], started/completed module 1 $M = 8.56$ [SD 1.82], started/completed module 4 $M = 6.68$ [SD 6.49]). Results for the T1T2 sample indicated a significant main effect for intervention completion level for acceptance $F(3, 48) = 3.26, P = 0.034$, and education values ratio $F(3, 48) = 3.427, P = 0.028$. Simple contrasts using the fourth level of the intervention completion variable (completed four modules) as the reference group showed a significant difference for education values ratio between completion of one module compared to four modules $t(3) = 0.25, P = 0.045$ and completion of two modules compared to four modules $t(3) = 0.40, P = 0.010$. Participants who completed four modules reported lower mean scores for education values ratio (indicating higher intrinsic motivation) than those who completed one or two modules (started/completed

TABLE 4 Indirect effects of the program on each ACT process measure through changes in the ACT processes

| | Point estimate | 95% CI | |
|--------------------------|----------------|----------------|----------------|
| | | Lower | Upper |
| ITT sample | | | |
| Depression | | | |
| Acceptance | 0.7061 | 0.0916 | 1.7879 |
| Cognitive fusion | 0.2545 | -0.6314 | 1.0927 |
| Education values ratio | -0.2460 | -0.7065 | -0.0022 |
| Valued living | 0.9271 | 0.3903 | 1.7948 |
| Mindfulness | -0.1292 | -1.4109 | 0.9334 |
| Anxiety | | | |
| Acceptance | 0.5583 | 0.0169 | 1.5423 |
| Cognitive fusion | 0.3497 | -0.1973 | 0.9981 |
| Education values ratio | -0.1044 | -0.4743 | 0.1197 |
| Valued living | 0.3915 | -0.0777 | 1.0073 |
| Mindfulness | -0.0151 | -0.7823 | 0.6640 |
| Stress | | | |
| Acceptance | 1.1334 | 0.2957 | 2.5577 |
| Cognitive fusion | 0.1151 | -0.9272 | 0.9865 |
| Education values ratio | -0.2912 | -0.8750 | -0.0036 |
| Valued living | 0.1322 | -0.5252 | 0.8577 |
| Mindfulness | 0.8238 | -0.6658 | 2.0693 |
| Well-being | | | |
| Acceptance | -0.1288 | -0.2522 | -0.0540 |
| Cognitive fusion | 0.0438 | -0.0266 | 0.1488 |
| Education values ratio | -0.0060 | -0.0553 | 0.0211 |
| Valued living | -0.2161 | -0.3389 | -0.1213 |
| Mindfulness | 0.0452 | -0.0650 | 0.1838 |
| Self-Compassion | | | |
| Acceptance | -0.0701 | -0.1535 | -0.0181 |
| Cognitive fusion | -0.0617 | -0.1383 | -0.0163 |
| Education values ratio | -0.0050 | -0.0317 | 0.0104 |
| Valued living | -0.0349 | -0.0826 | 0.0031 |
| Mindfulness | -0.0575 | -0.1461 | 0.0026 |
| Life satisfaction | | | |
| Acceptance | -0.6461 | -1.5296 | -0.1689 |
| Cognitive fusion | 0.0445 | -0.5343 | 0.5991 |
| Education values ratio | -0.0555 | -0.3656 | 0.0977 |
| Valued living | -1.3903 | -2.2328 | -0.7482 |
| Mindfulness | -0.0331 | -0.7039 | 0.5494 |

(Continues)

TABLE 4 (Continued)

