

Assessing psychological inflexibility in university students: Development and validation of the  
acceptance and action questionnaire for university students (AAQ-US)

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### Abstract

This study sought to develop and validate a domain-specific measure of psychological inflexibility for university students, the acceptance and action questionnaire for university students (AAQ-US). Generic versions of the AAQ tend to not be as sensitive to changes in campus-specific functioning—a key outcome of interest in this population. An online survey was conducted with 425 undergraduate students. Psychometric analyses led to the refinement of a 12-item, single factor scale with strong internal consistency. Evidence for convergent validity was found with moderate to large correlations between the AAQ-US and measures of academic outcomes, mental health, and psychological inflexibility. The AAQ-US was a stronger predictor of academic outcomes than the AAQ-II (a general measure of psychological inflexibility) whereas the AAQ-II was more strongly related to mental health outcomes than the AAQ-US. Incremental validity for the AAQ-US was found for predicting both academic and mental health outcomes while controlling for the AAQ-II, though effects were stronger for academic outcomes. Overall, results indicate that the AAQ-US is a reliable and valid measure of psychological inflexibility among university students and may be particularly relevant in the context of academic outcomes.

*Keywords:* Psychological flexibility; Acceptance and Commitment Therapy; Mindfulness; Experiential avoidance; College students.

Assessing psychological inflexibility in university students: Development and validation of the acceptance and action questionnaire for university students (AAQ-US)

Mental health problems, including depression, anxiety, eating disorders, and substance abuse, are prevalent among university students (e.g., Blanco et al., 2008; Lipson et al., 2015). These mental health problems have numerous negative effects on students and their institutions including challenges with retention (Hunt, Eisenberg & Kilbourne, 2010) and academic functioning (American College Health Association, 2016; Eisenberg, Golberstein & Hunt, 2009). These deleterious effects on academic success are particularly important given their impact over time on students' functioning during and following their time in school, which might further exacerbate decreased quality of life and mental health.

One psychological process that is a promising target for interventions seeking to improve university student mental health and its impact on academic success is psychological inflexibility. This process can be defined as the tendency to rigidly engage in behaviors based on internal experiences (e.g., avoiding unwanted thoughts and feelings, acting on urges or thoughts) at the expense of more effective or meaningful activities. For example, when a student consistently avoids going to class or procrastinates doing homework when experiencing anxiety and worry. A large number of survey studies indicate that psychological inflexibility contributes to a wide range of mental health problems among university students including depression, anxiety, substance abuse, and eating disorders (e.g., Levin, MacLane, et al., 2014; Masuda et al., 2014; Pierce et al., under review). Preliminary research also suggests psychological inflexibility relates to academic variables such as general academic distress (Pierce et al., under review) and procrastination (Glick, Millstein & Orsillo, 2015).

Not only does psychological inflexibility predict mental health and academic success variables, but research indicates that treatments designed to target psychological inflexibility might be able to improve these student outcomes. Acceptance and commitment therapy (ACT; Hayes, Strosahl & Wilson, 2012) is a contextual cognitive behavioral therapy that is specifically designed to reduce psychological inflexibility through a combination of acceptance, mindfulness, and values-based treatment strategies. ACT has been found to be effective among university students in randomized controlled trials (RCTs) for problems including depression, anxiety, stress, and academic functioning (e.g., Brown et al., 2011; Glick & Orsillo, 2015; Levin et al., 2017; Rasanen et al., 2016). Overall, these results suggest that psychological inflexibility is a broadly relevant process to student mental health and associated academic functioning and that treatments like ACT might be widely applied to improve these problems.

Although research has indicated the utility of psychological inflexibility as a transdiagnostic risk factor to target among university students, there are also some mixed findings for psychological inflexibility as a mechanism of change. Research on psychological inflexibility to-date has primarily used the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004), or its newer version, the AAQ-II (Bond et al., 2011). Outside of university student populations, a number of RCTs have found that changes in AAQ scores from ACT predict or statistically mediate the impact of ACT on mental health outcomes (e.g., Fledderus et al., 2013; Niles et al., 2014; Twohig, Plumb-Villardaga, & Hayes, 2015; Zarling, Lawrence & Marchman, 2015). However, the AAQ as a measure of psychological inflexibility has been inconsistent in detecting the effects of ACT among university students. Several RCTs with university students have found null results for ACT improving AAQ scores, despite largely positive results in the same trials for problems including depression and anxiety (e.g., Levin, Pistorello et al., 2014;

Levin et al., 2017; Rasanen et al., 2016), test anxiety (Brown et al., 2011), weight concerns (Katterman et al., 2014) and academic functioning (Glick & Orsillo, 2015).

Although these studies might suggest that ACT does not reduce psychological inflexibility as a mechanism of change for improving mental health and academic success among university students, this is unlikely as psychological inflexibility has been a robust mechanism of change in countless studies for ACT in other treatment settings and populations (e.g., Twohig et al., 2015). A more plausible explanation is that, as found in other settings, the generic AAQ is not sensitive enough to detect treatment effects from ACT *among university students*. In other words, findings that ACT fails to reduce psychological inflexibility among university students appears more likely to be due to measurement failure, rather than failure of theorized mechanisms of change.

