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Psychometric Properties of Acceptance and Action Questionnaire (AAQ) for Weight-Related Difficulties Questionnaire among University Students

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Abstract
This study evaluates the 22-item of Acceptance and Action on Weight-Related Difficulties Questionnaire-Revised 18 (AAQW-R18), which assesses weight-related psychological flexibility in university students. A total of 120 university students from the Faculty of Sports Science and Recreation, UiTM, aged 18 – 24 years old with a mean BMI= 22.71 ± 4.44 kg/m^2 (range 15.72 – 46.7kg/m^2) participated in this study. Participants were 65% male and 35% female. The corrected item-total correlation found that four items (items 1, 7, 14 and 18) had to be omitted due to low and negative correlations. High internal consistency was found in full length and the new AAQW (AAQW-R18). The new AAQW showed with a good convergent validity property. A two-week test-retest reliability was excellent. Age, gender and BMI categories were similar in AAQW score distributions. The AAQW-R18 demonstrates a greater criterion-related and convergent validity, confirming the validity and reliability of this instrument to measure psychological flexibility assessment among university students. It is concluded that the AAQW-R18 can be used for measuring weight-related psychological flexibility among our population.

Keywords: eating behaviors; experiential avoidance; validity; reliability; weight-related psychology

Introduction

The prevalence of obesity is well documented throughout the world and has been reported to increase steadily (Finucane, Stevens, & Cowan, 2011; James, 2008). Studies have rigorously explored the therapeutic effect of the Acceptance and Commitment Therapy (ACT) on eating behaviors issue (Weineland, Hayes, & Dahl, 2012) and also weight loss (Forman et al., 2013; Forman et al., 2016; Godfrey et al., 2019; Lillis & Hayes, 2007; Sairanen et al., 2015). The approach of ACT offers a viable solution to overcome the psychological issue related to experiential avoidance. Experiential avoidance is a psychological defense mechanism when individuals encounter a psychological issue. It has been proven to be a major factor in weight gain rebound and eating behavior issues.

Acceptance and Action on Weight-Related Difficulties Questionnaire-Revised (AAQ), a measure of experiential avoidance was developed (Hayes et al., 2004) was created, and the updated edition, AAQ-II (Bond et al., 2011). Another tool for assessing weight-related difficulties, feelings and behaviors, Weight-related Difficulties Acceptance and Action

Questionnaire (AAQW) was also developed (Lillis & Hayes, 2007). This inventory has been tested and produces a high internal consistency among the overweight populations.

While ACT weight-related intervention was found to be an effective psychological treatment for weight loss (Forman et al., 2016; Godfrey et al., 2019; Lillis & Hayes, 2007) the Three-Factor Eating Questionnaire-18 (TFEQ-18) subscales were then used as a measurement the effectiveness of this treatment. In this study, it was used as a pair instrument to establish convergent validity for AAQW. The validity and reliability of TFEQ-18 have been previously established (Kavazidou et al., 2012; Löffler A et al., 2015; Martins, da Silva, Maroco, & Campos, 2020).

Although the AAQW appears to have a reliable and robust measure in the overweight population, it is not known if its psychometric properties are sufficient for the general population, especially among university students. University students are young adults who are away from home, live independently to pursue their studies. Most of them struggle with a variety of issues, including eating behavior (Kristanto, Chen, & Thoo, 2016; Pasi et al., 2015) and weight-related issues (Che Wan Jasimah et al., 2019; Tahereh, Rosita, & Hazizi, 2015). Sport science students are eligible to enroll in this course with an athletic background and are physically active in academic years as athletes and to fulfill the academic syllabus demand. Even though the acceptance-based intervention was available in literature among physically active adults (Kangasniemi, Lappalainen, Kankaanpaa, & Tammelin, 2014), the evaluation of AAQW validity and reliability among active individuals is needed.

Conceptually, convergent validity is defined as the proximity of a scale relates to other variables and other measures of the same construct (Krabbe, 2017). In this study, AAQW scores are correlated with TFEQ-18 uncontrol eating and cognitive restraint subscale score. Meanwhile, criterion validity is defined as the degree to which the scores measuring one test criterion are compatible with another test criterion being evaluated (Piedmont, 2014). In this study, AAQW-R18 and BMI are expected to be correlated. Test-retest reliability is defined as a measure of the robustness of the scale, that is, the ability to generate consistent scores over time in a stable population. (Aaronson et al., 2002). In this study, each instrument (AAQW and TFEQ-18) was administered twice in two weeks interval and the total scores of the two instruments would be analyzed to see the correlation.

This study was therefore aimed at determining validity and reliability AAQW instrument among sports science university students. The convergent and criterion validity, internal consistency, and test-retest reliability were tested and evaluated.