| | Point Estimate | 95% CI | |
|------------------------|----------------|----------------|----------------|
| | | Lower | Upper |
| T1T2 sample | | | |
| Depression | | | |
| Acceptance | 0.1766 | -0.3653 | 0.7982 |
| Cognitive fusion | 0.0350 | -0.8438 | 1.0684 |
| Education values ratio | 0.0149 | -0.3339 | 0.3384 |
| Valued living | 0.6217 | -0.8891 | 2.0125 |
| Mindfulness | -0.3157 | -1.7633 | 0.7397 |
| Anxiety | | | |
| Acceptance | 0.0665 | -0.3973 | 0.5492 |
| Cognitive fusion | 0.4272 | -0.1465 | 1.2779 |
| Education values ratio | 0.0190 | -0.2150 | 0.4212 |
| Valued living | 0.4473 | -0.6894 | 1.7569 |
| Mindfulness | -0.1928 | -1.1147 | 0.5663 |
| Stress | | | |
| Acceptance | 0.2386 | -0.4818 | 1.4219 |
| Cognitive fusion | -0.4855 | -1.9253 | 0.5401 |
| Education values ratio | 0.0137 | -0.3115 | 0.5961 |
| Valued living | 0.2012 | -1.6398 | 2.3050 |
| Mindfulness | 0.4883 | -1.3988 | 2.0739 |
| Well-being | | | |
| Acceptance | -0.0564 | -0.1925 | 0.0181 |
| Cognitive fusion | 0.1098 | 0.0095 | 0.2374 |
| Education values ratio | 0.0033 | -0.0436 | 0.0506 |
| Valued living | -0.1275 | -0.3236 | 0.0010 |
| Mindfulness | 0.0015 | -0.1005 | 0.1634 |
| Self-compassion | | | |
| Acceptance | -0.0438 | -0.1535 | 0.0137 |
| Cognitive fusion | -0.0756 | -0.1654 | -0.0093 |
| Education values ratio | 0.0012 | -0.0246 | 0.0219 |
| Valued living | -0.0769 | -0.2087 | 0.0196 |
| Mindfulness | -0.0443 | -0.1364 | 0.0268 |
| Life satisfaction | | | |
| Acceptance | -0.2390 | -0.7849 | 0.1780 |
| Cognitive fusion | 0.1052 | -0.4866 | 0.8753 |
| Education values ratio | 0.0124 | -0.2704 | 0.2144 |
| Valued living | -1.5330 | -2.8306 | -0.4980 |
| Mindfulness | -0.1139 | -0.9965 | 0.5578 |
| Per protocol sample | | | |
| Depression | | | |
| Acceptance | 0.1573 | -0.9621 | 1.2010 |

(Continues)

TABLE 4 (Continued)

| | Point Estimate | 95% CI | |
|--------------------------|----------------|----------------|----------------|
| | | Lower | Upper |
| Cognitive fusion | 0.2184 | -1.2213 | 2.3015 |
| Education values ratio | -0.9062 | -3.1816 | 0.3581 |
| Valued living | 0.2588 | -2.4474 | 2.6522 |
| Mindfulness | -1.4863 | -3.8531 | 0.8071 |
| <i>Anxiety</i> | | | |
| Acceptance | -0.1287 | -0.8423 | 0.6983 |
| Cognitive fusion | 0.7913 | -0.0913 | 2.3973 |
| Education values ratio | -0.1010 | -0.9338 | 1.2586 |
| Valued living | 1.1705 | -0.7693 | 3.2317 |
| Mindfulness | -0.5518 | -2.6847 | 0.5373 |
| <i>Tress</i> | | | |
| Acceptance | -0.1255 | -1.4625 | 1.0540 |
| Cognitive fusion | 0.0331 | -2.0645 | 2.1931 |
| Education values ratio | 0.2256 | -1.2889 | 2.1243 |
| Valued living | 0.0275 | -4.1932 | 3.0371 |
| Mindfulness | 0.0710 | -2.2241 | 2.6806 |
| <i>Well-being</i> | | | |
| Acceptance | -0.0604 | -0.2552 | 0.0518 |
| Cognitive fusion | 0.1078 | -0.0251 | 0.3046 |
| Education values ratio | 0.0230 | -0.1206 | 0.1380 |
| Valued living | -0.2135 | -0.5243 | 0.0074 |
| Mindfulness | 0.1029 | -0.0516 | 0.3222 |
| <i>Self-compassion</i> | | | |
| Acceptance | -0.0468 | -0.2133 | 0.0394 |
| Cognitive fusion | -0.0689 | -0.2185 | 0.0298 |
| Education values ratio | -0.0593 | -0.1905 | 0.0343 |
| Valued living | -0.0973 | -0.4172 | 0.0943 |
| Mindfulness | -0.1350 | -0.3065 | 0.0115 |
| <i>Life satisfaction</i> | | | |
| Acceptance | -0.2286 | -1.0903 | 0.3523 |
| Cognitive fusion | 0.0981 | -1.2154 | 1.3763 |
| Education values ratio | -0.4673 | -1.8005 | 0.2332 |
| Valued living | -2.5659 | -4.4616 | -0.1395 |
| Mindfulness | -0.3338 | -1.8397 | 1.1183 |

Note. ITT: intention-to-treat ($n = 130$); T1T2: time 1 and time 2 ($n = 49$); per protocol ($n = 29$); CI: confidence interval. Based on 5,000 bootstrapped samples. Significant mediation effects are highlighted in bold.

module 1 $M = 0.78$ [$SD = 0.27$], started/completed module 2 $M = 0.86$ [$SD = 0.48$], and started/completed module 4 $M = 0.52$ [$SD = 0.24$].