In fact, researchers have often developed domain-specific versions of the AAQ when examining unique problem areas or populations such as smoking (Avoidance and Inflexibility Scale; Gifford et al., 2004), parenting (Parental AAQ; Green, Field, Fargo & Twohig, 2015), weight (AAQ for Weight-Related Difficulties; Lillis & Hayes, 2009), work settings (Work-Related AAQ; Bond et al., 2012), and stigma (AAQ – Stigma; Levin, Lillis, et al., 2014). These domain-specific versions of the AAQ provide a more face valid assessment of psychological inflexibility as it directly relates to relevant contexts. More importantly, research indicates that relative to the general AAQ, domain-specific versions of the AAQ are more strongly predictive of relevant outcomes (e.g., Bond et al., 2012; Levin, Lillis, et al., 2014) and are more sensitive to detecting the treatment effects from ACT (e.g., Gifford et al., 2011; Lillis & Hayes, 2009). In summary, the general AAQ does not appear to be as sensitive to detecting the effects of ACT among university students, but a domain-specific version of the AAQ may address this gap in the

research literature. Developing such a measure could help guide research seeking to further our understanding of psychological inflexibility as a transdiagnostic risk factor and process of change in treatments for university students. Perhaps the most campus-specific and outcome of interest to key stakeholders (e.g., university administrators) is academic functioning and this is not currently captured through the generic AAQ. To-date an AAQ specific to university contexts has not been developed.

Thus the current study sought to develop and validate a new measure of psychological inflexibility for university students specifically in relation to students' school-related experiences (e.g., studying, in class). This focus is consistent with research indicating that mental health problems impact academic success (Eisenberg et al., 2009; Hunt et al., 2010), that psychological inflexibility relates to academic struggles (Glick et al., 2015; Pierce et al., under review), and that ACT can improve academic functioning among university students (Glick & Orsillo, 2015; Sandoz et al., 2017). A pool of items was developed and administered as part of a larger online survey in a sample of 425 undergraduate students who were 18 years of age or older and participating for course credit. Psychometric analyses were conducted to develop a final AAQ for University Students (AAQ-US). Additional analyses examined the reliability and validity of the AAQ-US, including how it performs relative to the general AAQ-II. If successful, this study would provide a more sensitive and refined measurement tool to guide research and clinical practice related to psychological inflexibility and its amelioration among university students.

## **Methods**

### **Participants**

A sample of 425 undergraduate university students who were at least 18 years of age participated in this study. The study was conducted at a public land-grant university in the

Mountain West region of the United States. The university has a large student body of over 25,000 with a notable portion of students in regional campuses and distance education.

Participants were recruited through the Sona research participation platform, a commonly used online system by universities where students in relevant departments (primarily psychology at the current institution) can sign up for studies in exchange for course credit as permitted by their instructors.

In terms of demographic information, the average age was 21.06 ( $SD=4.57$ , range: 18 to 52). The sample was 57.4% female, 42.4% male, and 0.2% other. The sample was homogeneous in ethnicity (3.8% Hispanic/Latino, 96.2% not Hispanic/Latino) and race (92.7% White, 2.6% biracial/multiracial, 1.9% Black, 0.7% American Indian/Alaska Native, 0.7% Asian, 0.2% Native Hawaiian/Pacific Islander, and 1.2% other). The median gross annual income for students' primary household was \$40,000 - \$60,000 with approximately 26% earning less than \$20,000 and 18% earning \$100,000 or more. In terms of relationship status 58% were single, 27% dating, 14% married, and .5% divorced or widowed.

In terms of student demographics, most participants reported being early in their university career (56.9% in the first year, 26.1% in the second, and 16.9% in their third year or later). A total of 87% were students taking classes primarily on the main campus, 8% regional campus students (on a smaller campus in a different county), and 5% were students primarily taking classes online. The average self-reported grade point average (GPA) among participants was 3.34 ( $SD=0.48$ , range = 1.00 to 4.00).

Rates of mental health concerns were examined using empirical cutoff scores on the Counseling Center Assessment of Psychological Symptoms (CCAPS-34; CCMH, 2012). Overall, 57% of the sample was elevated on one or more subscale of the CCAPS, indicating

some mental health concern. More specifically, 22% were depressed, 23% generally anxious, 23% socially anxious, 17% academically distressed, 33% reported eating concerns, 15% reported hostility concerns, and 10% reported alcohol problems.

### **Procedures**

After providing informed consent participants were automatically directed to complete an online survey hosted on the secure Qualtrics platform. Assessments were completed anonymously and participants were able to skip any question they preferred not to answer. All study procedures were approved by the Institutional Review Board of the first author's university. Participants who reported moderate suicidal and/or violent thoughts were provided with information on mental health resources available.