Measures

Participants and procedure

A total number of 120 university students participated in this study. They were aged 18 to 24 years old, 65% (n =78) males and 35% (n = 42) female with mean BMI of 22.71 ± 4.44 kg/m^2. Most of the participants were normal weight (47.5%, n = 57) and overweight (37.5%, n = 45). Some were underweight (15%, n =18). They were selected based on their volunteer participation and were recruited among Faculty of Sports Science and Recreation. The AAQW and TFEQ-18 were administered to participants for the evaluation of convergent validity. A test-retest reliability protocol was administered, where they need to complete twice, which the second completion was a 2-week interval after the first test administration. The questionnaires were collected immediately after the participants completed them to ensure they would not remember their answers by checking them. The purpose of this protocol was to ensure consistency and stability of the measurement (Krabbe, 2017).

Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW)

The AQW is a 22-item assessment (Lillis & Hayes, 2007) with a reverse rating (items 1 , 6, 7, 14 and 18) prior to the total score being calculated (range 22-154) (see Appendix A). A higher score indicates more psychological flexibility in weight-related. The original English version was utilized in this study.

Three-Factor Eating Questionnaire-18 (TFEQ-18)

TFEQ-18 (Karlsson et al., 2000) is a measure to assess eating behavior. The original English version was employed. This inventory has been shown to be both reliable and valid within the general population (Pentikäinen, Arvola, Karhunen, & Pennanen, 2018). This study uses two factors for convergent validity, which are cognitive restraint (item 7 to 15) and uncontrolled eating (items 16 to 18) (see Appendix B). Uncontrolled eating is a desire to overeat as a consequence of a lack of regulated over food and a perceived sense of hunger, while, cognitive restraint represents the urge to limit the intake of food. Cognitive restraint is one of the dietary restraints which comes in two styles: flexible control and rigid control (Westenhoefer, 2001). Furthermore, acceptance-based therapy for weight management could be effective for eating behaviors (Forman et al., 2013). This justifies the selection of these measures as convergent validity. Positive significant correlations were established between the AAQW and cognitive restraint and uncontrolled eating subscales.

Anthropometric measurement

Participants' body weight was gathered using electronic scales. Standing height was measured to the nearest 0.5cm. Body mass index (BMI) was calculated by dividing weight in kg to the height in m squared. The value obtained were then categorized to underweight (< 18.5kg/m^2), normal weight (18.6kg/m^2 – 23kg/m^2) and overweight (> 23.0kg/m^2) (Boo et al., 2010).

Statistical analysis

All analyses were performed using Statistical Package for Social Science (SPSS) version 25. Convergent validity of AAQW and associated measures (uncontrolled eating and cognitive restraint) and test-retest reliability were evaluated using Pearson correlation coefficients where r = .00 to.30 is negligible, > .30 to.50 is low, > .50 to.70 is moderate, > .70 to.90 is high and > .90 to 1.00 is very high (Cohen, Cohen, West, & Aiken, 2003). Cronbach's alpha (α > .80 good fit and > .70 acceptable fit) was used to measure internal reliability (Lance, Butts, & Michels, 2006). Independent sample t-tests were used to examine the demographic variables; age and gender differences in measures AAQW and AAQW-R18. A one-way analysis of variance (ANOVA) was used to assess the total score of AAQW by BMI categories. Statistical significance was set at .05 (p < .05).

RESULTS

Table 1 shows the item characteristics of the 22-item AAQW. Most of the items are skewed to the left (-.808 to -.031) and low kurtosis (-1.136 to -.356). The corrected item-total correlation ranged from -.122 to .548. Items 1, 7, 14 and 18 have low and negative correlations, thus, they are to be considered omitted in further analyses. Internal consistency, Cronbach's alpha, α is .694 and the average inter-item correlation is .091 for the 22-item, however, it increases, α = .760 and the average inter-item correlation is .149 for the 18-item. The alpha if the item is deleted also showed the internal consistency would increases if the four items are eliminated. Thus, these strengthen the exclusion of the four items and retain the 18 items for further analyses.

Regarding the convergent validity, AAQW score is positively and significantly correlated with uncontrol eating (r = .386) and cognitive restraint (r = .214) (p < .05) scores. For criterion-related validity, there is a significant correlation between AAQW-R18 and BMI (r = .189, p < .05). All correlations of the AAQW-R18 are higher with convergent validity measures and criterion-related validity than the full-length of AAQW. For test-retest reliability, the correlation coefficient is r = .933, suggesting a high reliability (Table 2).
Table 3 shows the difference of AAQW by demographic variables. Age, gender and BMI does not significantly different in AAQW (p > .05).