To examine whether preintervention scores on the primary outcomes and ACT processes, and sociodemographics in the T1T2 sample were associated with intervention completion, univariate ANOVAs were conducted on continuous

variables (primary outcomes, ACT processes, and age), and chi-square analyses were conducted on the categorical variables (gender and degree level) using the four-level intervention completion variable. Results showed that preintervention primary outcomes, ACT processes, and sociodemographics were unrelated to intervention completion.

3.6 | Program usage

Regarding program functionality and usability, System Usability Scale scores of YOLO were compared to the average score of 500 studies, with scores above 68 considered above average (Sauro, 2011). YOLO mean scores from 49 participants ($M = 79.43$, $SD = 12.66$) were above average, indicating these participants found the program easy to use, well integrated, and consistent. In order to further investigate program acceptability, a one-way ANOVA was conducted using the total System Usability Scale score and level of completion as the factor. Results indicated a significant main effect for completion level $F(3, 45) = 5.18$, $P = 0.004$ with post hoc tests indicating a significant difference in mean scores for participants who completed one module ($M = 65.31$ [SD 11.99]) compared to those who completed four modules ($M = 82.82$ [SD 9.86]). Analysis of the mean scores for each level of intervention completion indicated that groups 2, 3, and 4 had similar means and rated the program higher than those who exited the program in the first module (module 1 $M = 65.31$ [SD 11.99], module 2 $M = 82.50$ [SD 6.85], module 3 $M = 79.29$ [SD 17.37], module 4 $M = 82.82$ [SD 12.67]). Despite not completing the whole program, mean scores for participants who completed more than one module indicated that they viewed the program usability as acceptable. Most (96%) participants used a laptop computer with only a few (4%) using phones and tablets. The majority (92%) of participants reported no difficulty viewing the program on their device of choice and only a few (8%) mentioned difficulty with using full screen mode and a link that was removed mid-program by an external source.

3.7 | Qualitative analysis of participant feedback

Forty-nine participants responded to open-ended questions regarding the program and delivery. Of these, most (59.2%; $n = 29$) completed all four modules (16.3%; $n = 8$ one module, 10.2%; $n = 5$ two modules, 14.3%; $n = 7$ three modules). The three most frequently reported themes for each question are reported. Forty-seven participants responded to the open-ended question asking what they liked about YOLO. Responses fell into two categories, program and content likes. Program likes included the learning format and session duration (28%; $n = 13$), integration and explanations of key concepts (26%; $n = 12$), and the videos (21%; $n = 10$). Regarding content, participants liked the easy to understand, relevant, and practical material (57%; $n = 27$); the helpfulness of the ACT strategies (26%; $n = 12$); and the use of metaphors (17%; $n = 8$).

Thirty-seven participants responded to an open-ended question asking what they disliked about YOLO. Responses fell into two categories, program and content dislikes. Program dislikes included the program being too short (22%; $n = 8$), the cartoon/video aesthetic being distracting (22%; $n = 8$), and technology/website issues (14%; $n = 5$). Content dislikes included excessive repetition of metaphors/concepts (11%; $n = 4$), specific exercise feedback (14%; $n = 5$), and the values module not being engaging (5%; $n = 2$).

Forty-seven participants answered a forced-choice question on program length. Of these, 64% ($n = 30$) endorsed the current 4-week duration, 23% ($n = 11$) endorsed *too short*, and 13% ($n = 6$) endorsed *too long*. Twenty-one participants answered an open-ended question regarding preferred length. Of these, 57% ($n = 12$) preferred it to be longer, 24% ($n = 5$) shorter, and 10% ($n = 2$) preferred less modules. Forty-nine participants responded to an open-ended question regarding reminders with 94% ($n = 46$) accessing reminders and 47 participants responding that they found them helpful (89%; $n = 42$).

Forty-eight participants answered a forced-choice question regarding preferred program delivery, with 52% endorsing completion of the program in their own time over 4 weeks, 25% endorsing one module per week over 4 weeks, and 23% endorsing no preference. Forty-three participants gave reasons for this preference: complete in own time over 4 weeks allows flexibility (56%; $n = 24$), one module a week over 4 weeks creates structure (30%; $n = 13$), and no preference (14%; $n = 6$).

4 | DISCUSSION

As predicted YOLO participants improved from pre- to postintervention on depression, anxiety, stress, well-being, self-compassion, and life satisfaction, and on all of the five ACT processes with mostly small and some medium effect sizes evident in the ITT sample. Program delivery method and preintervention primary outcomes and ACT processes were unrelated to intervention completion; however, postintervention anxiety, acceptance, and education values ratio scores were related to intervention completion. As expected, the psychological flexibility model was supported, with four ACT processes mediating changes on all primary outcomes in the ITT sample, two ACT processes mediating changes in three primary outcomes in the T1T2 sample, and one ACT process mediating change on one primary outcome in the PP sample. Qualitative data and system usability scores from the T1T2 sample supported program feasibility and acceptability. These findings provide preliminary support for the use of an ACT web-based transdiagnostic program to promote mental health in university students.