### **Outcome Measures**

*Counseling Center Assessment of Psychological Symptoms (CCAPS-34; CCMH, 2012)*. The CCAPS-34 is a 34-item measure of mental health problems in university students that provides a total distress score as well as subscales for depression, general anxiety, social anxiety, academic concerns, eating concerns, hostility, and alcohol use. Each item is rated from 0 ("Not at all like me") to 4 ("Extremely like me"). The total score for each CCAPS subscale is calculated as a mean value ranging between 0 and 4, with higher scores indicating greater distress. The CCAPS-34 has demonstrated good internal consistency and convergent validity in university students (CCMH, 2012; Locke et al., 2012). Internal consistency was good to excellent in the present sample (distress  $\alpha = 0.93$ , depression  $\alpha = 0.88$ , general anxiety  $\alpha = 0.85$ , social anxiety  $\alpha = 0.79$ , academics  $\alpha = 0.79$ , eating concerns  $\alpha = 0.84$ , hostility  $\alpha = 0.81$ , alcohol  $\alpha = 0.85$ ).

*Social Adjustment Scale-Self Report (SAS-SR; Weissman & Bothwell, 1976)*. The 6-item Student and 9-item Social/Leisure subscales of the SAS-SR were used to assess functioning



in the respective domains. Each item is rated on a 5-point scale in reference to the timeframe of the past two weeks. Subscale values are calculated as the mean item rating with a range of 1 to 5 with higher scores indicating greater functional impairment. The SAS-SR has been found to have adequate reliability and validity in past studies (Edwards et al., 1978; Weissman & Bothwell, 1976). Internal consistency was acceptable in the current sample (Social/Leisure  $\alpha = 0.70$ , Student  $\alpha = 0.71$ ).

***Irrational Procrastination Scale (IPS; Steel, 2010).*** The IPS is a 9-item measure of irrational procrastination. Each item is rated on a 5-point Likert scale from “Very seldom or not true of me” to “Very often true, or true of me.” The total score ranges from 9 to 45 with higher scores indicating greater procrastination. The IPS has demonstrated excellent internal consistency and convergent validity in a diverse sample (Steel, 2010). Internal consistency was good in this sample ( $\alpha = 0.88$ ).

***Test Anxiety Inventory (TAI) – Short Form (Taylor & Deane, 2002).*** The 5-item short form version of the TAI was administered as a measure of test anxiety. Each item is rated on a 4-point Likert scale from “Almost never” to “Almost always,” with instructions that ask participants to consider how they “generally feel.” The total score ranges from 5 to 25 with higher scores indicating greater anxiety. The 5-item version has demonstrated good internal consistency and validity in university students (Taylor & Deane, 2002). Internal consistency was excellent in the present sample ( $\alpha = 0.94$ ).

***Self-Reported GPA.*** Participants were asked to self-report their approximate university GPA as a measure of academic grades.

### **Psychological Inflexibility Measures**

*Acceptance and Action Questionnaire – II (AAQ-II; Bond et al., 2011).* The AAQ-II is the most commonly used general measure of psychological inflexibility. The 7-item version of the measure was used with items scored from 1 (“Never true”) to 7 (“Always true”). Total scores range from 7 to 49 with higher scores indicating greater inflexibility. The AAQ-II’s reliability and validity has been demonstrated in university students (Bond et al., 2011). Internal consistency was excellent in the current study sample ( $\alpha=0.92$ ).

*Valuing Questionnaire (VQ; Smout, Davies, Burns, & Christie, 2014).* The VQ is a 10-item measure of valued living with two 5-item subscales, Progress (in moving toward personal values) and Obstruction (the tendency for internal experiences to interfere with personal values). These aspects of valued living (low progress and difficulty engaging in actions consistent with personal values) are sub-processes of psychological inflexibility. Items are rated from 0 (“Not at all true”) to 6 (“Completely true”) in reference to the past week. Each subscale ranges from 0 to 30 with higher scores on progress indicating more valued action and higher scores on obstruction indicating more difficulty with valued action. Initial research on the VQ indicate adequate internal consistency and convergent validity in university students (Smout et al., 2014). Both subscales had good internal consistency (Obstruction  $\alpha = 0.82$ , Progress  $\alpha = 0.85$ ) in the current sample.

*Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT; Francis, Dawson, & Golijani-Moghaddam, 2016).* The CompACT is a newly developed, 23-item measure of psychological flexibility, the inverse of psychological inflexibility in which individuals engage in valued actions, while being mindful and accepting of internal experiences that arise. The CompACT includes three subscales that assess more specific sub-processes involved in psychological flexibility, Openness to Experience (responding to inner

experiences just for what they are, without being overly controlled by them or trying to avoid them), Behavioral Awareness (awareness of the present moment), and Valued Action (clarity regarding personal values and actions consistent with these values). Each item is rated from 0 (“Strongly disagree”) to 6 (“Strongly agree”). The range of scores for each subscale are 0 to 30 for behavioral awareness, 0 to 60 for openness to experience, and 0 to 48 for valued action, in each case such that higher scores indicate greater flexibility. The CompACT has demonstrated adequate reliability and validity (Francis et al., 2016) and internal consistency was adequate in the present sample (Openness to Experience  $\alpha = 0.78$ , Behavioral Awareness  $\alpha = 0.83$ , Valued Action  $\alpha = 0.88$ ).