Table 1: Item characteristics of the 22-item AAQW

Item	*M*	*SD*	Sk.	Kurt	$r_{ci\text{-}tc}$	α-id
Item 1	**4.43**	**1.895**	**.247**	**-.927**	**-.046**	**.713**
Item 2	4.22	1.726	-.122	-.865	.207	.689
Item 3	3.92	1.594	-.230	-.815	.158	.693
Item 4	4.21	1.619	-.296	-.639	.144	.694
Item 5	4.00	1.685	-.075	-.748	.237	.686
Item 6	3.38	1.588	-.514	-.426	.110	.697
Item 7	**3.58**	**1.453**	**-.141**	**-.635**	**-.120**	**.713**
Item 8	4.95	1.466	-.808	.576	.033	.702
Item 9	5.16	1.455	-.830	.539	.029	.702
Item 10	4.09	1.852	-.104	-.995	.548	.654
Item 11	3.94	1.898	.025	-1.136	.278	.682
Item 12	4.11	1.389	-.101	-.398	.511	.664
Item 13	3.50	1.715	.061	-.904	.428	.667
Item 14	**3.75**	**1.578**	**-.292**	**-.426**	**-.140**	**.718**
Item 15	3.72	1.588	-.113	-.798	.529	.659
Item 16	3.78	1.486	-.120	-.356	.563	.658
Item 17	4.14	1.457	-.350	-.142	.400	.672
Item 18	**3.25**	**1.361**	**-.795**	**.831**	**-.002**	**.705**
Item 19	3.73	1.674	.104	-.921	.374	.673
Item 20	3.23	1.891	.461	-.953	.553	.651
Item 21	3.82	1.659	-.031	-.504	.429	.668
Item 22	2.56	1.669	.828	-.397	.415	.669
OVRL	86.15	13.20				

AAQW, α = .694; Average inter-item correlation = .091

AAQW-18, α = .760; Average inter-item correlation = .149

Note. Sk. = skewness, Kurt. = kurtosis; $r_{ci\text{-}tc}$ - corrected item-total correlation; α-id = Cronbach's alpha if item deleted; α = Cronbach's alpha

Table 2: Correlation coefficients for AAQW, AAQW-R18 and measures for validation

	AAQW	AAQW-R18
$AAQW_2$	.917*	
$AAQW\text{-}R18_2$		.978*
Uncontrol Eating	.386*	.429*
Cognitive Restraint	.204*	.225*
BMI	.134	.189*

Note. Uncontrolled eating and Cognitive restraint - the constructs in Three-Factor Eating Questionnaire -18 (TFEQ-18)
AAQW-R18 - revised version with omitted items 1, 7, 14 and 18.
$AAQW_2$ - the second measure for AAQW (retest); $AAQW\text{-}R18_2$ = the second measure for AAQW-R18 (retest)
*p < .05

Table 3: Difference of AAQW-R18 by demographic variable

Variable	*M*	*SD*	*F*/*t*	*df*	*p*
Age (years)					
18–20 (*n*=103)	70.03	12.51	-.883	118	.379
21–24 (*n*=17)	73.12	17.92			
Gender					
Male (*n*=78)	69.14	11.55	-1489	118	.139
Female (*n*=42)	72.93	16.05			
BMI (Mean BMI = 22.71 ± 4.44 kg/m^2)					
UW (*n*=18)	68.94	14.60	2.210	117	.114
NW (*n*=57)	68.37	11.80			
OW (*n*=45)	73.73	14.32			

*$p < .05$.
t-value is for age and gender, *F*-value is for BMI.
Score ranges from 18 to 126

Discussion

ACT has become a successful therapy in body weight control and eating behavior, and evaluations to assess the desired targets was confirmed among university students. AAQW was designed to assess weight-related psychological flexibility in the overweight population (Lillis & Hayes, 2007), but it has not been tested in the general population of active individuals. The present study revealed a high internal consistency as reported in previous studies (Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016; Weineland, Lillis, & Dahl, 2013). With regards to the corrected item-total correlation ranged, item 1 (*It's OK to feel fat*), 7 (*When I evaluate my weight or my appearance negativity, I am able to recognize that this is just a reaction, not an objective fact*), 14 (*I am in control of my eating behavior*) and 18 (*I am a stable person*) have low and negative correlations, thus, they were omitted in further analyses. These items are stated in a positive manner; thus, they may be a certain degree of inconsistency if compare to other items which lead to more problematic eating behavior. As a result, this study finds a briefer, 18-item AAWQ (AAQW-R18) was more accurate and acceptable in university students and our population.

The reduced number of AAQW items attributable to small item-total correlations is representative of the disparity between the general population and the overweight participants in response to these items. The items eliminated are suggestive to be irrelevant to the sports science students in terms of their eating behavior.

The test-retest reliability for the AAQW-R18 found a highly consistent result, $r = .978$, suggesting a stable and reliable measurement. This finding suggests that AAQW-R18 can be used to assess weight-related psychological flexibility among university students. From a functional perspective, the AAQW-R18 is reliable to be used among university students.