The improvements on distress, well-being, self-compassion, life satisfaction, and the ACT processes are consistent with previous research that has examined using ACT to promote mental health among university students (Levin et al., 2014; Muto et al., 2011; Rasanen et al., 2016; Stafford-Brown & Pakenham, 2012).

Mediation analyses indicated that one to four of the five ACT process measures in each sample grouping mediated changes in primary outcomes, with acceptance, valued living, and cognitive fusion emerging as the most frequent mediators of change. Few studies on university students have tested whether ACT processes mediate changes on primary mental health outcomes (Levin et al., 2014, 2016; Rasanen et al., 2016). These results highlight the potential of ACT skills training in mental health promotion programs to improve distress and well-being in students.

Qualitative feedback and above average System Usability Scale ratings from the T1T2 sample suggest YOLO is both a feasible and acceptable mental health promotion program for university students. Further analysis using System Usability Scale scores indicated well above average user ratings for participants who completed more than one program module. In addition, feedback identified aspects of the intervention that required revision, such as more flexible delivery, less distracting presentation aesthetics, more engaging values presentation, and more interactive exercises with real life applicable content. Interestingly, only one participant disliked the full web-based format of the program, preferring the inclusion of face-to-face contact.

The prevalence of mild to extremely severe levels of distress in the present sample (48.5–58.5%) is similar to that (51.1–83.9%) of large-scale studies of university students (Eskin et al., 2016; Stallman, 2010). Of specific concern are students falling within the mild to moderate categories, as these distress levels are predictive of future clinically significant mental health problems (Kessler et al., 2002). Notably, distress levels in the present sample were markedly higher than those of other similar web-based ACT intervention studies (Levin et al., 2014, 2016). One possible explanation for this is that the present study recruited across all degree levels, whereas the prior web-based ACT intervention studies (e.g., Levin et al., 2014, 2016) focused on undergraduate samples, resulting in a lower mean age compared to the current study (e.g., Levin et al., 2014, 2016, $M = 18.37$ – 21.61 vs. $M = 26.7$ current study). However, given the highest incidences of distress have been found to occur in the 18–24 age range (Stallman, 2010), these age differences do not adequately explain the higher levels of distress in the present study.

Unexpectedly, the increase in acceptance was nonsignificant in the T1T2 or PP samples; however, it was significant in the ITT sample with a small effect size ($P = 0.000$, $d = 0.37$). Given the small sample sizes of the T1T2 ($n = 49$ and PP ($n = 29$) groups relative to the ITT group ($n = 130$), it is likely the analysis lacked sufficient power to detect the relatively weak improvements in acceptance.

Of the two education values dimensions investigated (education values success and education values ratio), a significant change emerged on the education values ratio in the ITT and PP samples. These results suggest that participants reported an increase at postintervention in being more intrinsically (vs. extrinsically) motivated in pursuing their education values. Few ACT intervention studies have investigated education values. Levin et al. (2014) found a significant increase for education values success from pre- to postintervention; however, they were unable to replicate this finding in a subsequent evaluation of their ACT-CL intervention (Levin et al., 2016). The lack of a significant increase in

education values success in the present study may be due to a ceiling effect (not evident with the values ratio score), given preintervention mean education values success scores were relatively high. This is not surprising, given students are likely to possess high education values, motivating them to undertake university study. In addition, given the significant increase in valued living scores, it also appears that the intervention effectively prompted students to focus on connecting with values in other life domains, yielding a more balanced engagement with values across multiple areas of living.

Lastly, alcohol and drug use did not significantly change. Reported alcohol and drug use in this study was low at preintervention, and was below levels often found in this population (Blanco et al., 2008), indicating a likely floor effect. It is also possible that alcohol and drug use was underreported.