### **Initial Scale Development**

A pool of 50 items were developed by the study authors to assess psychological inflexibility relevant to university students, specifically in the context of school-related behaviors and settings. The authors are experts in applying ACT with university students (*citation removed for blind peer review*), and also have experience in developing measures of psychological inflexibility (*citation removed for blind peer review*). First a set of content categories were identified in which psychological inflexibility might apply to university students in the context of school-related behaviors including 1) difficult internal experiences as obstacles to effective/valued actions in school, 2) perfectionism and perseveration with school work (particularly as it relates to avoiding unwanted inner experiences or fused responses to thoughts about school), 3) avoidance, suppression, and other experientially avoidant behaviors in response to inner experiences related to school, 4) fusion with difficult thoughts related to school, 5) being on autopilot (not mindful) or difficulty attending in relation to school, and 6) a sense of purpose and values in relation to school. Between 4 and 11 items were generated for each of these content

categories, with items based on or informed by other established measures of psychological inflexibility and related sub-processes when possible (e.g., Bond et al., 2011; Gamez et al., 2011).

The instructions for responding to these set of items stated “Below you will find a list of statements regarding experiences university students might have. Please rate how true each statement is for *you*. Use the scale below to make your choice.” Participants provided responses on a 7-point scale ranging from 1 (“Never true”) to 7 (“Always true”).

### **Data Analysis**

There was minimal missing data from the survey, with 3-4 participants (~1%) missing data for each AAQ-US item and other variables. Therefore, listwise deletion was used for all analyses.

Preliminary item reduction was conducted based on observed zero order correlations between AAQ-US items and criterion variables, with items removed due to a lack of correlation with relevant measures of mental health, academic functioning, and/or psychological inflexibility. Item distribution was also examined, with items removed due to excessive skewness and/or unbalanced responding patterns (e.g., most respondents providing the same answer). Following these steps, an exploratory factor analysis (EFA) was conducted to determine whether a single factor solution was justifiable based on eigenvalues and factor loadings of items. The goal of these analyses was to develop a unidimensional scale given that past research has often found a single factor solution (or highly correlated two factor solution) for AAQ measures and their variants (e.g., Hayes et al., 2004; Bond et al., 2011; Bond et al., 2015; Lillis & Hayes, 2009). Based on the EFA findings and the goals of this measure, a series of principal components analyses (PCA) were then conducted. An initial decision rule for item removal was a factor

loading below .40 (Floyd & Widaman, 1995), but higher cutoff scores were used for final item reduction due to most items having a factor loading above .40 and the goals of providing a relatively short measure for practical use.

Once a final set of items was identified, descriptive statistics and reliability were examined to provide basic psychometric information. Convergent validity was examined using zero-order correlations between the AAQ-US and relevant measures of mental health, academic functioning, and psychological inflexibility. Correlations between the AAQ-US and these criterion variables were compared to correlations between the AAQ-II and the same criterion variables using Fisher's *Z* tests to provide a preliminary test of whether the AAQ-US is more strongly correlated with psychological outcomes in university samples. A series of hierarchical regressions were then conducted with the AAQ-II entered as a predictor in the first step, and the AAQ-US as an additional predictor in the second step, which provided a test of the incremental validity of the AAQ-US in predicting outcomes above and beyond a general measure of psychological inflexibility. For academic variables, a third step was added with the CCAPS total distress variable to test whether the AAQ-US continued to predict academic functioning even when controlling for psychological distress. Finally, known groups' validity was tested with independent sample *t*-tests by comparing AAQ-US scores between groups of students based on recommended cutoff scores using the CCAPS (CCMH, 2012).

## **Results**

### **Scale Refinement**

As a first step, correlations between each AAQ-US item and relevant criterion variables (academic, mental health, and psychological inflexibility measures) were examined. A total of 15 AAQ-US items were identified for removal due to an overall pattern of low correlations (below

.15) or correlations in the opposite direction with criterion variables (greater inflexibility related to less mental health problems). The distribution of each of the remaining 35 items was examined. No items were identified for removal due to skewness or unbalanced responding.

An EFA without rotation was then conducted with the remaining 35 items. The first factor had an eigenvalue of 11.43 and accounted for 33% of the variance. There was a large drop after the first factor, with the subsequent six factors having eigenvalues and % variance of 2.86 (8%), 2.37 (7%), 1.32 (4%), 1.21 (3%), 1.09 (3%), and 1.03 (3%), before dropping below an eigenvalue of 1. Visual inspection of the scree plot indicated two potential “elbows” in which eigenvalues plateaued at the second or fourth factor. Inspection of the factor loading values for each item did not readily provide interpretable distinct loadings of items onto factors 2 and 3, relative to factor 1. Overall this pattern supported a reasonable single factor solution and the questionable utility of a multi-factor solution. This is consistent with the results from many domain-specific AAQ variants, which have typically had a single factor structure or two highly correlated factors reflecting positive and negatively worded items (e.g., Hayes et al., 2004; Bond et al., 2011; Bond et al., 2015; Lillis & Hayes, 2009). That in combination with the rationale for the utility of a single factor solution supported the use of PCA for scale refinement.