AAQW is significantly correlated with all convergent measures; uncontrolled eating and cognitive restraint, however not its criterion-related validity, BMI. Nevertheless, the revised AAQW (AAQW-R18) shows a higher association with those measures and BMI, but in low range. This indicates an adequate convergent and criterion validity of AAQW-R18 in this study. The revised AAQW of this study is comparable with other study (Dochat et al., 2020), were their revised AAQW with 10-item has a low correlation with BMI.

The positive significant correlations between AAQW and AAQW-R18 and uncontrolled eating and cognitive restraint suggest that weight-related psychological flexibility and eating behavior is related but with a distinct construct. These eating behavior measures are subscales from TFEQ-18 which is also reported to be a useful construct in assessing different eating behavior

in a general population (De Lauzon, Romon, Deschamps, Lafay, & Borys, 2004; Kavazidou et al., 2012). Besides, studies have shown that improved psychological flexibility was useful in managing weight and improving eating behaviors (Forman et al., 2013; Forman et al., 2016; Tapper et al., 2009) Therefore, this study proves that weight-related psychology flexibility and eating behavior are a related construct.

As the number of items reduced to 18, the minimum total score is 18 and the maximum score is 126. Therefore, the mean score obtained indicates an acceptable flexible psychology in weight-related difficulties among this population. This is also strengthened by a similar distribution across age groups, gender and BMI categories in the total score of AAQW-R18.

Conclusions

The present study provided encouraging psychometric properties analysis on the AAQW with the omission of four items, to the revised version, the AAQW-R18. The AAQW-R18 tends to be an appropriate indicator of psychological flexibility related to weight for university students. The AAQW-R18 is useful to assess weight-related psychological flexibility in the general population who are likely to be active individuals.

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Appendix A (Weight-related Difficulties Acceptance and Action Questionnaire -AAQW (Lillis & Hayes, 2002))

No	Items
1	It's OK to feel fat
2	When I have negative feelings, I use food to make myself feel better
3	I try to suppress thoughts and feelings that I don't like about my body or weight by just not thinking them
4	I am not in control of what I eat
5	I try hard to avoid feeling bad about my weight or how I look
6	I am in control of how much physical activity I do
7	When I evaluate my weight or my appearance negatively, I am able to recognize that this is just a reaction, not an objective fact
8	In order to eat well and do physical activity, I need to feel like it
9	I need to feel better about how I look in order to live the life I want to
10	Other people make it hard for me to accept myself
11	If I'm overweight, I can't live the life I want to
12	If I feel unattractive, there is no point in trying to be intimate
13	If I gain weight, that means I have failed
14	I'm in control of my eating behavior
15	I don't have what it takes to be healthy for life
16	My eating urges control me
17	I need to get rid of my urges to eat better
18	I am a stable person
19	I f I eat something bad, the whole day is a waste
20	I should be ashamed of my body
21	I need to avoid social situations where people might judge me
22	I will always be overweight

Note. Item 1 to 10 are rated by never true to always true (1 - 7); item 1, 6, 7, 14 and 18 are reversed keyed. Item 11 to 22 are rated by not at all believable to completely believable (1 – 7).

Appendix B (The Three-Factor Eating Questionnaire-Revised-18) (de Lauzon-Guillian et al., 2004)

No	Item
Cognitive Restrained	
1	When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal
2	I deliberately take small helpings as means of controlling my weight
3	When I feel anxious, I find myself eating
4	Sometimes when I start eating, I just can't seem to stop
5	Being with someone who is eating often makes me hungry enough to eat also
6	When I feel blue, I often overeat
Uncontrolled eating	
7	When I see a real delicacy, I often get so hungry that I have to eat right away
8	I get so hungry that my stomach often seems like a bottomless pit
9	I am always hungry, so it is hard for me to stop eating before I finish the food on my plate
10	When I feel lonely, I console myself by eating
11	I conscious hold back at meals in order not to gain weight
12	I do not eat some foods because they make me fat
13	I am always hungry enough to eat at any time
14	How often do you feel hungry?
15	How frequently do you avoid 'stocking up' on tempting foods?
Emotional Eating	
16	How likely are you to consciously eat less than you want?
17	Do you go on eating binges though you are not hungry?
18	On a scale of 1 to 8, where 1 means no restraint and 8 means total restraint, what number would you give yourself?

Note. Item 1 to 13 are rated by definitely false/mostly false/mostly true/definitely true. Item 14 is rated by almost. Item 15 is rated by almost never/seldom/moderately likely/very likely. Item 16 is rated by unlikely/slightly likely/moderately likely/very likely. Item 17 is rated by never/rarely/sometimes/at least once a week. Item 18 is rated from 1 to 8.