In comparison to other web-based ACT studies using university students, program (27%) and postintervention assessment (39%) completion rates for the present study were relatively low. Levin et al. (2014) reported a 92% program completion rate with almost all participants completing postintervention and follow-up assessments. However, participants were paid \$60 and interviewed in person, potentially influencing motivation for completion. In their subsequent study with no face-to-face contact and a \$10 incentive payment, Levin et al. (2016) reported completion rates of 85% (module 1) and 55% (module 2), with postintervention, 1- and 3-month follow-up assessment completion rates at 70%, 64%, and 63%, respectively; a marked drop from the previous study. When ACT-CL was used as an adjunctive with face-to-face counseling, Levin et al. (2015) reported lower completion rates of 67% (module 1), 49% (module 2), and 38% (module 3), and a postintervention assessment completion rate of 44%. Finally, Rasanen et al. (2016) reported high program completion rates of 85% and postintervention and follow-up assessment rates of 88% and 78.8%, respectively. However, this study included two face-to-face sessions at the beginning and end of the study, which potentially enhanced participation. Retention is a widely documented difficulty for web-based mental health programs in various populations (Eysenbach, 2005), including students (Christensen, Griffiths, & Farrer, 2009), with meta-analyses recording completion rates between 2% and 83% (Melville et al., 2010).

High levels of attrition do not necessarily indicate low student acceptability or efficacy. Despite high rates of attrition in the present study, qualitative data from the T1T2 sample indicated participants with various levels of program completion reported that the intervention was useful and acceptable. In a large-scale study of the acceptability and utility of a web-based resilience program for university students, 50% of participants left the home page without viewing further material, and only one-quarter engaged in a single session averaging 5.3 min (Stallman & Kavanagh, 2016). Despite this apparent minimal engagement, the program was rated as acceptable, helpful, and useful for students. These findings support the notion that students do not have to complete an entire web-based mental health promotion program in order to benefit from it. Further, Stallman and Kavanagh (2016) found only one-quarter of participants to be repeat users of their program, with a repeat user being a participant who used the program more than once. In the present study, 62.3% ($n = 81$) were repeat users (i.e., they revisited the program more than once). Additionally, Christensen et al. (2006) noted only a 7% completion rate of their web-based program MoodGYM for university students and highlighted the need to identify the many types of users of web-based interventions, given a low number of participants are likely to complete entire interventions. It may simply be the case that participants take what they need and cease use. Finally, given there was no face-to-face contact in the present study and participants were not paid or rewarded academically for participation, this may have contributed to the lower retention rates.

Finally, the lack of between group differences and high level of attrition over the three intervention groups was an interesting finding given one of the main objectives of the study was to ascertain an acceptable delivery method for the program. Based on qualitative data, the most disliked delivery method was that of Group 3, where participants had to wait 3 days after completing a module before beginning the subsequent module. Participants commented that this delivery method did not allow for flexible use of the program. In addition, this delivery method did not allow participants to continue with the program when their engagement was high, resulting in dissatisfaction and reduced involvement in the program. Also of note, Group 2, who were simply given 4 weeks to complete the program with no recommended completion, showed higher rates of not beginning the program compared to the other groups (Group 1: 23%, Group 2: 30%, and Group 3: 23%). This may indicate that not providing any structure to participants resulted in higher

rates of disengagement or procrastination, than those given more constraining completion instructions. Program completion analyses indicated that a structured approach with flexibility suits this population and gives them incentive to complete within a given timeframe. Qualitative data indicated that 52% of participants completed the program in their own time over 4 weeks and 89% of participants endorsed the helpfulness of reminder e-mails. These findings suggest that a balance between structure and flexibility is preferred by students accessing web-based mental health programs.

This study had several limitations. First, the study did not use a control group, therefore intervention effects should be evaluated with caution. Second, there was no follow-up assessment; therefore, it is unclear whether the intervention effects are likely to be sustained beyond program completion. Third, although completion rates were low and lead to 61% missing data in the ITT sample, a robust imputation method was used, and results were similar across the three sample groupings. Fourth, the large number of tests undertaken increases the risk of Type I error rate; however, treatment effects in all samples were significant at $P < 0.01$ with effect sizes being small to medium. Fifth, the nonrandom sampling and the high proportion of female participants limits the generalizability of findings. Lastly, the relatively small sample size is problematic, as preventative research requires large samples in order to gauge preventative effects (Munoz, Cuijpers, Smit, Barrera, & Leykin, 2010).

5 | CONCLUSION

Findings from this pilot study show preliminary support for the effectiveness, feasibility, and acceptability of a web-based ACT program for promoting mental health in university students. Findings showed that program participation was associated with improved mental health skills such as acceptance, defusion, valued living, and mindfulness, which show potential in improving well-being, self-compassion, life satisfaction, and distress. Future large-scale randomized controlled trials of YOLO are necessary. Such research should consider modifying YOLO in accord with participant suggestions from this study. These preliminary findings suggest the YOLO program is an effective web-based ACT intervention for promoting mental health in university students and, therefore, warrants further research to evaluate efficacy.

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