The first PCA was conducted forcing a single component solution with the 35 items. Component loadings varied between .31 and .79. A total of 10 items were identified for removal due to loadings below .5. A third PCA was conducted with the remaining 25 items forcing a single component solution. The component accounted for 39.26% of the variance with loadings ranging between .81 and .49. In order to reduce the scale to a shorter length for practical utility and given the single component being assessed, items were removed if they loaded below .6 on the first component. This led to the removal of 12 additional items.

The internal consistency of the remaining 13 items was examined. One item was indicated for removal to increase internal consistency (changing the  $\alpha$  from .89 to .91 if deleted). A PCA was conducted with the final 12 items (see Table 1). The component accounted for 51.38% of the variance with loadings ranging between .63 and .83.

This final set of 12 items had good face validity in assessing relevant features of psychological inflexibility among university students. This included (a) how internal experiences function as a barrier to effective/valued action (e.g., “Worries get in the way of my success at school” and “I find myself avoiding going to classes when I feel anxious or depressed”); (b) cognitive fusion with thoughts related to school (e.g., “I struggle with my thoughts about school” and “I often believe that I’m not smart enough to be in college or in this major”); (c) disconnect between values and actions with school (e.g., “It seems like I’m just “going through the motions” at school”); and (d) difficulty attending to the present (e.g., “It’s hard for me to focus on what my professors are saying in classes” and “I get so caught up in my worries during tests that I have trouble focusing on the test itself”).

### **AAQ-US Measure Scoring**

The final AAQ-US included 12 items (see Table 1). All items are written such that higher scores indicate greater psychological inflexibility. These items can be summed to create a total AAQ-US score. The average AAQ-US score in the sample was 41.53 ( $SD = 13.34$ ) with a range of scores between 12 and 77. The internal consistency for the AAQ-US was  $\alpha = .91$ .

### **Validity of the AAQ-US**

*Preliminary analyses.* Prior to conducting correlations, all variables were checked for skewness and kurtosis. Four variables (CCAPS hostility, CCAPS alcohol, SAS-SR social functioning, and SAS-SR student functioning) were identified as having non-normal

distributions. Logarithmic transformations produced normal distributions for CCAPS hostility and SAS-SR social functioning, while an exponential transformation produced a normal distribution for SAS-SR student functioning. CCAPS alcohol continued to be highly skewed (1.83) and leptokurtic (1.75) due to 79% of students scoring a zero. Thus the CCAPS alcohol subscale was excluded from all analyses.

*Correlations with academic and mental health outcomes.* Significant correlations were found between the AAQ-US and all five academic outcomes with correlation coefficients ranging between .33 and .72 (see Table 2). Significant correlations were also found between the AAQ-US and all seven mental health outcomes with correlation coefficients ranging between .31 and .65. In each case, correlations were in the expected direction with greater psychological inflexibility relating to greater academic and mental health problems.

*Correlations with psychological inflexibility measures.* Significant correlations were found between the AAQ-US and all six measures of psychological inflexibility with correlation coefficients ranging between .47 and .65 (see Table 2). In each case, greater psychological inflexibility with the AAQ-US was related to greater psychological inflexibility as assessed by other measures.

Of note, the AAQ-US was more strongly correlated with the AAQ-II than CompACT Valued Action ( $Z = 5.15, p < .001$ ) and Valuing Questionnaire (VQ) Progress ( $Z = 5.42, p < .001$ ) subscales, suggesting the AAQ-US is more strongly correlated with measures of psychological inflexibility broadly than values more specifically. The VQ Obstruction subscale was also particularly highly correlated with the AAQ-US, but this scale is very similar to the AAQ-II with items assessing the degree to which internal barriers impede valued action.



Consistent with this, the VQ obstruction subscale was more strongly correlated ( $Z = 6.37, p < .001$ ) with the AAQ-II,  $r = .69, p < .001$ , than with the VQ progress subscale,  $r = .49, p < .001$ .

*Comparisons of correlations with the AAQ-II.* The AAQ-II was significantly correlated with all academic and mental health outcomes with correlation coefficients ranging between .15 and .77 (see Table 2). This raised questions regarding the incremental validity of the AAQ-US relative to the AAQ-II. Fisher's  $Z$  tests indicated that the AAQ-US had significantly larger correlations with all five academic outcomes relative to the AAQ-II whereas the AAQ-II was more strongly correlated with five mental health outcomes relative to the AAQ-US. Of note, the mental health correlations were primarily in the area of depression and anxiety symptoms, which have been found to be particularly highly related to the AAQ-II in previous studies with university students (e.g., Levin, MacLane et al., 2014).

*Incremental validity of the AAQ-US in hierarchical regression models with the AAQ-II.* A series of hierarchical regression models tested the incremental validity of the AAQ-US in predicting outcomes above and beyond the AAQ-II (see Table 3). For academic outcomes, in the first step the AAQ-II predicted each outcome with  $R^2$  values ranging between .02 and .38. In the second step, the AAQ-US significantly predicted academic outcomes above and beyond the AAQ-II with increases in  $R^2$  values ranging between .10 and .22. Furthermore, after controlling for the AAQ-US, the AAQ-II no longer predicted three of the five academic outcomes, suggesting the AAQ-US accounted for the variance predicted by the AAQ-II.

For academic outcomes, a third step was added to examine whether the AAQ-US continued to predict academic functioning, even when controlling for distress (CCAPS total distress score). For each academic variable, the AAQ-US continued to significantly predict outcome when controlling for distress. In contrast, CCAPS distress only related to

procrastination, student functioning (SAS-SR), and academic distress (CCAPS) in these models when controlling for the AAQ-II and AAQ-US.

For mental health outcomes, in the first step the AAQ-II predicted each outcome with  $R^2$  values ranging between .13 and .60. In the second step, the AAQ-US significantly predicted six of the seven mental health outcomes above and beyond the AAQ-II (except CCAPS Hostility) with small increases in  $R^2$  values ranging between .01 and .03. The AAQ-II continued to significantly predict each mental health outcome after controlling for the AAQ-US.

*Known groups' validity.* AAQ-US scores were compared between students who were above or below validated cutoff scores on the CCAPS for elevated distress using independent sample *t*-tests (See Table 4). AAQ-US scores were significantly higher among distressed students based on each CCAPS subscale relative to students who did not have any elevated CCAPS scores. Effect sizes on the AAQ-US between groups were all large with Cohen's *d* values ranging between .90 and 2.17.

## Discussion

This study sought to develop and examine the psychometric properties for a measure of psychological inflexibility specifically designed for university students (e.g., academic functioning). Psychometric analyses led to the refinement of a 12-item, single factor scale with good internal consistency. Evidence for convergent validity was found with moderate to large correlations between the AAQ-US and measures of academic outcomes, mental health, and psychological inflexibility. There was strong support for divergent validity of the new measure relative to the generic AAQ: The AAQ-US was a stronger predictor of academic outcomes whereas the AAQ-II was more strongly related to mental health outcomes. The instrument also showed divergent validity relative to other ACT processes: There were stronger correlations

between the AAQ-US and the AAQ-II relative to measures of values processes (a psychological inflexibility sub-process less directly assessed by the AAQ). Incremental validity for the AAQ-US was found for predicting both academic and mental health outcomes while controlling for the AAQ-II, though effects were much stronger for academic outcomes. Known groups' validity was supported with large effect sizes between students who were or were not elevated on CCAPS mental health subscales. Overall, these results indicate that the AAQ-US is a reliable and valid measure of psychological inflexibility among university students and may be particularly relevant in the domain of academic functioning.

Previous research indicates that domain-specific measures of psychological inflexibility are stronger predictors of psychological outcomes than the general AAQ/AAQ-II (g., Bond et al., 2013; Levin, Lillis et al., 2014) and are more sensitive to detecting the effects of ACT interventions (e.g., Gifford et al., 2011; Lillis & Hayes, 2009). This study found a similar pattern in the area of academics with the AAQ-US being more strongly related to general academic distress, test anxiety, procrastination, and GPA relative to the AAQ-II. Furthermore, hierarchical regression results indicated that the AAQ-US often accounted for the variance in academic outcomes predicted by the AAQ-II such that the AAQ-II was no longer a significant predictor. This suggests the AAQ-US captures a similar psychological inflexibility process while accounting for more variance overall. The AAQ-US was also highly related to measures of psychological inflexibility, suggesting this measure is more sensitive and apt for examining psychological inflexibility in the context of academic issues.

This study also found that the AAQ-US was less strongly related to many mental health outcomes than the generic AAQ. Although the AAQ-US was still strongly correlated with mental health, these relations were somewhat weaker than the AAQ-II in the student sample. This is

consistent with a previous study validating a measure of psychological inflexibility in workplace settings, which found that the AAQ for work-related issues was a stronger predictor of worksite functioning, but was a weaker predictor of general mental health relative to the AAQ-II (Bond et al., 2013). It makes sense that the AAQ-US is more sensitive to detecting academic functioning outcomes given the items were framed in relation to unique aspects of the campus setting (e.g., homework, experiences in class). This was done in order to frame psychological inflexibility in a university specific context that would be likely to be relevant to all students (as opposed to more general and varied experiences in home life, relationships, social activities, and so on).

Possibly as a result of the focus on school contexts, the AAQ-US may be most relevant for research studying psychological inflexibility in relation to academics, which, in the case of college students, it is a key outcome of interest in gauging the impact of psychosocial interventions (cf. Kay & Schwartz, 2010). This is an understudied area, although preliminary studies indicate psychological inflexibility is related to academic behaviors such as procrastination (e.g., Glick et al., 2015) and that ACT can improve academic problems and outcomes such as procrastination (e.g., Glick & Orsillo, 2015), test anxiety (e.g., Brown et al., 2011), grades and graduation (e.g., Sandoz et al., 2017). These studies often find improvements in academic outcomes, but not improvements in psychological inflexibility measured with a generic AAQ (e.g., Brown et al., 2011; Glick & Orsillo, 2015; Sandoz et al., 2017), suggesting a more targeted measure like the AAQ-US could be used to further guide research in this area.

Previous research has similarly found that the generic AAQ/AAQ-II is often not sensitive to detecting the effects of ACT interventions that improve mental health among university students (e.g., Levin, Pistorello, et al., 2014; Levin et al., 2017; Rasanen et al., 2016). Although the AAQ-US is more sensitive to predicting academic outcomes, it may also be sufficiently

sensitive to detecting improvements in psychological inflexibility with interventions such as ACT that target mental health more broadly. In support of this hypothesis, ACT intervention studies with university students have sometimes found other measures of psychological inflexibility related to academics are sensitive to detecting treatment effects (e.g., Valued Living Questionnaire Education domain, Sandoz et al., 2017), even when the focus is on mental health and the AAQ-II does not improve (e.g., Personal Values Questionnaire [PVQ] Education domain, Levin, Pistorello et al., 2014). For example, a RCT with 76 undergraduate students found that an ACT website led to improvements in mental health as well as education values assessed by the PVQ (an aspect of psychological inflexibility assessed specifically in relation to academics), but not the AAQ-II (Levin, Pistorello et al., 2014). Thus, the AAQ-US might be most confidently applied as a measure of psychological inflexibility in relation to academics among university students, but may still be relevant more broadly to mental health.

This highlights a primary limitation of the current study, which is that it cannot yet answer the question of whether or not the AAQ-US is more sensitive than the generic AAQ in detecting the effects of treatments like ACT that target psychological inflexibility. Thus, future research is needed to determine whether the AAQ-US provides a more sensitive measure for studies applying ACT to academic behaviors or mental health more broadly among university students. Although the AAQ-II has clearly had mixed results in ACT interventions among university samples, it is less clear whether the AAQ-US will be more sensitive to detect changes in this putative ACT mechanism.

Another key limitation in this study was the use of a homogeneous sample of students that was not representative of university students in general in the United States (Musu-Gillette et al., 2017). The sample was recruited from a single university, largely from psychology courses

that offered course credit for participation. Consistent with the demographics of the university, the sample was largely white, with few minority students, but this diverges substantially from nationally representative data on student race/ethnicity in the United States (Musu-Gillette et al., 2017). Furthermore, data regarding other student factors relevant to academic success were not measured for potential generalizability such as first-generation student status and sexual minority status. It is unclear if the AAQ-US would demonstrate similar validity and reliability in more diverse or distinct samples relevant to universities, including those for whom student success issues may be most relevant (e.g., first-generation and non-traditional students). Furthermore, items that were excluded may have actually been relevant to other samples of students, which might have further biased the final questionnaire towards a more homogeneous, White sample at a large public university. Thus, further research is clearly needed to test whether the psychometric properties of the AAQ-US are similar in more diverse samples to determine the external validity of the measure for various University contexts it may be used in.

The study included a cross-sectional design, which precluded the examination of prospective associations (e.g., test-retest reliability, predictive validity). Furthermore, the study lacked objective measures of student success (e.g., retention, actual GPA). This might have altered observed relations between the AAQ-US and academic outcomes, particularly due to any relevant third variables correlated with both (e.g., negative bias about one's academic performance, social desirable responding). Finally, the items generated for the AAQ-US were not subjected to review by external experts prior to the conduct of the study, which might have further refined items used in the study and supported their content validity.

Overall, the results of this study provide preliminary support for the AAQ-US as a reliable and valid measure for researchers and practitioners seeking to assess psychological

inflexibility among university students, particularly in the context of academic functioning. It is currently unclear whether the AAQ-US is more sensitive to detecting the effects of treatments like ACT among university students and whether the AAQ-US is as applicable to mental health treatment. Therefore, we recommend that future studies within the university context include both the generic and university-specific AAQs, which should not pose undue burden on participants given their short length, to further compare their performance as measures of this key mechanism of change.

Psychological inflexibility is a promising psychological process to assess and target for improving student mental health and academic success. The development of a more sensitive measure to capture this construct within this context would be helpful in two major ways. First, the AAQ-US might facilitate further understanding of the role of psychological inflexibility as a mechanism of change in ACT and other treatments among university students—who are typically amidst the critical developmental period of emerging adulthood (Arnett, 2004). Second, being able to show that psychosocial interventions can decrease psychological inflexibility in the academic context as well as mental health outcomes would provide more convincing evidence to university administrators and may facilitate the dissemination of evidence-based practices such as ACT in higher education settings. Future study and use of the AAQ-US will hopefully serve to further guide research and clinical practice in this area.

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*Table 1. Principal components analysis loadings and descriptive statistics for the final 12 AAQ-US items.*

Item	Component Loading	Item <i>M (SD)</i>
Worries get in the way of my success at school	.828	3.34 (1.46)
My thoughts and feelings get in the way of studying	.802	3.58 (1.47)
I get so worried about upcoming exams that I feel paralyzed and can't study	.772	3.10 (1.69)
I struggle with my thoughts about school	.743	3.57 (1.61)
It seems like I'm just "going through the motions" at school	.725	4.06 (1.38)
I find myself avoiding going to classes when I feel anxious or depressed	.721	3.04 (1.81)
I get so caught up in my worries during tests that I have trouble focusing on the test itself	.692	3.22 (1.70)
It's hard for me to focus on what my professors are saying in classes	.678	3.74 (1.34)
I often believe that I'm not smart enough to be in college or in this major	.670	3.55 (1.78)
I don't get anything out of a class when I'm having negative thoughts	.654	3.41 (1.54)
When I think an assignment is too hard or confusing, I give up	.653	2.75 (1.39)
I put off schoolwork when I feel bad	.633	4.15 (1.49)

Table 2. Zero order correlations between the AAQ-US and AAQ-II relative to academic outcomes, mental health, and psychological inflexibility.

Measure	AAQ-US	AAQ-II	Fisher's Z test <sup>a</sup>
<i>Academic Outcomes</i>			
Irrational Procrastination Scale	.62***	.42***	5.66***
Test Anxiety Inventory	.59***	.41***	4.94***
Social Adjustment Scale – Student	.63***	.49***	4.19***
Self-Reported GPA	-.33***	-.15**	3.91***
CCAPS Academic Distress	.72***	.61***	4.06***
<i>Mental Health Outcomes</i>			
CCAPS Total Distress	.65***	.77***	-5.00***
CCAPS Depression	.55***	.73***	-6.34***
CCAPS Anxiety	.55***	.67***	-3.93***
CCAPS Social Anxiety	.47***	.58***	-3.11***
CCAPS Eating Problems	.33***	.36***	-.70
CCAPS Hostility	.31***	.41***	-2.35*
Social Adjustment Scale – Social	.45***	.50***	-1.32
<i>Psychological Inflexibility Processes</i>			
Acceptance and Action Questionnaire-II	.65***	-	
Valuing Questionnaire - Progress	-.47***	-.44***	
Valuing Questionnaire – Obstruction	.64***	.69***	
CompACT – Open to Experience	-.53***	-.63***	
CompACT – Behavioral Awareness	-.63***	-.56***	
CompACT – Valued Action	-.48***	-.43***	

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . <sup>a</sup> Fisher's z test comparing AAQ-US and AAQ-II correlation coefficients with the relevant outcome variable (positive scores indicate the AAQ-US was more strongly related to the criterion variable than the AAQ-II).

Table 3. Hierarchical regression analyses testing the incremental validity of the AAQ-US over the AAQ-II and CCAPS in predicting academic and mental health outcomes.

Outcome	Step	AAQ-II $\beta$	AAQ-US $\beta$	CCAPS $\beta$	$R^2$
<i>Academic Outcomes</i>					
Irrational Procrastination Scale	1	.42***			.17***
	2	.02	.61***		.39**
	3	-.06	.58***	.14*	.40*
Test Anxiety Inventory	1	.41***			.17***
	2	.05	.56***		.35**
	3	.01	.54***	.06	.35
Social Adjustment Scale – Student	1	.49***			.24***
	2	.17**	.49***		.38***
	3	.02	.43***	.24***	.40***
Self-Reported GPA	1	-.15**			.02**
	2	.11	-.40***		.12***
	3	.12	-.40***	-.02	.12
CCAPS Academic Distress	1	.62***			.38***
	2	.26***	.55***		.55***
	3	-.08	.40***	.57***	.67***
<i>Mental Health Outcomes</i>					
CCAPS Total Distress	1	.77***			.60***
	2	.61***	.26***		.63***
CCAPS Depression	1	.73***			.53***
	2	.64***	.14**		.54**
CCAPS Anxiety	1	.67***			.44***
	2	.53***	.21***		.47***
CCAPS Social Anxiety	1	.58***			.34***
	2	.49***	.15**		.35**
CCAPS Eating Problems	1	.36***			.13***
	2	.26***	.16**		.15**
CCAPS Hostility	1	.41***			.17***
	2	.35***	.08		.17
Social Adjustment Scale – Social	1	.50***			.25***
	2	.37***	.21***		.28***

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . Step 3 CCAPS predictor variable was the total distress scale. Significant  $R^2$  values indicate improvement in proportion of variance accounted for in the dependent variable.



*Table 4. Differences in AAQ-US scores between known group categories from the CCAPS.*

	<u>Elevated CCAPS Scores</u>		<u>No Elevated Scores</u>		<i>t</i> -test	Cohen's <i>d</i>
	AAQ-US <i>M (SD)</i>	<i>n</i>	AAQ-US <i>M (SD)</i>	<i>n</i>		
Any elevated CCAPS score	46.77 (12.74)	241	34.51 (10.65)	180	10.47***	1.04
Depression	53.11 (12.75)	91	34.51 (10.65)	180	12.68***	1.58
Anxiety	51.85 (12.67)	96	34.51 (10.65)	180	12.05***	1.48
Social anxiety	49.98 (11.99)	94	34.51 (10.65)	180	10.93***	1.36
Academic distress	57.01 (10.08)	68	34.51 (10.65)	180	15.07***	2.17
Eating problems	46.53 (12.93)	138	34.51 (10.65)	180	9.09***	1.01
Hostility	47.46 (14.40)	63	34.51 (10.65)	180	7.54***	1.02
Alcohol	45.77 (14.06)	43	34.51 (10.65)	180	5.83***	.90